



AJMER VIDYUT VITRAN NIGAM LIMITED AJMER

TENDER DOCUMENT

**FOR THE WORK OF SURVEY, DESIGN, SUPPLY, ERECTION, TESTING,
COMMISSIONING & 10 YEARS COMPREHENSIVE OPERATION & MAINTENANCE
OF
“ 33/11 KV GRID SUBSTATION & ASSOCIATED INFRASTRUCTURE”**

ON OPEX MODEL IN AVVNL

NIT No: AJD/SE/TW/TN-378

Note : Tender document cost : Rs. 2,950/-(Inclusive of GST)

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SECTION - A: Disclaimer

1. Ajmer Vidyut Vitran Nigam Limited (“AVVNL”/ “Ajmer Discom”), Jaipur Vidyut Vitran Nigam Limited (“JVVNL” / “Jaipur Discom”) and Jodhpur Vidyut Vitran Nigam Limited (“JdVVNL” / “Jodhpur Discom”) are statutory bodies constituted in year 2000 from the erstwhile Rajasthan State Electricity Board and have been engaged in distribution of electricity in the State of Rajasthan hereinafter collectively referred to as the “Rajasthan Discoms”.
2. AVVNL hereby invites through this NIT, bids from eligible bidders for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.
3. This document is not transferable.
4. Although adequate care has been taken while preparing the Tender document, however, the Bidders shall satisfy themselves that document is complete in all respects. If noticed, Bidders shall intimate any discrepancy in the Tender document to office of the undersigned within 3 days from the date of issuance of the Tender document. If no intimation is received from the Bidders within the stipulated period, it shall be assumed that the Tender document is complete in all respects and fulfils the expectations of the Bidders.
5. AVVNL may modify, amend or supplement any aspect of this Tender document, including selection process and evaluation criteria, if deemed necessary by it or the same is required under Law. Further, AVVNL or its authorized officers reserve the right, without prior notice, to change the selection procedure and the delivery of information at any time before submission of bids without assigning any reasons thereof. However, such change shall be posted on Bidding Portal.
6. Nothing in the Tender Document should be relied on, as a promise or representation as to the future.
7. AVVNL, its officers, employees and consultants have made best efforts to provide as accurate and reliable information as possible. However, before submitting their bids, the Bidders are expected to independently assess, verify and validate the information/data provided in the Tender Document.
8. AVVNL, its officers, employees and consultants have no responsibility for authenticity of the information/data hence shall not be held liable for any possible omission, misrepresentation, mistake or error in the information/data provided in the Tender Document and consequences thereof.
9. AVVNL reserves the right to annul the bid process and/or reject any or all of the Bids submitted in response to this Tender Document at any stage without assigning any reasons whatsoever. In such cases AVVNL will refund the Bid Security and cannot be subjected to any liability whatsoever due to such rejection/cancelation.

SECTION - B: Key Abbreviations & Definitions

1. Definitions:

| | | |
|----|------------------------------|--|
| 1. | “AVVNL” / “Ajmer Discom” | Ajmer Vidyut Vitran Nigam Limited, Ajmer At multiple places in this document terms such as “Purchaser”/ “Employer”/ “Procuring Entity” / “Discom” are used shall be meaning AVVNL. |
| 2. | Rajasthan Discoms | All 3 Discoms in Rajasthan namely: AVVNL, JVVNL & JdVVNL |
| 3. | NIT / Tender Document | “Notice Inviting Tender” / “Tender Document” / shall mean this “Notice Inviting Tender for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378. |
| 4. | Grid Sub-station: | “GSS” shall mean Grid Sub-station and equipment, man & material installed in the land premises allotted by Discom in the said GSS under consideration. |
| 5. | Bid: | shall mean the “Proposal” / “Quotation” submitted by eligible bidders for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378. |
| 6. | Bidder: | shall mean an entity submitting the Bid. Any reference to the Bidder includes an entity including its successors, executors and permitted assigns severally, as the context may require |
| 7. | Contractor: | shall mean the successful Bidder whose Bid to perform the Contract as per this Tender Document has been accepted by AVVNL, Project is awarded by the AVVNL and is named as such in the Contract Agreement, and includes the legal successors or permitted assigns of the Contractor; At multiple places in this document terms such as “Seller”/ “Supplier” are used shall be meaning Contractor/ Bidder as applicable. |
| 8. | Contract/ Contract Agreement | shall mean the contract signed between the Discom and the Contractor to execute the entire Scope of Work as given in this Tender Document; |

| | | |
|-----|-----------------------------|---|
| 9. | Discom: | shall mean the relevant electricity Distribution Company from which the Contractor has received the award of Contract under this NIT unless specifically name of Discom is mentioned. At multiple places terms such as “Purchaser”/ “Employer”/ “Procuring Entity” are used shall be meaning AVVNL as applicable. |
| 10. | Project: | The Project shall mean: “Work divided in two parts: 1) Construction of 33/11 kV GSS & associated infrastructure: survey, design, supply, erection, testing, commissioning of 33/11 KV Grid Substation (GSS) and associated infrastructure (33 kV Line & 11 kV Lines), including civil work; and 2) 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Substation (GSS) and 33 kV Line on OPEX model in AVVNL under TN-378. The quantity of GSS can be single or multiple as per the terms and conditions of Tender Document. |
| 11. | “Associated Infrastructure” | The associated 11 kV Line, 33 kV Line emanating/ incoming from/to the GSS. |
| 12. | “Successful Bidder” | The Bidder who has been issued LOI by AVVNL. |
| 13. | Engineer In-charge | Field Office Engineer as designated by Discom |
| 14. | Nodal Officer | Senior Engineer as designated by Discom |
| 15. | Payment Officer | Officer from Accounts Wing designated by Discom |
| 16. | Authorized Officer | Officer Designated by Discom for specific task |
| 17. | Electrical Inspectorate | Electrical Inspectorate Department Rajasthan |

2. Abbreviations

| | | |
|-----|-----------------|--|
| 1. | BOQ | Bill of Quantity |
| 2. | BOS | Balance-of-System |
| 3. | CEA | Central Electricity Authority |
| 4. | CEIG | Chief Electrical Inspector of Rajasthan |
| 5. | CERC | Central Electricity Regulatory Commission |
| 6. | COMC | Comprehensive Operation & Maintenance Contract |
| 7. | DC | Direct Current |
| 8. | DT | Distribution Transformer |
| 9. | DWC | Double Walled corrugated |
| 10. | HP | Horse Power |
| 11. | IEEE | Institute of Electrical and Electronics Engineers |
| 12. | IPR | Intellectual Property Right |
| 13. | IS | Indian Standard |
| 14. | Isc | Short Circuit Current |
| 15. | IST | Indian Standard Time |
| 16. | kV | Kilo Volt |
| 17. | kW | Kilo Watts |
| 18. | kWp | Kilo Watt peak |
| 19. | LoI | Letter of Intent |
| 20. | LT | Low Tension |
| 21. | MCB | Miniature Circuit Breaker |
| 22. | MoP | Ministry of Power |
| 23. | MW | Mega Watt |
| 24. | NEC | National Electric Code |
| 25. | PAN | Permanent Account Number |
| 26. | POC | Proof of Concept |
| 27. | Deleted | Deleted |
| 28. | RCCB | Residual Current Circuit Breaker |
| 29. | RERC | Rajasthan Electricity Regulatory Commission |
| 30. | RFID | Radio Frequency Identification |
| 31. | RTPP Act 2012 | Rajasthan Transparency in Public Procurement Act 2012 including any amendments issued thereto; |
| 32. | RTPP Rules 2013 | Rajasthan Transparency in Public Procurement Rules 2013 including any amendments issued thereto; |
| 33. | SMB | Sub Miniature version B |
| 34. | TPI | Third-party inspection |

| | | |
|-----|------|--|
| 35. | TPIA | Third-Party Inspection Agency' appointed by Discom |
| 36. | -ve | Negative |
| 37. | Vmp | Voltage at Maximum Power |
| 38. | Voc | Voltage at Open Circuit |
| 39. | W | Watt |
| 40. | WO | Work Order |
| 41. | Wp | Watt peak |
| 42. | XLPE | Cross-linked Polyethylene |

SECTION - C: Key Bid Data

| | | |
|-------|--|---|
| i. | Programme & detail of work / “Project” | <p>The Project shall mean: “Work divided in two parts:</p> <ol style="list-style-type: none"> 1) Construction of 33/11 kV GSS & associated infrastructure: survey, design, supply, erection, testing, commissioning of 33/11 KV Grid Sub-station (GSS) and associated infrastructure (33 kV Line & 11 kV Lines), including civil work; and 2) 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) and 33 kV Line <p>on OPEX model in AVVNL under TN-378. The quantity of GSS can be single or multiple as per the terms and conditions of Tender Document.</p> |
| ii. | Work Area: / “Site” | Land identified & to be handed-over to Contractor for Project of 10 Nos. of GSS & Associated Infrastructure as mentioned in Section E Clause 5 |
| iii. | NIT No: | AJD/SE/TW/TN-378 |
| iv. | Estimated Nos. of GSS to be erected | 10 Nos. (Tentative - Quantity may increase/decrease) |
| v. | Estimated Project Cost: | Total Estimated Project Cost: Rs 14,56,11,057.36/- |
| vi. | Bid Security: | 2% of Estimated Project Cost i.e. Rs. 29,12,221/- * (* in case of SSI units please see Section-C (3.1.4) |
| vii. | Date of downloading | 25.09.2019 from 11:00 AM {The tender can be downloaded from Bidding Portal} |
| viii. | Last Date of submission of Envelope-1 at AVVNL Head Office {in Hard Copy } | 21.10.2019, 05:00 PM |
| ix. | Last Date of online submission of Bid (Cover-1, Cover-2 & Cover-3) | 22.10.2019, 01:00 PM |
| x. | Date of Opening of online Technical bid (Cover-1 & Cover-2) | 22.10.2019, 05:00 PM |
| xi. | Date of opening of Financial bid of eligible & qualified bidders (cover-3) | Shall be intimated after evaluation of Technical bid. |
| xii. | Date of Completion of work. | As provided in Section E Clause 6. |
| xiii. | Cost of Tender Document: | Rs. 2,950/-(inclusive of GST) in favour of payable at Sr. A.O. (EA & Cash), AVVNL, Ajmer. |

| | | |
|--------|--------------------------------|--|
| xiv. | E-procurement processing Fees: | Rs.1180/-(inclusive of GST) in favour of MD RISL, payable at Jaipur. |
| xv. | Date of Pre-bid meeting | 30.09.2019 at 11:00 AM at Ajmer, Rajasthan |
| xvi. | Bid Validity | 6 months from the date of opening of online Technical bid. |
| xvii. | Bidding Portal | www.eproc.rajasthan.gov.in |
| xviii. | NIT Issue Date | 21.09.2019 |

NOTE: Bids are to be submitted online in electronic format on Bidding Portal with scanned copies of all required documents. Documents regarding Bid Security, Cost of Tender Document and RISL E-procurement processing Fees to be submitted in physical form as detailed in subsequent clauses. One hard copy of technical bid also to be submitted before the scheduled date & time.

1. The bidders are requested to submit their bids prior to scheduled date & time to avoid event of non-submission of their bids due to non-availability / hanging of Bidding portal, at either ends, at last moment or any reason whatsoever. The last date of submission of bids will not be extended in such circumstances.
2. The Bid Security, Cost of Tender Document and RISL E-procurement processing Fees, is to be deposited in Envelope-1(in Physical/ Hard Form) at Office of SE (TW) AVVNL, Ajmer prior to scheduled date & time as mentioned in Section C Clause 2 (viii) and the scanned copy of proof of deposit/ receipt of these documents be uploaded on Bidding Portal in Cover-1 as mentioned in Section C (ix). Both hard copy submission and online submission of scanned copies as prescribed is essential otherwise the bid (Technical Bid (Cover-2 & Financial Bid (Cover-3)) in electronic form will not be opened of that bidder.
3. The bidder shall have to submit the desired documents in the following manner:
 - 3.1. **Envelope-1:** i.e.:
 - 3.1.1. The DD/Banker's Cheque only of prescribed cost of Tender document as mentioned in Section C (xiii) in favour of **Sr. A.O. (EA & Cash) AVVNL, Ajmer payable at Ajmer;**
 - 3.1.2. The DD/Banker's Cheque only of prescribed processing fee of RISL as mentioned in Section C (xiv) in favour of **MD RISL, payable at Jaipur;** and
 - 3.1.3. Bid security of prescribed value as mentioned in Section C (vi) by way of
 - 3.1.3.1. DD/Banker's Cheque/ in favour of **Sr. A.O. (EA & Cash) AVVNL, Ajmer payable at Ajmer**
 - OR**
 - 3.1.3.2. **Bank Guarantee ("BG") in favour of SE (TW) AVVNL, Ajmer. The BG shall be from Any Government bank and in case of private bank as enlisted below:-**

| Sl. No. | Name of Banks |
|---------|------------------------------|
| 1. | HDFC Bank Ltd. |
| 2. | Axis Bank Ltd. |
| 3. | Kotak Mahindra Bank Ltd. |
| 4. | Federal Bank Ltd. |
| 5. | Indusind Bank Ltd. |
| 6. | Development Credit Bank Ltd. |

| Sl. No. | Name of Banks |
|---------|------------------------|
| 7. | ING Vysya Bank Ltd. |
| 8. | Karnataka Bank Ltd. |
| 9. | Karur Vysya Bank Ltd. |
| 10. | Ratnakar Bank Ltd. |
| 11. | South Indian Bank Ltd. |
| 12. | Yes Bank Ltd. |
| 13. | ICICI Bank |
| 14. | IDFC Bank |

3.1.4. A Certificate of Registration under DIC's in Rajasthan shall require to be submitted in proof of SSI unit of Rajasthan for getting benefit of exemption in submission of Bid Security.

Government undertakings PSUs are exempted from submission of Bid Security on producing certificate issued by competent authority. As per RTPP Act 2013, Rule 42 (2) in case of open competitive bidding, two-stage bidding, rate contract, electronic reverse auction, bid security shall be 2% or as specified by the State Government of the estimated value of subject matter of procurement put to bid. **In case of small scale industries of Rajasthan it shall be 0.5%** of the quantity offered for supply and in case of sick industries, other than small scale industries, whose cases are pending with Board of Industrial and Financial Reconstruction, it shall be 1% of the Estimated Project Cost. Concessional bid security may be taken from registered bidders as specified by the State Government. Every bidder, if not exempted participating in the procurement process shall be required to furnish the bid security as specified in the tender document.

For claiming the above benefit an affidavit on Rajasthan Non-Judicial Stamp Paper of Rs. 100/- (as per Section M Format M2) and SSI Certificate from Govt. of Rajasthan need to be submitted in the envelope no. 1.

- 3.2. Bid security shall remain valid for a period of thirty (30) days beyond the original bid validity period, and beyond any extension subsequently requested. In case of submission of the Bid Security in form of Bank Guarantee (BG), bid security shall be submitted in standard format **as per Section M Format M1**
4. Cutting / overwriting if any in the figures of the tendered documents is required to be clarified / indicated in words, duly signed, failing which the tender may be rejected.
5. Deviation of any kind is "not" to be quoted in the bid. Such deviations shall not prevail.
6. The bidders shall provide complete information at the time of submission of bid. If the bidders are asked to furnish some more clarification/confirmation/document, they shall be required to furnish the same within specified time, failing which the case shall be finalized /decided on the basis of available information/documents. The responsibility of ignorance of their bid on account of delay in furnishing of desired information/documents shall be of the bidder. However, if there are any shortcomings in the submission of the information which not materially affects the qualification criterion, then AVVNL shall have the power to consider the facts on the merit of the case and decide the bid evaluation accordingly.

7. **All tender documents shall essentially be signed digitally and submitted/uploaded on Bidding Portal in time specified Section C.**
8. The Bidder shall submit the Techno Bid in hard copy also marked as Bid Envelope (Technical Part) containing the documents. These envelopes shall then be sealed in an outer envelope.
9. Bidders who wish to participate in this tender, will have to register on Bidding Portal (bidders registered earlier on the Bidding Portal need not to get registered again). To participate in online tenders, Bidders will have to procure Digital Signature Certificate (Class II & Class III) as per requirement under Information Technology Act-2000 using which they can sign their electronic bids. Bidders can procure the same from any CCA approved certifying agency or they may contact e-Procurement Cell, Department of IT & C, Government of Rajasthan on the address **e-Procurement Cell, RISL, Yojana Bhawan, Tilak Marg, C-Scheme, Jaipur, e-mail: eproc@rajasthan.gov.in**
10. Bidders are also advised to refer “Bidders Manual” available under “Downloads” section on Bidding Portal for further details about the e-tendering process.
11. **All the required information shall be furnished strictly in the prescribed Formats only. Any information indicated other than the prescribed Formats shall not be entertained.** The bid shall be evaluated on the basis of information furnished in the prescribed Formats only.
12. **Clarifications regarding this tender document for any type of typographical Errors or misunderstanding of document, the version/decision of AVVNL shall be final.**
13. Pre-bid Meeting
 - 13.1. Pre-bid Meeting shall be conducted at Corporate Office of AVVNL at Ajmer, Rajasthan on the scheduled date and time as mentioned in Section C (xv) at the following address:

Ajmer Vidyut Vitran Nigam Limited,
216, Vidyut Bhawan, Panchsheel Nagar, Ajmer.
14. **Correspondence for enquiries and clarifications**

All correspondence in respect of this tender and submission of the Tender shall be addressed to:

The Superintending Engineer (TW) AVVNL, Ajmer
AJMER VIDYUT VITRAN NIGAM LIMITED,
216, Vidyut Bhawan, Panchsheel Nagar, Ajmer,
Ph.-0145-2644507, Mobile No: 9414003323
E-mail setwipdsavvn@gmail.com

SECTION - D: Introduction

1. Background:

1.1. Ajmer Vidyut Vitran Nigam Limited (AVVNL), Jaipur Vidyut Vitran Nigam Limited (JVVNL) and Jodhpur Vidyut Vitran Nigam Limited (JdVVNL) are public utility companies under the Department of Energy, Govt. of Rajasthan and are holders of the distribution and retail supply business licenses in the State of Rajasthan (jointly called as “Rajasthan Discom” and individually addressed as “Discom”). The three Distribution Companies came in to existence on 19th July 2000 pursuant to the “Rajasthan Power Sector Reforms Transfer Scheme, 2000” and restructuring undertaken in the State under which the vertically integrated Electricity Board (Rajasthan State Electricity Board or RSEB) was unbundled and the power generation, transmission and distribution business was segregated to form 5 successor companies viz.

1.1.1. Rajasthan Rajya Vidyut Utpadan Nigam Limited (RVUN) to manage the electricity generation business of erstwhile RSEB

1.1.2. Rajasthan Rajya Vidyut Prasaran Nigam Limited (RVPN) to manage the electricity transmission and bulk supply business of erstwhile RSEB.

1.1.3. Ajmer Vidyut Vitran Nigam Limited (AVVNL) to manage the electricity distribution and retail supply business of erstwhile RSEB in Ajmer City Circle, Ajmer District Circle, Bhilwara, Nagaur, Jhunjhunu, Sikar, Udaipur, Chittorgarh, Rajsamand, Banswara, Pratapgarh and Dungarpur Circles.

1.1.4. Jaipur Vidyut Vitran Nigam Limited (JVVNL) to manage the electricity distribution and retail supply business of erstwhile RSEB in Alwar, Bharatpur, Jaipur City, Jaipur District, Dausa, Kota, Jhalawar, Sawai Madhopur, Bundi, Baran, Tonk, Karauli and Dholpur Circles.

1.1.5. Jodhpur Vidyut Vitran Nigam Limited (JDVVNL) to manage the electricity distribution and retail supply business of erstwhile RSEB in Sriganganagar, Hanumangarh, Churu, Bikaner District, Bikaner City, Jaisalmer, Jalore, Barmer, Jodhpur City, Jodhpur District, Sirohi, Jalore, and Pali Circles.

1.2. AVVNL intends to select competent, experienced and eligible Bidders for the work of “Project” which shall mean:

“Work divided in two parts:

1) Construction of 33/11 kV GSS & associated infrastructure: survey, design, supply, erection, testing, commissioning of 33/11 KV Grid Sub-station (GSS) and associated infrastructure (33 kV Line & 11 kV Lines), including civil work;

and

2) 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) and 33 kV Line

on OPEX model in AVVNL under TN-378 (as per scope of work & technical specifications as prescribed in this tender document).

1.3. The list of 33 KV GSS where the work shall be required to be executed by the Contractor is provided in this tender document.

2. Mode of Execution of Programme:

- 2.1. The basis of evaluation of the bids shall be the cost/rate quoted in the Price Schedule. To further clarify, all the costs including applicable taxes, duties, etc. pertaining to the said specified Scope of Work and execution as per the specifications as provided in this Tender Document, shall be inclusive in the Price Bid quoted by Bidders for the purpose of comparison and evaluation. Bidders are required to quote rate / cost on firm basis and no price variation on any account (except in case of statutory variation) shall be considered.
- 2.2. **The estimated quantity of 33 KV GSS and associated infrastructure covered under this Tender will be around for 10 Nos distributed in AVVNL area. This quantity may further increase upto 50% and decreased as required by Discom.**
- 2.3. The Contractors shall be provided the list along with locations of such GSS as covered under the scope of work under this Tender Document.
- 2.4. Imported goods in Supply of Material shall not be acceptable. Only indigenous goods shall be acceptable in the contract.
- 2.5. Sub-letting/ Sub-Contracting is not allowed under this Tender.

SECTION - E: Summary Scope of Work

1. Scope of work for Contractors under this Tender Document covers work of the survey, design, supply, erection, testing, commissioning of 33/11 KV Grid Sub-station (GSS) & Associated Infrastructure (33 kV Line & 11 kV Line), including civil work & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & 33 kV Line on Opex model in AVVNL under TN-378 conforming to detailed scope of work & technical specifications enumerated in Section L & P of this Tender document. Summary scope of work is provided hereunder:-

1.1. The said Scope of Work of Project shall be on the Contractor's responsibility, completely covering all the material supply and erection activities and successful comprehensive operation & maintenance for a period of 10 (ten) years after successful commissioning under the accompanying technical specification. It will include the following:

1.1.1. Detailed design of the equipment

1.1.2. Complete responsibility of manufacture including shop testing (by the representative of Discom) prior to dispatch at manufacturer's premises as per technical specifications.

1.1.3. Providing Engineering drawings, data, operation manual, etc. for the approval by Discom.

1.1.4. Complete responsibility of material & erection of civil works including but not limited to levelling, boundary wall, control room, etc. as per the detailed specifications provided.

1.1.5. Packing and transportation from the manufacturer's works to the site, receipt, storage, preservation and conservation of equipment at the site, pre- assembly, if any, erection, testing and commissioning of all the equipment, Reliability tests and performance and guarantee tests on completion of Commissioning.

1.1.6. Comprehensive O&M of substation for 10 years with required manpower, tool & tackle and arrangement of required day to day consumable items for GSS & 33 kV Line.

1.2. Further, entering into Contract agreements with Discom.

1.3. Contractor will essentially provide the verified documents (from Discom after physical verification of installations) along-with location coordinates (Longitude and Latitude of GSS & infrastructure installed) to Discom as per directions before submission the claims for payment. Verified copies of statements of GPS coordinates shall be submitted to Nodal Officer of Discom in the desired formats.

1.4. The Contractor shall be allowed to complete the supply & erection conforming to the scope & technical specifications (detailed at Section – L & P) with submission of type test certificates (not older than five years) of material used from "NABL approved test lab" / "any Government recognized lab" after authorisation by Discom.

2. Work of O&M of Project shall involve:

- 2.1. Discom gives great importance to comprehensive operation & maintenance of the systems & it is felt that without proper maintenance after installation of system.
- 2.2. The Contractor shall have to provide comprehensive operation & maintenance for a period of 10 years for the said GSS(s) after successful commissioning under this Contract.
- 2.3. For carrying out round the clock comprehensive operation & maintenance of the said GSS(s), the Contractor shall employ his own, minimum 3 (three) persons per day per GSS who possess a minimum qualification of ITI from a recognized/ Govt. Institution in each shift i.e one Skilled (ITI) in each shift is to be deployed. The contractor shall ensure that the persons engaged by him shall not continue the shift for more than 8 hours in a day.
- 2.4. **The Contractor has to strictly follow the Minimum Wage Criteria as per the applicable Laws of the Rajasthan Government. The following is the computation of the Minimum Wage Computation as per the latest circular issued by Labour which is to be strictly abided by the Contractor and his personnel at all times during the period of the Operation & Maintenance of each GSS(s) under the Contract: (The following computation is on per GSS basis)**

| Minimum No. of Person required for each GSS (Nos.) | Rate as per latest Minimum Wages Act of Govt. of Rajasthan per day for skilled workman (In Rs.) | Days (Nos) | Wages for 30 days per GSS for Minimum No. of Persons (In Rs.) | As per notification no. WSU/44/(2)97/Administrative charges/33959 on dated 22.03.2017 EPF@13.15 % (In Rs.) | As per Gazette of India notification dated 13.06.2019 vide GSR 423 (E) ESI @ 3.25 % (In Rs.) | Total inclusive all components, applicable taxes, etc. (In Rs.) |
|--|---|------------|---|--|--|---|
| 1 | 2 | 3 | 4 = 1x2x3 | 5=4 x 13.15% | 6 = 4 x 3.25% | 7=4+5+6 |
| 3 | 249 | 30 | 22410 | 2946.92 | 728.33 | 26085.25 |

- 2.5. It is mandatory for Bidders to quote in the Price Bid Format, the O&M costs equal or above the above-mentioned Minimum Wage Criteria. The Bids having quotes lower than the above-mentioned criteria, such bids shall be rejected.
- 2.6. Contractor has to abide by the Minimum Wage Criteria at all risk & cost of Contractor for each GSS during the period of O&M, failure to comply with this clause shall lead to termination of Contract by Discom.

3. Detailed Scope of Work for this tender document is provided in Section L along with the Technical specifications in Section P.

4. Tentative Quantity:

- 4.1. The tentatively estimated quantity of GSS and related infrastructure related to these GSSs to be executed under this tender are 10 (ten) Nos. **This quantity may further increase upto 50% and decreased as required by Discom.**
- 4.2. There are several main components of Scope of Work in this Tender Document as provided below:
- (a) Survey of complete Project
 - (b) Design and Approval of specifications of Materials used and as wherever required in this Tender Document
 - (c) Inspections by Discom
 - (d) Supply, Erection, testing & Commissioning
 - GSS
 - 11 KV Line
 - 33 KV Bay
 - Civil Work
 - (e) Operation & Maintenance for the period of 10 years after successful Commissioning of GSS & 33 kV Line
- 4.3. Note: It is to be clearly noted that, in case some of the partial work is already completed or to be completed by Discom with regard to Supply, Erection, Testing & Commissioning, such part shall be excluded from the Scope of Work of the Contractor accordingly. However, the O&M of the complete GSS & associated 33 kV Line and associated infra including the part which is completed or to be completed by Discom shall be the sole responsibility of the Bidder/Contractor under this Tender document.
- 4.4. The scope of work and quantities indicated for each item in the Price-BOQ is tentative, Discom reserves right to delete or add any scope of work/item:
- 4.4.1. The quantities indicated in the Price-BOQ are only provisional and Discom reserves the right of revising the same at the time of placing the order.
 - 4.4.2. However, the actual quantity of material and quantum of work involved shall be based on the final survey report duly authenticated by the concerned Superintending Engineer (O&M), Discom. The revised survey report along with revised BOQ shall be approved as per clause no. 14.2 of Section-J (GCC).
 - 4.4.3. The Discom reserves the right to split the quantities and to entrust the order for the line to one or more Contractors/ Bidders. The Contractor/ Bidder shall agree to execute part quantities order on him at the rates/ prices mentioned in his bid and/or accepted by the Discom.
 - 4.4.4. The Discom may provide part or full quantity of some items to the contractor as per his discretion depending upon the prevailing circumstances, required in erection/ execution of related work activity. No payment towards the cost of such material as indicated in Price-bid BoQ of prices shall be payable to the contractor. However, the same shall be included in the complete Operation & Maintenance scope of the Bidder/ Contractor.

5. Site Details

- 5.1. The Project Sites shall be the lands allotted by Discom where such GSS are to be constructed. Once the land is handed-over by Discom to the Contractor for start of Project, the complete responsibility of the protection & security of land, GSS & its

associated infra shall be of the Contractor. In case, some work has been already completed by Discom on the land. For example: Civil work and the infrastructure erected till the handed over shall be complete responsibility of Contractor and he shall borne all the risk and costs associated with the security, protection, operation & maintenance of complete Project including part completed by Discom.

- 5.2. **However, it is made very clear that the complete 100% ownership of the Project, its related infrastructure and anything erected by Contractor under this Tender Document shall be with the Discom and at no point during the execution of the Contract such ownership shall be transferred to any other Party (unless approved by Discom).** The list of such GSS and their tentative locations are provided below:

| S. No. | Name of GSS | Constituency | Name of Circle | Config (MVA) | 11 kV Line Length | 11 kV Bays | 33 kV Line |
|--------|--------------|---------------|----------------|--------------|-------------------|------------|--------------|
| 1. | Kana Khera | Masuda | Ajmer City | 1 x 5 | 4 | 4 | 12.00 |
| 2. | Dudiya | Sahada | Bhilwara | 1 x 3.15 | 2 | 4 | 1.70 |
| 3. | Mandol | Mandalgarh | Bhilwara | 1 x 5 | 3 | 4 | 0.50 |
| 4. | Kishangarh | Mandalgarh | Bhilwara | 1 x 3.15 | 12 | 4 | 8.00 |
| 5. | Mansinghpura | Sahara | Bhilwara | 1 x 3.15 | 5 | 4 | 6.00 |
| 6. | Mandal | Mandal | Bhilwara | 1 x 3.15 | 1 | 4 | 3.60 |
| 7. | Ban Ka Khera | Jahazpur | Bhilwara | 1 x 3.15 | 5 | 4 | 0.30 |
| 8. | Mailasi | Dhod | Sikar | 1 x 3.15 | 5 | 4 | 2.50 |
| 9. | Jamnadi | Shrimadhampur | Sikar | 1 x 3.15 | 5 | 4 | 1.50 |
| 10. | Suker RIICO | Mavli | Udaipur | 2 x 5 | 2 | 4 | 0.60 |
| | Total | | | | 44 | 40 | 36.70 |

5.3. Local Conditions

5.3.1. It will be imperative on each bidder to fully inform himself of all local conditions and factors which may have any effect on the execution of the works covered under these documents and specifications. Discom shall not entertain any request for clarifications from the bidders, regarding such local conditions.

5.3.2. It must be understood and agreed that such factors have properly been investigated and considered while submitting the bids. No claim for financial adjustment to the contract awarded under these specifications and documents will be entertained by Discom. Neither any change in the time schedule of the contract nor any financial adjustments arising thereof shall be permitted by Discom, which are based on the lack of such clear information or its effect on the cost of the works to the bidder.

6. Completion Period:

- 6.1. **The following completion period shall be applicable for each GSS under this tender:**

| | | |
|--|--|---|
| (1) Constructi on of Facilities | Completion of complete scope of work regarding each GSS work of the survey, design, supply, erection, testing, commissioning of 33/11 KV Grid Sub- | within 9 months from the date of handing over of land/Site of |
|--|--|---|

| | | |
|--|---|---|
| | station (GSS) & Associated Infrastructure (33 kV Line & 11 kV Line), including civil work conforming to detailed scope of work & technical specifications mentioned in this Tender Document (Facilities as defined in GCC Section J) | respective GSS by Discom. |
| (2) Operation & Maintenance of Facilities | Completion of complete scope of work regarding each GSS work of operation & maintenance of 33/11 KV Grid Substation (GSS) & 33 kV Line, conforming to detailed scope of work & technical specifications mentioned in this Tender Document | From the date of "Operational Acceptance" (as defined in GCC Section J) for a period of 10 years. |

(Facilities as defined in GCC Section J)

6.2. Discom may extend the completion period at its discretion.

6.3. The time specified for work in the contract is important essence of the contract and the Contractor shall arrange to complete the work within the stipulated period. The progress will be reviewed fortnightly by Discom. The Contractor shall provide daily/weekly/monthly progress as per requirements of Discom in the formats as required by Discom.

SECTION - F: Eligibility & Qualification

1. Eligibility Requirement

The details of eligibility requirements is provided in the table below. The bidders are required to furnish the required supporting documents along with the Technical Bid.

| S. No. | Criteria | Documents Required |
|--------|--|--|
| 1.1. | Bidder Status – Bidder can be sole/ single bidder OR JV of up to 2 (two) members, with one of the members as a Lead Member | In case of JV, Deed of Undertaking |
| 1.2. | The Bidder shall have any of the following legal status: a) Body incorporated in India under the Companies Act, 2013 including any amendment thereto; OR b) Body incorporated in India under the Limited Liability Partnership (LLP) Act, 2008 including any amendment thereto; OR c) Firm registered under Partnership Act, 1932 in India; OR d) Sole Proprietor In case of JV, all the members must fulfill this requirement and submit the documents as per the Tender Document. | a) In case of Company – Copy of Registration/ Incorporation Certificate b) In case of LLP – Copy of Deed of Partnership c) In case of Partnership – Copy of Deed of Partnership d) In case of Sole Proprietor – Duly notarized Undertaking from Sole proprietor |
| 1.3. | The Bidder must have the required GST Registration In case of JV, all the members must fulfill this requirement. | Copy of GST registration certificate with legible GSTIN. |
| 1.4. | The Bidder must have valid PAN Number. In case of JV, all the members must fulfill this requirement. | Copy of Pan Card |
| 1.5. | The bidder should possess "A" Class license issued by the Electrical inspectorate of Govt of Rajasthan/Central Inspectorial organization of Govt. of India/ other State Govt. In case Bidder is a distribution Licensee under Electricity Act 2003, contractor License is not required. In case bidder is a Distribution Franchisee under Electricity Act 2003 it should possess “A” Class license issued by Electrical inspectorate of Govt of Rajasthan/Central Inspectorial organization of | Copy of Registration Certificate issued by Competent Authority of respective Central / State Government Department. |

| S. No. | Criteria | Documents Required |
|--------|--|--|
| | <p>Govt. of India/ other state Govt or avail it within a month from the date of award of contract.</p> <p>In case of JV, any one of the members must fulfill this requirement and submit the documents as per the Tender Document.</p> | |
| 1.6. | <p>The Bidder shall be engaged in the business of Electrical works.</p> <p>In case of JV, all the members must fulfill this requirement and submit the documents as per the Tender Document.</p> | <p>Statutory Documents substantiating this requirement along with Documents submitted in Clause 1.2 of this Section above.</p> |
| 1.7. | <p>The bidder shall be having unblemished record and must not be blacklisted/ declared ineligible/ debarred / under business relation severed for corrupt & fraudulent practices by “any State/ Central Government” / “any State / Central Government Department/ Company / Entity/ PSU/ Power Utility”</p> <p>In case of JV, all the members must fulfill this requirement.</p> | <p>The bidder shall provide an undertaking as per the format provided in Section M Format M13.</p> <p>In case of JV, all the members must submit the undertaking as per the format provided in Section M Format M13.</p> |
| 1.8. | <p>The bidder must submit a Power of Attorney (POA) authorizing a person to sign the documents on behalf of the Bidder, submit technical, commercial information and attend meetings on behalf of the Bidder.</p> | <p>Sole Bidder to provide POA as per the applicable Law as provided in Section M Format M3-A</p> <p>In case of JV, Undertaking by JV as per the format provided in Section M Format M4 and POA as per the format provided in Section M Format M3-B</p> |
| 1.9. | <p>The bidder shall have “No Conflict of Interest”</p> <p>In case of JV, all the members must fulfill this requirement.</p> | <p>The bidder shall provide an undertaking as per the format provided in as per the format provided in Section M Format M8-A</p> <p>In case of JV, all the members shall submit the undertaking as per the format provided in Section M Format M8-A</p> |
| 1.10. | <p>a) The Bidder should be registered with PF and ESI Department in case of notified area.</p> | <p>Notarized copies of required Certificates issued by</p> |

| S. No. | Criteria | Documents Required |
|--------|--|--|
| | <p>b) The Bidder should possess the valid license as provided under section 12 of the Contract Labour (R&A) Act 1970.</p> <p>Note: In case of JV, any one of the members must fulfill this requirement (both (a) & (b)) and submit the documents as per the Tender Document.</p> | relevant Govt. Department shall be provided. |

2. Qualification Requirement

The details of qualification requirements is provided in the table below. The bidders are required to furnish the required supporting documents along with the Technical Bid.

| S. No. | Criteria | Documents Required |
|--------|--|--|
| 2.1. | Technical Criteria | |
| 2.1.1. | <p>(a) "The bidder must have satisfactorily erected and commissioned works of 33/11 kV (or higher) sub-stations of value at least 25% of "Estimated Project Cost" in last 5 (five) financial years (up to 31.03.2019)." For the purpose of meeting this requirement, only those contracts shall be considered which has contract value of not less than Rs.50 lakhs individually and order is placed on or after 01.04.2010. The orders executed of only Supply of material shall not be considered.</p> <p>AND</p> <p>(b) The bidder should have at least 1.5 Years/18 Months (Gross), successful experience with minimum 12 month continuous experience for operation & maintenance of 33/11 KV Sub-Stations in last Five preceding Financial years and bidder having similar exposures in higher voltage class than 33 KV i.e. 66 KV, 132 KV & 220 KV etc. shall also be considered, during last Five Financial years from date of opening of Bid i.e. from Financial Year 2014 -15 to Financial Year 2018-19. The Bidders experience of operation & maintenance of 33/11 KV GSS shall be counted cumulative (Sum of best three years) of last five preceding financial years and should not be less than 5 Nos. of GSS (required to be constructed in this</p> | <ol style="list-style-type: none"> The details of projects executed during period mentioned above should be listed in as per the format provided in Section M Format M7 & M7-A. Notarized Copy of work orders and a satisfactory work completion certificate for 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./Electricity Power Utility/ Power Deptt. in India only. The certificate shall not be issued by the officer below the equivalent rank of Executive Engineer |

| S. No. | Criteria | Documents Required |
|--------|--|---|
| | <p>Tender Document) as mentioned in this Tender document.</p> <p>Notes:</p> <p>In case of JV, the above qualification shall be met as follows:</p> <p>1) For Requirement (a) above</p> <p>i. the Lead partner shall meet not less than 60% of the work experience</p> <p>AND</p> <p>the other partner(s) shall meet the balance of the work experience and collectively the requirement of total work experience i.e. 100% of Work experience requirement.</p> <p>2) For Requirement (b) above, either of the Lead Member or other member or both cumulatively shall meet the complete 100% requirement.</p> <p>It may be noted that a proposal /bid from any JV member which has not carried out works related to installation of electrical systems as noted above shall not be considered a responsive offer.</p> | <p>of Concerned Entity. In absence of any one, it will not be considered for qualifying in technical bid.</p> <p>4. Work experience Certificate having value of completed work in the name of Bidder duly certified by Practicing Chartered Accountant as per the format provided in Section M Format M7-A mentioning UDIN.</p> <p>5. In case of distribution licensee / Distribution Franchisee, the bidder shall provide the self-certification and CA audited annual accounts and reports of meeting the criteria.</p> |
| 2.2. | Financial Criteria | |
| 2.2.1. | <p>The Bidder shall have Net Worth for the each of the last three Financial Years (FY16-17, FY17-18, and FY18-19) shall be positive.</p> <p>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.</p> <p>In case of JV, all the partners of JV shall meet individually this qualification.</p> | <p>1. Certificate fulfilling required financial criteria in the name of Bidder duly certified by Practicing Chartered Accountant as per the format provided in Section M Format M7-B, duly mentioning UDIN</p> <p>2. Firm's Annual Audit Report, Balance sheet, Profit & Loss and Income Tax Returns / CA</p> |
| 2.2.2. | <p>Minimum Annual Turnover (MAT) in any one/single year out of the last five financial years (FY14-15, FY15-16, FY16-17, FY17-18, and</p> | |

| S. No. | Criteria | Documents Required |
|--------|--|--|
| | <p>FY18-19) of the bidder shall be more than 50% of “Estimated Project Cost”</p> <p>In case of JV, all the partners of the JV shall meet, collectively the qualification requirement. The figures for each of the partner of the joint venture shall be added together to determine the bidder’s compliance with this qualifying criteria; however in order for a joint venture to qualify, the partner(s) of joint venture must meet the following minimum criteria:</p> <p>“The Lead partner shall meet not less than 60% AND of the other partner shall meet not less than 40% of MAT requirement. Collectively, JV shall meet the 100% requirement as in this MAT qualification”</p> | <p>certificate for last Five years i.e. F.Y: 2014-15, 2015-16, 2016-17, 2017-18 & 2018-19.</p> |
| 2.2.3. | <p>Bidder shall have liquid assets (LA) and/ or evidence of access to or availability of fund based credit facilities of not less than 10% of the “Estimated Total Project Cost” and the Banker should confirm that the Credit facility is earmarked for the Work specified under Bid on receipt of the Bid. Liquid assets would include cash (and equivalents), bank deposits, securities that can be freely traded and receivables which has general certainty of getting received.</p> <p>In case of JV, all the partners of the JV shall meet, collectively the qualification requirement. The figures for each of the partner of the joint venture shall be added together to determine the bidder’s compliance with this qualifying criteria; however in order for a joint venture to qualify, the partner(s) of joint venture must meet the following minimum criteria:</p> <p>“The Lead partner shall meet not less than 60% AND of the other partner shall meet not less than 40% of this requirement. Collectively, JV shall meet the 100% requirement as in this qualification”</p> | |
| 2.2.4. | Certificate from Banker | <p>A certificate from banker (as per the format provided in Section M Format M7-C) indicating various fund based/non fund based limits</p> |

| S. No. | Criteria | Documents Required |
|--------|----------|---|
| | | <p>sanctioned to the bidder and the extent of utilization as on date Such certificate shall have been issued not earlier than three months prior to the date of bid opening. Wherever necessary, AVVNL may make queries with the Bidders' bankers.</p> <p>In case of Bid Submitted in JV, the certificate from Bank for all the JV partners be furnished.</p> |

3. Key Information regarding Documentary proofs

- 3.1. The bidder must fill up above information clearly in enclosed sheet and attach all required documents in support as at a glance in Technical bid.
- 3.2. If supporting documents are not attached for each eligible criterion above, the bid may be rejected without further reference.

SECTION - G: Submission of Bids

1. Sale of Tender Document

The sale/ download of Tender Document shall commence as per the date specified in Section C (vii). The complete Tender Document is also placed on the Bidding Portal specified in Section C (xvii). The prospective Bidders are permitted to download the Tender Document from any of the specified websites/ Bidding Portal but must pay the cost of Tender Document, E-procurement processing fees & Bid Security while submitting the Bid to the Discom in the manner prescribed in the Tender Document.

2. Local Conditions:

It will be imperative on each Bidder to fully acquaint himself of all local conditions and factors which may have any effect / bearing on the execution of the works covered under this Tender Document. AVVNL/ Discom, as applicable, shall not entertain any request for clarifications from the Bidder, regarding such local conditions, post award of contract. It must be understood and agreed that such factors have properly been investigated and considered while submitting the Bid. No claim for financial adjustment to the contract awarded under this Tender Document will be entertained by the AVVNL/ Discom as applicable. Neither any change in the time schedule of the contract nor any financial adjustments arising thereof shall be permitted by the AVVNL/ Discom as applicable, which are based on the lack of such clear information or its effect on the cost of the works to the Contractor. The Contractor can take few visits of locations of different area to get acquainted with local conditions, if required.

3. Clarification and Amendment of Bidding Document

3.1. Clarifications to the Tender Document

- 3.1.1. A prospective bidder requiring any clarification on the Tender documents may notify AVVNL through email as specified in the [Section N Format N1](#) and shall reach before the specified Date and Time of Pre-Bid meeting as per the information provided in Section C.
- 3.1.2. AVVNL will only accept Bidder queries sent through email, as per the specified Format, on or before the date and time specified in Section C of Tender Document.
- 3.1.3. AVVNL would prepare and upload the corrigendum and final Tender Document based on modifications (if any).

3.2. Pre-bid Meeting

- 3.2.1. Pre-bid Meeting shall be conducted at the location, date & time specified in Section C (xv)
- 3.2.2. The prospective Bidders' official representative (only one representative) are invited to attend the pre-bid meeting. The objective of this meeting is to address the queries of the prospective bidders related to the Project/Tender document and also to understand/address any concerns of the bidders related to the Tender Document.
- 3.2.3. The prospective bidders are allowed to attend the pre-bid meeting and submit their pre-bid queries in the specified format and schedule.
- 3.2.4. As a result of discussions in the pre-bid meeting, if modifications in the Tender document, specifications of services are considered necessary, they may be done by issuing an addendum/ corrigendum on the Bidding Portal as mentioned in the Tender Document.

- 3.2.5. Response to bidder queries provided during the pre-bid meeting will not have any impact on the Tender Document scope, requirements or the terms & conditions until and unless queries are provided in the format indicated and response has been published/communicated and addendum/ corrigendum is released indicated as above 3.2.4 in this Section.
- 3.2.6. AVVNL reserves the right not to respond to any/ all queries raised or clarifications sought if, in their opinion and at their sole discretion, they consider that it would be inappropriate to do so or do not find any merit in it.

3.3. Amendment of Bidding Document

- 3.3.1. At any time prior to the deadline for submission of the Bids, AVVNL may amend the Tender document by issuing Corrigendum/ Addenda.
- 3.3.2. Any Corrigendum/ Addendum issued shall be a part of the Tender document and shall be communicated on the Bidding Portal.
- 3.3.3. To give prospective Bidders reasonable time in which to take a Corrigendum/Addendum into account in preparing their Bids, AVVNL may, at its discretion, extend the deadline for the submission of the Bids.
- 3.3.4. Any change in date of submission and opening of bids would be published on Bidding Portal.

4. Submission of Bid Security

- 4.1. Bidder shall have to deposit Bid Security of amount as detailed in Section C (vi) in the form of Demand Draft / Bankers cheque / Bank Guarantee (BG) of scheduled bank (valid for 30 days beyond the Bid Validity i.e. 6 months + (plus) additional 30 days grace period), without which Bid will not be considered and shall be summarily rejected.
- 4.2. The BG for bid security shall be executed on Non-Judicial Stamp Paper worth 0.25% of BG value or Rs. 25,000/- whichever is lower.
- 4.3. Government undertakings PSUs are exempted for Bid Security deposition on producing certificate issued by competent authority in Hard Copy in envelope-1 and also online in cover-I.
- 4.4. The Bid Security will be refunded to all the Bidders within 30 days after execution/signing of the contracts with successful bidder and Performance Security is obtained from successful bidder.
- 4.5. Forfeiture of Bid Security: The Bid Security taken from the Bidder shall be forfeited in the following cases:-
- 4.5.1. If the Bidder modifies/ withdraws its Bid except as per the provisions specified in the Tender Document;
- 4.5.2. If the Bidder withdraws its Bid before the expiry of the Bid validity period;
- 4.5.3. If the successful bidder fails to provide the Performance Security to Discom and execute the Contract within the stipulated time or any extension thereof provided by Discom;
- 4.5.4. If any information or document furnished by the Bidder turns out to be misleading or untrue in any material respect.

- 4.5.5. If the successful Bidder does not accept the Letter of Intent unconditionally within Three (3) days of issue of Letter of Intent or the period as extended by AVVNL.
- 4.5.6. If the Bidder breaches any provision of code of integrity prescribed for the Bidders specified by AVVNL.
- 4.5.7. In the event of a bidder not responding to further negotiations as required for selection of Contractor, AVVNL reserves the right to forfeit the Bid Security Deposit amount furnished by such Bidders.
- 4.6. Bid Security of a bidder lying with the AVVNL in respect of other bids awaiting decision will not be adjusted towards bid security for the fresh bids. The bid security money originally deposited may, however, would be taken into consideration in case bids are re-invited.
- 4.7. No interest shall be paid by AVVNL on the Bid Security.

5. Submission of Bids

- 5.1. A Two Part-Three Cover system shall be followed for the bid. The Bid shall be submitted on Bidding Portal in electronic format in the following manner. E-procurement system shall be followed for the Bid as per the RTPP Act 2012 and RTPP Rules 2013
- 5.2. The Bidder would ensure that all the required documents, as mentioned in this Tender Document, are submitted along with the Bid and in the prescribed format and manner only. Non-submission of the required documents or submission of the documents in different format/contents & different manner may lead to the rejections of the Bid submitted by the Bidder.

5.3. Language of Bids:

Bidders are required to furnish all information and documents as called for in this document shall be in the English Language. Any printed literature furnished by the bidder may be in another language, provided that this literature is accompanied by an English translation, in such case, for the purpose of interpretation of the document, the English version will govern.

5.4. Submission of Technical Bid:

- 5.4.1. The technical bid comprises of Online (Cover-1 & Cover-2) duly digitally signed by Authorized Signatory and Physical Hard Copy duly signed by Authorized Signatory (Envelope-1 for hard copy of Cover-1 documents (Bid Security, Cost of Tender Document and E-procurement processing Fees & Envelope 2 Single Hard Copy of Cover 2 – Technical Bid)
- 5.4.2. Cover – 1 & Envelope - 1: The Cover-1 & Envelope - 1 Consists of

| S. No. | Document Type | Cover – 1 Online | Envelope-1 Physical Hard Copy |
|--------|-------------------------|---|-------------------------------|
| 1 | Cost of Tender Document | Scanned copy of the receipt by AVVNL of submission of Cost of Tender Document | Original DD/Pay Order |

| S. No. | Document Type | Cover – 1 Online | Envelope-1 Physical Hard Copy |
|--------|-------------------------------|---|--|
| 2 | E-Procurement Processing Fees | Scanned copy of the receipt by AVVNL of submission of E-procurement processing Fees. | Original DD/Pay Order |
| 3 | Bid Security | Scanned copy of the receipt by AVVNL of submission of banker's cheque / demand draft/Bank Guarantee/ valid exemption certificate along with Affidavit | Original banker's cheque / demand draft/ Bank Guarantee/ valid exemption certificate and Affidavit |

5.4.3. Cover – 2: Online Cover - 2 consists of following documents (To be uploaded in the format prescribed on the Bidding Portal).

| S. No. | Document Type | Cover – 1 Online |
|--------|--|---|
| 1 | Eligibility Criteria Documents | As per Section M Format M6 And supporting documents as per Section F (1) . |
| 2 | Qualification Criteria Documents | As per Section M Format M7 supporting documents as per Section F (2) . |
| 3 | Work Experience Certificate & Documents | As per Section M Format M7-A supporting documents as per Section F (1) . |
| 4 | Financial Qualification Certificate & Documents | As per Section M Format M7-B supporting documents as per Section F (2) . |
| 5 | Bidder's Banker Certificate | As per Section M Format M7-C supporting documents as per Section F (2) . |
| 6 | No-blacklisting Undertaking | As per Section M Format M13 |
| 7 | No-Conflict of Interest Undertaking | As per Section M Format M8-A |
| 8 | Power of Attorney | Power of Attorney in favour of Authorized Signatory by Sole Bidder Section M Format M3-A and in case of JV, POA as per Format in As per Section M Format M3-B for Authorized Signatory and Undertaking by JV for Bid submission as per As per Section M Format M4 |
| 9 | Declaration as per RTPP Act 2012 & RTPP Rules 2013 | As per Section M Format M8-A, B, C, D |

| S. No. | Document Type | Cover – 1 Online |
|----------------------------|------------------------------------|--|
| Other Bid Documents | | |
| 10 | Bid Submission Letter/ Undertaking | As per Section M Format M5 |
| 11 | Summary Details of Bidder | As per Section M Format M5-A |
| 12 | Declaration of Material Offered | As per Section M Format M5-B |
| 13 | Integrity Pact | Section M Format M11 |

| S. No. | Document Type | Cover – 1 Online |
|--------|--|--|
| 14 | Declaration by the Bidder regarding Omissions/ Inconsistencies/ Reservations | Section M Format M10 |
| 15 | Declaration by the Bidder regarding Deviations | Section M Format M9 |
| 16 | Bank Guarantee Verification Checklist | Section M Format M12 |
| 17 | Signed/ Initialled & Seal | The Complete Tender Document shall have to be signed/ Initialled sealed as token of acceptance of all terms & conditions of Tender Document while submitted bid. |

5.4.4. The technical bid (all the information required in the tender document pursuant to the desired formats except Price Bid) is to be submitted online in Cover – 2 before the prescribed time on the Bidding Portal. Also, one hard copy of technical bid is to be submitted at the Office of SE (TW), AVVNL. Further, all the documents which are executed on Stamp Papers are to be submitted with due care. All such submissions shall have to be made by Bidders before the scheduled time and place as per the details mentioned in Section – C (ix).

5.4.5. In case of any discrepancy between the hard copy submitted and online submission of technical bid on Bidding Portal, the details as provided in the online technical bid shall supersede the hard copy submission.

5.5. Submission of Price Bid:

5.5.1. Bidders shall quote their lowest rates / costs for the **work of the survey, design, supply, erection, testing, commissioning of 33/11 KV Grid Sub-station (GSS) & Associated Infrastructure (33 kV Line & 11 kV Line), including civil work & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & 33 kV Line on Opex model in AVVNL under TN-378 conforming to detailed scope of work & technical specifications**, including all applicable taxes, duties etc. pursuant to [Section M Format M14](#) in MS Excel file on Bidding Portal. The rates quoted by Bidders be firm and fixed, FOR site(s) as per prescribed format.

5.5.2. The Price Bid which is to be filled in MS Excel File is divided into 4 parts and has been provided in MS Excel as 4 separate sheets. Bidder has to fill Bidder's name and their quote accordingly in each MS Excel sheet. The four parts are provided below:

| Part/ BOQ Nos. | BOQ Detail | Bidding Methodology | Bidder to Quote |
|----------------------|--|------------------------|--|
| 1 | Supply of Material for work of the survey, design, supply, erection, testing, commissioning of 33/11 KV Grid Sub-station (GSS) & Associated Infrastructure (33 kV Line & 11 kV Line) | G-Schedule | Bidder shall quote in % premium/ discount on the estimated cost of the respective BOQ |
| 2 | Survey, Design, Erection, Testing & Commissioning of Material for 33/11 KV Grid Sub-station (GSS) & Associated Infrastructure (33 kV Line & 11 kV Line) | G-Schedule | Bidder shall quote in % premium/ discount on the estimated cost of the respective BOQ |
| 3 | Civil Work for 33/11 KV Grid Sub-station (GSS) | G-Schedule | Bidder shall quote in % premium/ discount on the estimated cost of the respective BOQ |
| 4 | Operation & Maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) and Associated 33 kV Line for period of ten (10) years | H-Schedule | Bidder shall quote the wage rate per month per sub-station basis which shall in no case be lower than applicable Minimum Wage Rate and further shall quote the service charges, if required on per month per sub-station basis |

5.5.3. The total amount as arrived after Bidder(s) quote in each BOQ of MS Excel File shall be added to arrive at the final quote of the BOQ, which shall be used for evaluation purpose to determine L1, L2, L3... Bidder(s) and so on.

5.5.4. Financial/ Price Bid consist the details of prices as per Price Schedule in MS Excel File (.xls file of price Bid) published with NIT and this tender document on Bidding Portal.

5.5.5. Price bid in form of price schedule shall be uploaded by the bidder on Bidding Portal before scheduled due date and time for submission of bids as mentioned in Section – C (ix). The locked price bid shall be opened on notified date and time. Due intimation shall be given to technically and commercially cleared bidders about date and time of opening of Prices Bids on Bidding Portal.

- 5.5.6. Important Note: Bidders are directed that price offer shall be furnished online only in cover-3 pursuant to the format provided separately in MS Excel file on Bidding Portal. If price offer submitted in technical bid (i.e. in cover-1 and cover-2), such bids will be rejected in technical bid evaluation stage and will not be considered for further process to conclude the bid.**
- 5.5.7. Unless otherwise indicated in the Tender document, prices quoted by Bidder shall correspond to 100% cost & risk of the complete scope of work to be delivered.
- 5.5.8. Installation Charges are provided in BOQ 2 and shall include rates and prices for all labour, Contractor's equipment, temporary works, materials, consumables and all matters and things of whatsoever nature, provision of operations and maintenance manuals, etc. wherever identified in the Bidding Documents as necessary for the proper execution of all installation services except those provided in Schedule 1, 3 & 4.
- 5.5.9. The Bid price shall include insurance charges as per insurance requirement mentioned in Section – J: GCC Clause 30 and Appendix-3: Insurance Requirements to Form of Contract Agreement as contained in Section N Format N6 A & B of the Tender Document. Bidder shall further note that the Discom shall not be liable to make any payment/ reimbursement to the Contractor whatsoever for insurance of Contractor's Plant and Machinery.
- 5.6. The Joint venture Bids shall be acceptable as per following conditions :
- 5.6.1. The maximum number of members allowed in Joint Venture shall be two (2) only. One of the member must be identified as Lead Member.
- 5.6.2. The JV member has procured the tender document in its own name.
- 5.6.3. The lead member shall submit Joint Venture Undertaking along with the Bid.
- 5.6.4. All requirements as per Section-F of the tender document can be furnished by both Joint Venture members jointly or individually as required in relevant clauses of Section-F.
- 5.6.5. The lead member shall undertake the responsibility for all obligations and liabilities relating to the project in accordance with the terms of this tender.
- 5.6.6. The work would be awarded to the lead member and Discom would acknowledge other Joint Venture member in the work award letter and other communications.
- 5.6.7. All payments from Discom will be made in informed joint bank account of Joint Venture firms only, the details of such bank account shall be provided by the Bidder.
- 5.6.8. Only one agreement with only one party will be accepted under Joint Venture agreement.
- 5.6.9. A firm/entity can be a partner in only one Joint Venture; bids submitted by joint ventures or consortium including the same firm/ entity as partner shall be rejected.
- 5.6.10. Authorization in favour of the lead member from all the members. (A separate power of attorney signed by legally authorized signatories of all the partners is required as per Section M FormatM 3B)
- 5.6.11. The lead member is authorized to incur liabilities and receive instructions for and on behalf of any and all partner of the Joint Venture / Consortium and the entire execution of the contract including payment shall be done exclusively with the lead member.

- 5.6.12. All partners of the Joint Venture / Consortium shall be liable jointly and severally for the execution of the contract in accordance with the contract terms.
- 5.6.13. In the event of any default by any partner / partners of Joint Venture / Consortium, the other partner / partners shall accept the liability and execute the contract in full.
- 5.6.14. The agreement must provide details of roles and responsibilities of each member of the consortium. Overall responsibility in respect of execution of tendered work is with the lead member.
- 5.6.15. The Joint Venture / Consortium agreement shall not be cancelled or amended unilaterally without consent of the purchaser after opening of the bid and a statement to this effect should appear in the JV agreement.
- 5.6.16. Bids from agents are not acceptable in the case of Joint Venture / Consortium, and such bids will be treated as non-responsive.
- 5.6.17. The change in consortium /JV after opening / submission of tender shall not be entertained, in the event the consortium / JV is altered then such proposals shall be treated as rejected.
- 5.6.18. The above stated requirements are a minimum and the Discom reserves the right to request for any additional requirement and also reserve the right to reject the proposal of any bidder, if in the opinion of the Discom, the qualification data is incomplete or the bidder is found not qualified to satisfactorily perform the works.
- 5.6.19. The JV / Consortium agreement/undertaking should be tender specific i.e. signed specifically for this tender.

5.7. Cost of Bidding:

The Bidder shall bear all costs associated with the preparation and submission of its Bid, and AVVNL shall not be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

5.8. Alternative Bids:

Alternative bids shall not be considered at all.

5.9. Period of Validity of Bids:

- 5.9.1. **Bids shall remain valid for 6 months from the date of opening of Technical Bid as prescribed by AVVNL.** A Bid valid for a shorter period shall be rejected and treated as non-responsive.
- 5.9.2. In exceptional circumstances, AVVNL may solicit the Bidder's consent to an extension of the period of validity. The request and the responses thereto shall be made in writing.

5.10. Format and Signing of Bid

- 5.10.1. The bid forms/templates/annexure etc., wherever applicable, shall be typed or written in indelible ink and shall be signed (all the pages) by a person duly authorized by Bidder to sign, in token of acceptance of all the terms and conditions of the Tender Document. This authorization shall consist of a written confirmation in the form of Power of Attorney as specified in the bidding document and shall be attached to the bid.
- 5.10.2. Any amendments such as interlineations, erasures, or overwriting shall be valid only if they are signed or initialled by the authorized person signing the bid.

- 5.10.3. The bid documents shall be properly checked before uploading for submission of Bids.
- 5.10.4. The bid, duly signed (digitally) by Auth. Signatory, shall be uploaded on the Bidding portal in respective file/ format.
- 5.10.5. Bidders must submit their bids online at Bidding Portal. Bids received by another other means except as desired in this Tender Document shall not be accepted.
- 5.10.6. If bids are not submitted as per the details mentioned in this Tender document and Bidding Portal, the tendering authority shall reject the bid.
- 5.10.7. Bidders are required to carefully go through the instructions included in the Tender Document and furnish complete information, necessary documents and schedules.
- 5.10.8. The Bidder shall sign the bid on each page and also at the specified location. Each and every paper enclosed must be given a page no. like 1,2,3,.....etc. & a bid summary must be enclosed along with covering letter on the Letter Head of the firm in the following format : -

| S.No. | Particulars/brief of information/ schedule/ Annexure | Page No: |
|-------|--|----------|
| 1. | | |
| 2. | | |
| 3 | | |
| | | |
| | Total Page | |

Signature of Authorized Signatory, Seal of Entity, Date and Place

5.11. Deadline for Submission of Bids

- 5.11.1. Bids must be submitted on the Bidding Portal no later than the date and time indicated in Section C (ix).
- 5.11.2. Normally, the date of submission and opening of bids would not be extended. However, in exceptional circumstances or when the Tender Document is required to be substantially modified as a result of discussions in pre-bid meeting and the time with the prospective bidders for preparation of bids appears insufficient, the date may be extended by the Discoms, which shall be informed on the Bidding Portal. In such cases, it would be ensured that after issue of corrigendum, reasonable time is available to the Bidders to prepare and submit their bids. Any change in date of submission and opening of bids would also be placed on the Bidding Portal. However, if the modifications in Tender document, specifications of goods and service are substantial, fresh publication of original Tender Document may also be issued.
- 5.11.3. AVVNL may, at its discretion, extend the deadline for the submission of bids by amending the Tender document, in which case all rights and obligations of the AVVNL and bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.

5.12. Withdrawal, Substitution, and Modification of Bids

- 5.12.1. A Bidder may withdraw its bid or re-submit its bid (technical and/ or financial cover) as per the instructions/ procedure mentioned at Bidding Portal under the section "Bidder's Manual Kit", but not after bid submission end date and time.

5.12.2. Bids withdrawn shall not be opened and processed further.

SECTION - H: Bid Opening & Evaluation

1. AVVNL will first perform the technical bid opening, which is a critical event in the bidding process. This shall be done online on the stipulated time.
2. After opening of Bids and till final selection of successful Bidder(s), no correspondence of any type will be entertained, unless called for by AVVNL. Any type of uncalled for clarifications on prices and or rebates shall not be accepted.

3. Confidentiality

- 3.1. Information relating to the examination, evaluation, comparison, and post qualification of bids, and recommendation of contract award, shall not be disclosed to bidders or any other persons not officially concerned with such process until publication of the Contract award.
- 3.2. Any attempt by a bidder to influence AVVNL or other officials in the examination, evaluation, comparison, and post qualification of the bids or Contract award decisions may result in the rejection of his bid.

4. Code of Integrity

- 4.1. All the officers or employees of the Discom shall:
 - 4.1.1. maintain an unimpeachable standard of integrity both inside and outside their office
 - 4.1.2. act in accordance with the provisions of the Act, these rules, guidelines issued under the Act and instructions
 - 4.1.3. not allow any bidders to have access to information on a particular procurement, before such information is available to the public at large
 - 4.1.4. not intentionally use unnecessarily restrictive or “tailored” specifications, terms of reference or statements of work that can discourage competition
 - 4.1.5. not solicit or accept any bribe, reward or gift or any material benefit of any directly or indirectly promise of future employment from anyone, who has sought or is seeking procurement from Discom
 - 4.1.6. not have a financial interest in any bidder(s) responding to AVVNL’s bidding process and any person having financial interest in any bidder shall not participate in this tender process
 - 4.1.7. not disclose proprietary and source selection information, directly or indirectly, to any person other than a person authorised to receive such information
 - 4.1.8. treat all bidders in a fair and equitable manner in line with the principle of fairness, integrity and transparency in the procurement process
 - 4.1.9. provide all bidders identical information at the same time, during the bidding process;
 - 4.1.10. apply the same criteria of evaluation as specified in the bidding documents, bidder registration documents or pre-qualification documents and under no circumstances new evaluation criteria shall be introduced during the evaluation process
 - 4.1.11. not entertain any favour, recreation, presents, services, etc. from the bidders or prospective bidders
 - 4.1.12. protect the interests of the Discom under all circumstances while dealing with information and information sources

- 4.1.13. maintain confidentially of all bids
 - 4.1.14. ensure that the selection of bidder is as per the Tender Document and is not influenced by personal reasons attributable to concerned officials in any manner
 - 4.1.15. Disclose conflict of interest, if any.
- 4.2. Any Bidder participating in Tender process shall:
- 4.2.1. not offer any bribe, reward or gift or any material benefit either directly or indirectly in exchange for an unfair advantage in procurement process or to otherwise influence the procurement process
 - 4.2.2. not misrepresent or omit information that misleads or attempts to mislead so as to obtain a financial or other benefit or avoid an obligation
 - 4.2.3. not indulge in any collusion, bid rigging or anticompetitive behaviour to impair the transparency, fairness and progress of the Tender process
 - 4.2.4. not misuse any information shared between Discom and the bidders with an intent to gain unfair advantage in the Tender process
 - 4.2.5. not indulge in any coercion including impairing or harming or threatening to do the same, directly or indirectly, to any party or to its property to influence the Tender process;
 - 4.2.6. not obstruct any investigation or audit of a Tender process
 - 4.2.7. disclose conflict of interest, if any; and
 - 4.2.8. disclose any previous transgressions with any entity in India or any other country during the last three years or any debarment by any other procuring entity.

5. Breach of code of integrity by the bidder

Without prejudice to the provisions of Chapter IV of the RTPP Act 2013, in case of breach of any provision of the code of integrity by a bidder or prospective bidder, as the case may be, AVVNL may take appropriate action in accordance with the provisions of subsection (3) of section 11 and section 46 of the RTPP Act 2013.

6. Vexatious Appeals & Complaints

Whoever intentionally files any vexatious, frivolous or malicious appeal or complaint under the “The Rajasthan Transparency Public Procurement Act 2012 / Rules 2013”, with the intention of delaying or defeating any procurement or causing Loss to the Discom or any other bidder, shall be punished with fine which may extend to Twenty Lakh Rupees or five per cent of the value of procurement, whichever is less.

7. Offences by Firms/ Companies

- 7.1. Where an offence under “The Rajasthan Transparency Public Procurement Act 2012 / Rules 2013” has been committed by an entity, every person who at the time the offence was committed was in charge of and was responsible to the entity for the conduct of the business of the entity, as well as the entity, shall be deemed to be guilty of having committed the offence and shall be Liable to be proceeded against and punished accordingly:
Provided that nothing contained in this sub-section shall render any such person Liable for any punishment if he proves that the offence was committed without his knowledge or that he had exercised all due diligence to prevent the commission of such offence.
- 7.2. Notwithstanding anything contained in (a) above, where an offence under this Act has been committed by an entity and it is proved that the offence has been committed with

the consent or connivance of or is attributable to any neglect on the part of any director, manager, secretary or other officer of the entity, such director, manager, secretary or other officer shall also be deemed to be guilty of having committed such offence and shall be Liable to be proceeded against and punished accordingly.

7.3. For the purpose of this clause-

7.3.1. "Entity" means a body corporate and includes a Limited Liability partnership, firm, registered society or co- operative society, trust or other association of individuals; and

7.3.2. "Director" in relation to a Limited Liability partnership or firm, means a partner in the firm.

7.4. Abetment of certain offences: Whoever abets an offence punishable under this Act, whether or not that offence is committed in consequence of that abetment, shall be punished with the punishment provided for the offence.

8. Debarment from Bidding

8.1. A bidder shall be debarred by the Discoms if he has been convicted of an offence

8.1.1. under the Prevention of Corruption Act, 1988 (Central Act No. 49 of 1988); or

8.1.2. Under the Indian Penal Code, 1860 (Central Act No. 45 of 1860) 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.

8.2. A bidder debarred under sub-clause 8.1.1 above shall not be eligible to participate in a bidding process of any of the three Rajasthan Discoms for a period not exceeding three years commencing from the date on which he was debarred.

8.3. If the Discoms find that a bidder has breached the code of integrity prescribed in terms of "Code of Integrity for bidders" above, it may debar the bidder for a period not exceeding three years.

8.4. Where the entire Bid Security or the entire Performance Security or any substitute thereof, as the case may be, of a bidder has been forfeited by the Purchaser in respect of any bidding process or contract, the bidder may be debarred from participating in any bidding process undertaken by the Discoms for a period not exceeding three years.

8.5. The Discoms shall not debar a bidder under this section unless such bidder has been given a reasonable opportunity of being heard

9. Clarification of Bids

9.1. To assist in the examination, evaluation, comparison and qualification of the bids, the AVVNL may, at its discretion, ask any bidder for a clarification regarding its bid. The AVVNL's request for clarification and the response of the bidder shall be in writing.

9.2. Any clarification submitted by a bidder with regard to its bid that is not in response to a request by AVVNL shall not be considered.

9.3. No change in the prices or substance of the bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the committee in the evaluation of the financial bids.

9.4. No substantive change to qualification information or to a submission, including changes aimed at making an unqualified bidder, qualified or an unresponsive submission, responsive shall be sought, offered or permitted.

9.5. All communications generated under this rule shall be included in the record of the procurement proceedings.

10. Technical Bid Opening:

- 10.1. First of all Envelope-1 in hard copy (in physical form) furnished by bidder shall be opened as per the prescribed mentioned in the Section C and documents submitted against Tender Cost, RISL charges & Bid Security shall be examined as per the requirement of tender conditions. If found as per requirements, the Cover-1(on-line) containing scanned copies of documents submitted for Tender Cost, RISL e-proc charges and Bid Security shall be opened and examined pursuant to the tender conditions as per the date & time specified in Section C. All the documents as furnished in envelope-1 shall be available in cover-1.
- 10.2. Cover-2 (i.e. Technical Bid) shall be opened for only those bidders shall be opened, whose documents as provided in Clause 10.1 above in this Section are found responsive as per the tender conditions. If the documents mentioned, are found non-responsive pursuant to the tender conditions, the Cover-2 of such bidders shall not be opened and such bidders shall be disqualified.

11. Technical Bid Evaluation:

11.1. Guiding Principle for Evaluation of Bids

- 11.1.1. AVVNL shall strictly apply only and all of the evaluation and qualification criteria specified in the Tender Document.
- 11.1.2. The determination shall be based upon an examination of the documentary evidence of the bidder's qualifications and proposed solution submitted by the Bidder.

11.2. Determination of eligibility and responsiveness

- 11.2.1. A Bidder shall be considered to be eligible if it meets the eligibility criteria mentioned in the Tender Document.

11.3. A responsive Bid is one that meets the requirements of the Tender document without any material deviation, reservation, or omission where:

- 11.3.1. "deviation" is a departure from the requirements specified in the Tender document;
- 11.3.2. "reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Tender Document; and
- 11.3.3. "Omission" is the failure to submit part or all of the information or documentation required in the Tender document.

11.4. A material deviation, reservation, or omission is one that,

- 11.4.1. If accepted, shall affect in any substantial way the scope, quality, or performance of the subject matter of procurement specified in the Tender documents; or
- 11.4.2. Limits in any substantial way, inconsistent with the Tender documents, AVVNL's rights or the Bidder's obligations under the proposed contract; or
- 11.4.3. If rectified, shall unfairly affect the competitive position of other Bidders presenting responsive Bids.

11.5. Non-material Non-conformities in Bids

11.5.1. AVVNL may waive any nonconformities in the Bid that do not constitute a material deviation, reservation or omission, the Bid shall be deemed to be substantially responsive.

11.5.2. AVVNL may request the Bidder to submit the necessary information or document Like audited statement of accounts/ CA Certificate, Registration Certificate, VAT/ CST clearance certificate, ISO/ CMMi Certificates, etc. within a reasonable period of time. Failure of the Bidder to comply with the request may result in the rejection of its Bid. During technical bid evaluation, AVVNL may, at its discretion, ask the Bidder for a clarification of its bid. The request for clarification and the response shall be in writing, and no change in the price or substance of the bid shall be sought, offered or permitted.

11.5.3. AVVNL may rectify non-material nonconformities or omissions on the basis of the information or documentation received from the Bidder under clause 11.5.2 of this Section. To this effect, the bid price shall be adjusted, for comparison purposes only, to reflect the price of the missing or nonconforming item or component. The adjustment shall be made using the method indicated in pre-qualification and Evaluation Criteria of this bidding document.

11.6. AVVNL shall examine the technical aspects of the Bid in particular, to confirm that all requirements of bidding document have been met without any material deviation, reservation or omission.

11.7. AVVNL shall regard a Bid as responsive if it conforms to all requirements set out in the Tender Document, or it contains minor deviations that do not materially alter or depart from the characteristics, terms, conditions and other requirements set out in the Tender Document, or if it contains errors or oversights that can be corrected without touching on the substance of the Bid.

11.8. AVVNL shall take up detailed evaluation of the responsive bids only.

11.9. Conflict of Interest

11.9.1. The Discoms considers a conflict of interest to be a situation in which a party has interests that could improperly influence that party's performance of official duties or responsibilities, contractual obligations, or compliance with applicable laws and regulations. In pursuance of Discoms' procurement ethics, the bidders, suppliers, and contractors under contracts, observe the highest standard of ethics, the Discoms will take appropriate actions against the Bidder, if it determines that a conflict of interest has flawed the integrity of any procurement process. Consequently, all Bidders found to have a conflict of interest shall be disqualified.

11.9.2. Conflict of interest will be determined in accordance with clause 81 of the Rajasthan Transparency in Public Procurement Rules (RTPP) 2013.

11.9.3. Further, it may be considered to be in a conflict of interest with one or more parties in the bidding process if

11.9.3.1. they have controlling shareholders in common; or

11.9.3.2. it receives or have received any direct or indirect subsidy from any of them; or

11.9.3.3. they have the same legal representative for purposes of the Bid; or

11.9.3.4. they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or

influence on the Bid of another Bidder, or influence the decisions of AVVNL regarding this bidding process.

- 11.10. Bids considered non-responsive are liable for disqualification/ rejection for the following reasons:
- 11.10.1. Bid is not received by the due date & time and Bids is not accompanied with the required documents & schedules.
 - 11.10.2. Bid not submitted in accordance with Tender Document.
 - 11.10.3. Bid do not meet the minimum eligibility criteria as mentioned in the bidding document.
 - 11.10.4. Bids is not accompanied by Bid Security /Cost of Tender Document / RISL E-procurement processing Fees.
 - 11.10.5. Conditional Bid shall be rejected.
 - 11.10.6. Proposal is not valid for at least six (6) months from the date of opening of online Technical Bid.
 - 11.10.7. During validity of the Bid or its extended period, if any, Bidder increases his quoted prices.
 - 11.10.8. Desired certificates in the required in the Tender Document not attached by the bidder.
 - 11.10.9. Prices not quoted in prescribed Proforma /schedule.
 - 11.10.10. Bidder has made misleading or false representations in the forms, statements and attachments submitted in proof of the eligibility requirements.
 - 11.10.11. Bidder is found to have a record of poor performance such as abandoning work, not properly completing the contract, inordinately delaying completion, being involved in major litigation or financial failures, etc.
 - 11.10.12. Bidder failed to provide clarifications related thereto, when sought.
 - 11.10.13. Bidder has submitted more than one bid. This will cause disqualification of all Bids submitted by such Bidders including forfeiture of the Bid Security.
 - 11.10.14. Bidder who is found to canvass, influence or attempt to influence in any manner for the qualification or selection process, including without limitation, by offering bribes or other illegal gratification shall be disqualified from the process at any stage.
 - 11.10.15. Bid is not meeting any other pre-requisite as spelt out elsewhere in this document.
- 11.11. AVVNL shall refer the evaluation report to the Competent Authority of AVVNL, which reserves the right to reject any Bid which is nonresponsive and no request for alteration, modification, substitution or withdrawal shall be entertained by AVVNL in respect of such Bids.
- 11.12. The Cover -3 – Price Bid shall be kept unopened and shall be opened later on the date and time intimated to the bidders who qualify in the evaluation of technical bids.
- 11.13. The eligible Bidders whose bid is determined to be substantially responsive shall be considered to be qualified in the technical evaluation, unless disqualified pursuant to clause 11.10 above in this Section, and shall be informed in writing about the date, time and place of opening of their financial bids.

11.14. The Bidders which could not qualify in technical evaluation will be informed about this fact. Their financial bid will be remain unopened for such Bidders and Bid Security refunded after completion of the bid process as mentioned in tender document.

12. Financial Bid Opening:

12.1. Price bids (i.e. Cover-3) of only those bidders will be opened whose Bids are found responsive and Bidders are technically eligible and qualified on the prescribed time as mentioned in Section C (xi).

13. Financial Evaluation:

13.1. To evaluate a bid, AVVNL shall consider the following: -

13.1.1. The bid price as quoted in accordance with Tender document, pursuant to Section G Clause No 5.5

13.1.2. Price adjustment for correction of arithmetic errors in accordance with Tender document.

13.2. AVVNL's evaluation of a bid will exclude and not take into account any allowance for price adjustment during the period of performance of the Contract, if provided in the Bid.

13.3. The evaluation shall include all costs and all taxes and duties applicable to the bidder as per law of the Central/ State Government/ Local Authorities.

13.4. Correction of Arithmetic Errors

Provided that the bid is substantially responsive, the competent Procurement Committee shall correct arithmetical errors on the following basis:

13.4.1. if there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity (months, number of consultants, etc.), the unit price shall prevail and the total price shall be corrected, unless in the opinion of the tendering authority there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected;

13.4.2. if there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

13.4.3. if there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to 13.4.1 and 13.4.2 above.

13.5. Financial offers will be arranged in the ascending order of their all-inclusive total quoted rates in the price bid i.e. L-1, L-2, L-3, L-4, L-5,Ln.

14. Negotiations

14.1. Except in case of procurement by method of single source procurement or procurement by competitive negotiations, to the extent possible, no negotiations shall be conducted after the pre-bid stage. All clarifications needed to be sought shall be sought in the pre-bid stage itself.

14.2. Negotiations may, however, be undertaken only with the lowest or most advantageous bidder under the following circumstances.

14.2.1. when ring prices have been quoted by the bidders for the subject matter of procurement; or

- 14.2.2. when the rates quoted vary considerably and considered much higher than the prevailing market rates.
- 14.3. The Competent Committee appointed by AVVNL shall have full powers to undertake negotiations. Detailed reasons and results of negotiations shall be recorded in the proceedings.
- 14.4. The lowest or most advantageous bidder shall be informed in writing either through messenger or by registered letter and email (if available). In case of urgency the Competent Committee, after recording reasons, may reduce the time, provided the lowest or most advantageous bidder has received the intimation and consented to regarding holding of negotiations.
- 14.5. Negotiations shall not make the original offer made by the bidder inoperative. The Competent Committee shall have option to consider the original offer in case the bidder decides to increase rates originally quoted or imposes any new terms or conditions.
- 14.6. In case of non-satisfactory achievement of rates from lowest or most advantageous bidder, the Competent Committee may choose to make a written counter offer to the lowest or most advantageous bidder and if this is not accepted by him, the committee may decide to reject and re-invite bids or to make the same counter-offer first to the second lowest or most advantageous bidder, then to the third lowest or most advantageous bidder and so on in the order of their initial standing and work / supply order be awarded to the bidder who accepts the counter-offer. This procedure can be used in exceptional cases only.
- 14.7. In case the rates even after the negotiations are considered very high, fresh bids shall be invited.
- 14.8. In the event of a bidder not responding to further negotiations as required for selection of suppliers, AVVNL reserves the right to forfeit the Bid Security Deposit amount furnished by such bidders.

15. Right To Reject by AVVNL

AVVNL reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids at any time prior to award of contract, without thereby incurring any liability to the affected Bidder or bidders or any obligation to inform the affected Bidder or bidders of the grounds for AVVNL's action.

SECTION - I: Award of Contract

1. Based on the results of the financial evaluation, AVVNL shall award the contract to the successful Bidder (also referred to as the L1 Bidder) whose bid has been determined to be substantially responsive and to be the lowest evaluated bid, further provided that the Bidder is determined to be qualified, as per the Qualification Requirement specified in tender document to perform the contract satisfactorily.
2. Further, AVVNL has complete right to award the Contract and issue LOI to of complete Scope of Work under this Tender Document to successful bidder who is L1.
3. The following order shall be followed after selection of successful bidder(s) in the financial evaluation.
 - 3.1. Issuance of Letter of Intent (LoI) by AVVNL and its unconditional acceptance by the Bidder(s) within 3 days from date of issuance of LoI.
 - 3.2. Mutual agreement on PERT chart / Project Execution Plan duly signed and accepted by Contractor(s) and Discom within seven (7) days from date of acceptance of LoI.
 - 3.3. Submission of Performance Security, within 15 (fifteen) days from date of issue of LoI.
 - 3.4. Issue of Work Order by respective Discom and its unconditional acceptance by the Bidder within 21 (twenty one) days from date of issue of LoI.

Two separate work orders shall be issued by Discom

 - 3.4.1. First Work Order: Work Order for work of for work of the survey, design, supply, erection, testing, commissioning of 33/11 KV Grid Sub-station (GSS) & Associated Infrastructure (33 kV Line & 11 kV Line), including civil work for the Nos. of GSS under this Tender Document on Opex model in AVVNL under TN-378 conforming to detailed scope of work & technical specifications for the amount of the work specified in First Work Order (arrived at by price quoted by the successful bidder in Price Bid BOQ 1, 2 & 3)
 - 3.4.2. Second Work Order: Work Order for work of 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & 33 kV Line on Opex model in AVVNL for the amount of the work specified in First Work Order (arrived at by price quoted by the successful bidder in Price Bid BOQ 4)

4. Performance Security:

- 4.1. The successful bidder shall be required to furnish Performance Security as per any of the following options:
 - 4.1.1. Options for Submission of Performance Security
 - (a) Within fifteen days (15) days after receipt of the notice of award through LoI, the successful Bidder shall furnish the Performance Security for 10% (Ten percent) of the contract price as applicable for First Work Order/ Contract A in line with the requirement of Qualification Requirements, of the Tender Document. The performance security of a joint venture shall be in the name of any member of Joint Venture.
 - OR
 - (b) Within fifteen (15) days after receipt of the notice of award through LoI, the successful Bidder shall furnish the Performance Security for 2% (2 percent) of the

contract price as applicable for First Work Order/ Contract A, instead of 10% for completing contractual formalities and the remaining 8% of the amount against Performance Security shall be recovered by Discom from Contractor's running bills starting from 1st bill under the said Contract in equal installments against work done under the awarded contract. However, the available 2% Bid Security shall be released only after ensuring availability of 10% Performance Security (BG+Cash) with the Discom. The performance security of a joint venture shall be in the name of joint venture.

4.1.2. The above-mentioned Performance Security / retained amount against Performance Security shall be returned after 3 (Three) months from the date of issue of Final Taking Over certificate by Discom for the amount proportionate to the Commissioned GSS. The same shall be extended by the Contractor time to time till ninety (90) days beyond original period of 10 years of O&M months.

4.1.3. The departments of the State Government and undertakings, corporations, autonomous bodies, registered societies, co-operative societies which are owned or controlled or managed by the State Government and undertakings of the Central Government may be exempt from submission of Performance Security. However, a declaration shall be taken such government owned departments which are exempted from submission of Performance Security.

4.2. The Performance Security shall be in the Form of unconditional Bank Guarantee as per the [Section N Format N1](#) or retention of Bid Security/ Cash as per the option selected by the Contractor. The BG for Performance Security shall be executed on Rajasthan State Non-Judicial Stamp Paper worth 0.25% of BG value or Rs. 25,000/- whichever is lower.

4.3. In case of award of the contract to a Joint Venture, the Bank Guarantees for performance security shall be submitted in the name of any of the partner(s) of the Joint Venture "OR" in the name of Lead Partner in the Joint Venture submitting the bid.

4.4. The BG shall be from Any Government bank and in case of private bank as list provided in Section C 3.1.3.2.

4.5. Forfeiture of Performance Security:

Apart from cases mentioned in the Tender Document regarding forfeiture of Performance Security, the Performance Security amount in full or part may also be forfeited in the following cases:

4.5.1. Failure in executing the Contract Agreement (Contract A and B/ First Contract and Second Contract) with the Discom

4.5.2. When the terms and conditions of contract is breached / infringed by the Successful Bidder/ Contractor

4.5.3. If the Successful Bidder/ Contractor fails to carry out the work satisfactorily

4.5.4. When contract is being terminated due to non-performance by the Successful Bidder/ Contractor

4.5.5. Notice of reasonable time will be given in case of forfeiture of Performance Security deposit. The decision of the AVVNL/ Discom, as applicable, in this regard shall be final.

4.6. No interest will be paid by the Discoms on the amount of Performance Security.

5. Signing of Contract:

5.1. Under this Tender/NIT, Contractor shall be required to execute Contracts under following two modes:

5.1.1. **Contract for GSS Construction “(Contract A/ First Contract)”**: **Single Contract** for work of the survey, design, supply, erection, testing, commissioning of 33/11 KV Grid Sub-station (GSS) & Associated Infrastructure (33 kV Line & 11 kV Line), including civil work for the Nos. of GSS under this Tender Document on Opex model in AVVNL under TN-378 conforming to detailed scope of work & technical specifications. This Contract shall have to be executed by the Contractor within 7 days after submission of Performance Security. This shall come into force from the date on which the Letter of Intent is dispatched to the successful bidder. This Contract Agreement shall be pursuant to [Section N Format N6A](#) The Contract period shall be from date of issue of LOI by Discom to completion of 10 years of O&M period of the last GSS to be constructed under this Tender.

5.1.2. **Contract(s) for O&M of GSS “(Contract B/ Second Contract)”**: **Separate Contract for each GSS** for work of 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & 33 kV Line on Opex model in AVVNL under TN-378 conforming to detailed scope of work & technical specifications. These Contracts shall be executed by the Contractor within 7 days of successful commissioning of the respective GSS for which 10 years O&M period starts from the date of successful commissioning of GSS. This Contract Agreement shall be pursuant to [Section N Format N6B](#). The Contract period shall be from date of “Construction Completion of respective GSS by Discom to completion of 10 years of O&M period of the said GSS.

5.2. If the bidder, whose bid has been accepted, fails to sign a written Contract A or fails to furnish the required Performance Security with in specified period, the AVVNL shall take action against the successful bidder as per the provisions of the Tender Document, Act and the rules. The AVVNL may, in such case, cancel the tender process or if it deems fit, offer for acceptance the rates of lowest or most advantageous bidder to the next lowest or most advantageous bidder, in accordance with the criteria and procedures set out in the Tender Documents.

5.3. The bidder shall be asked to execute the agreement on a non-judicial stamp of Rajasthan State of value worth 0.25% of the contract value.

6. If the Successful Bidder/ Contractor quotes/reduces its price to tender similar goods, works or services at the price lower than contract price to anyone in the State at any time during the currency of the contract, the contract price shall be automatically reduced with effect from the date of reducing or quoting lower price, for all delivery of the subject matter of procurement under that contract and the contract shall be amended accordingly going forward.

7. Reservation of Rights:

To take care of unexpected circumstances, AVVNL shall reserve the rights for the following:

- 7.1. Extend the closing date for submission of the bids.
- 7.2. Amend the bidding requirements at any time prior to the closing date, with the amendment being notified to prospective bidders.
- 7.3. Seek information from or negotiate with one or more of the bidders on any issue at any time and to continue to negotiate with one or more of the bidders.
- 7.4. Discontinue negotiations at any time with any bidder.
- 7.5. Allow a bidder to change its Technical proposal if the same opportunity is given to all bidders.
- 7.6. To accept any bid not necessarily the lowest, reject any bid without assigning any reasons and accept bid for all or anyone or more of the articles for which bid has been invited or distribute items of stores to more than one bidder.
- 7.7. Terminate or abandon the Tender procedure or the entire Project whether before or after the receipt of Bids.
- 7.8. Seek the advice of external consultants to assist AVVNL in the evaluation or review of Bids.
- 7.9. Make enquiries of any person, company or organization to ascertain information regarding the bidder and its Bid.
- 7.10. Reproduce for the purposes of the procedure the whole or any portion of the Bid despite any copyright or other intellectual property right that may subsist in the Bid.

SECTION - J: General Conditions of Contract (GCC)

1. Preamble:

1.1. This Section is named as General Conditions of Contract (GCC) and provides all the rights and obligations of the parties under the Contract. This Section contains provisions which are to be used unchanged unless Section – K named as Special Conditions of Contract (SCC) states otherwise as any changes in GCC or any complementary information that may be needed has been shown in SCC. If there is a conflict between the provisions of GCC & SCC, the provisions of SCC shall prevail.

A. Definitions and Interpretation

1. Definitions

1.1. The following words and expressions shall have the meanings hereby assigned to them:

- (a) "Settlement Committee" means the committee formed by Employer to make a decision on or to settle any dispute or difference between the Employer and the Contractor referred to him or her by the parties pursuant to GCC Sub-Clause 38.1 hereof.
- (b) "Associate" means a party who has been conjoined by the Contractor to independently execute a pre-selected part of facilities of the contract and grant him the associated contractual rights and obligations, without diluting the overall responsibility of the contractor in respect of the Facilities under the contract.
- (c) "Collaborator" or "Parent Company" means the firms/corporations who has provided technological support to the manufacturer for establishing production line for the specific Equipment.
- (d) "Commissioning" means operation of the Facilities or any part thereof, if any, as per GCC Sub-Clause 1.1(e) by the Contractor as specified in the Technical Specifications, which operation is to be carried out by the Contractor as provided in GCC Sub-Clause 20.1.3 (Commissioning), for the purpose of Trial – Operation (GCC Sub-Clause 20.1.4).
- (e) "Construction Completion" in respect of each GSS shall mean that the Facilities (or a specific part thereof where specific parts are specified in the **Section E Clause 6.1 (1)**) have been completed operationally and structurally and put in a tight and clean condition and that all works in respect of pre-commissioning of the Facilities (or a specific part thereof where specific parts are specified in the **Section E Clause 6.1 (1)**) has been completed (wherever required, as per Technical Specifications) and Commissioning followed by Trial – Operation has been completed, as provided in GCC Sub-Clause 20.1 (Completion of Facilities) hereof.
- (f) "Contract" means the Contract Agreement entered into between the Employer and the Contractor together with the Contract Documents referred to therein.
- (g) "Contract Documents" means the documents (Contract Documents) of the Form of Contract Agreement (including any amendments thereto); Section N – N6A & B.

- (h) "Contract Price" means the sum specified in Clause 2.1 of Article 2 (Contract Price) of the Contract Agreement, subject to such additions or deductions therefrom, as may be made pursuant to the Contract. For the purpose of Liquidated Damages and Contract Performance Guarantee, the "Contract Price" means the sum specified in Clause 2.1 of Article 2 (Contract Price) of the Contract Agreement.
- (i) "Contractor" means the firms whose bid to perform the Contract has been accepted by the Employer and is named in the Contract Agreement, and includes the legal successors or permitted assigns of the Contractor.
- (j) "Contractor's Equipment" means all plant, 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 and Equipment, or other things intended to form or forming part of the Facilities.
- (k) "Contractor's Representative" means any person nominated by the Contractor and approved by the Employer in the manner provided in GCC Sub-Clause 13.2 (Contractor's Representative and Construction Manager) hereof to perform the duties delegated by the Contractor.
- (l) "Day" means calendar day of the Gregorian Calendar.
- (m) "Defect Liability Period" means the period of validity of the warranties given by the Contractor commencing at Construction Completion of the Facilities or a part thereof, if any, as per GCC Sub-Clause 1.1(e), during which the Contractor is responsible for defects with respect to the Facilities (or the relevant part thereof) as provided in GCC Clause 22 (Defect Liability) hereof.
- (n) "Effective Date" means the date of notice of award through LoI from which the Time for Completion shall be determined.
- (o) "Employer" means the firm/corporation/ government entity, Ajmer Vidyut Vitran Nigam Limited ("AVVNL"/"Ajmer Discom"), who is responsible for getting the Facilities implemented. The Employer shall include the legal successors or permitted assigns of the Employer. For the purpose of execution of the contract, the contractual activities shall be performed by the Employer.
- (p) "Facilities" means the Plant and Equipment to be supplied and installed, as well as all the Installation Services to be carried out by the Contractor under the Contract.
- (q) "GCC" means the General Conditions of Contract hereof.
- (r) "Guarantee Test(s)" means the test(s) specified in the Technical Specifications to be carried out to ascertain whether the Facilities or a specified part thereof is able to attain the Functional Guarantees specified in the Technical Specifications in accordance with the provisions of GCC Sub-Clause 20.2.1 (Guarantee Test) hereof during/after successful Commissioning followed by Trial - Operation.
- (s) "Installation Services" means all those services ancillary to the supply of the Plant and Equipment for the Facilities, to be provided by the Contractor under the Contract; e.g., 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.

- (t) "Month" means calendar month of the Gregorian Calendar.
- (u) "Notification of Award" means the official notice through LoI issued by the Employer notifying the Contractor that his bid has been accepted.
- (v) "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 GCC Sub-Clause 20.2.2 (Operational Acceptance) hereof after successful Commissioning followed by Trial - Operation.
- (w) Deleted.
- (x) "Plant and Equipment" means permanent plant, equipment, machinery, apparatus, articles and things of all kinds to be provided and incorporated in the Facilities by the Contractor under the Contract (including the spare parts to be supplied by the Contractor under GCC Sub-Clause 3.3 hereof), but does not include Contractor's Equipment. (All the supply Materials required to construct GSS & Associated Infrastructure (33 kV and 11 kV Line) and materials required for Civil Work & required during the Operation & Maintenance period 10 years of GSS & 33 kV Line)
- (y) "Pre-commissioning" means the testing, checking and other requirements specified in the Technical Specifications that are to be carried out by the Contractor in preparation for Commissioning as provided in GCC Sub-Clause 20.1.2 (Pre-Commissioning) hereof.
- (z) "Project Manager" or "Engineer" or "Engineer – in Charge" means the person appointed by the Employer in the manner provided in GCC Sub-Clause 13.1 hereof to perform the duties delegated by the Employer.
- (aa) "SCC" means the Special Conditions of Contract.
- (bb) "Site" means the land and other places upon which the Facilities are to be installed, and such other land or places as may be specified in the Contract as forming part of the Site.
- (cc) Deleted
- (dd) "Interim Taking Over" means the Employer's written acceptance of the Facilities (each GSS) under the Contract, after successful Trial – Operation for the specified period in accordance with the Contract, as provided in GCC Sub-Clause 20.1.5.
- (ee) "Time for Construction Completion" means the time within which Completion of the Facilities is to be attained in accordance with the scope of work and specifications, as a whole (or of a part of the Facilities where a separate Time for Completion of such part has been prescribed below) and "Taking Over" by the Employer is to be attained. The Time for Completion is specified in Section E Clause 6.

- (ef) "Time for O&M Completion" means the time within which O&M Completion of the Facilities is to be attained in accordance with the scope of work and specifications, as a whole (or of a part of the Facilities where a separate Time for Completion of such part has been prescribed below) and "Final Taking Over" by the Employer is to be attained. The Time for Completion is specified in Section E Clause 6.
- (eg) "O&M Completion" in respect of each GSS shall mean that the Facilities (or a specific part thereof where successful operation & maintenance period of 10 years of said GSS have been completed and Final Taking Over by Discom has been completed.
- (eh) "Final Taking Over" means the Employer's written acceptance of the Facilities (for each GSS) under the Contract, after Construction Completion & O&M Completion of respective GSS, as provided in GCC Sub-Clause 20.1.5.

2. Interpretation

2.1 Contract

- 2.1.1 The Contracts to be entered into with the successful Bidder shall be as per Section I Clause 5.
- 2.1.2 The award of two separate Contracts shall not in any way dilute the responsibility of the Contractor for the successful completion of the Facilities as per Specification and a breach in one Contract shall automatically be construed as a breach of the other Contract(s) which will confer a right on the Employer to terminate the other Contract(s) also at the risk and the cost of the Contractor.
- 2.1.3 Each Contract will be signed in two originals and the Contractor shall be provided with one signed original and the second will be retained by the Employer.
- 2.1.4 The Contractor shall provide free of cost to the Employer all the engineering data, drawing and descriptive materials submitted with the bid, in at least two (2) copies to form a part of the Contract immediately after Notification of Award.
- 2.1.5 Subsequent to signing of the Contract, the Contractor at his own cost shall provide the Employer with at least Two (2) true copies of Contract Agreement within fifteen (15) days after signing of the Contract.

2.2 Contract Documents

All documents forming part of the Contract (and all parts thereof) are intended to be correlative, complementary and mutually explanatory, subject to Article 1.2 (Order of Precedence) of the Contract Agreement. The Contract shall be read as a whole.

2.3 Language

The ruling language of the Contract and the language for communications shall be English.

2.4 Singular and Plural

The singular shall include the plural and the plural the singular, except where the context otherwise requires.

2.5 Headings

The headings and marginal notes in the General Conditions of Contract are included for ease of reference, and shall neither constitute a part of the Contract nor affect its interpretation.

2.6 Entire Agreement

Subject to GCC Sub-Clause 12.4 hereof, the Contract constitutes the entire agreement between the Employer and Contractor with respect to the subject matter of Contract and supersedes all communications, negotiations and agreements (whether written or oral) of parties with respect thereto made prior to the date of Contract.

2.7 Amendment

No amendment or other variation of the Contract shall be effective unless it is in writing, is dated, expressly refers to the Contract, and is signed by a duly authorized representative of each party hereto.

2.8 Independent Contractor

The Contractor shall be an independent contractor performing the Contract. The Contract does not create any agency, partnership, joint venture or other joint relationship between the parties hereto.

Subject to the provisions of the Contract, the Contractor shall be solely responsible for the manner in which the Contract is performed. All employees or representatives engaged by the Contractor in connection with the performance of the Contract shall be under the complete control of the Contractor and shall not be deemed to be employees of the Employer, and nothing contained in the Contract awarded by the Contractor shall be construed to create any contractual relationship between any such employees, representatives and the Employer.

2.9 Joint Venture

If the Contractor is a joint venture of two or more firms, all such firms shall be jointly and severally bound to the Employer for the fulfillment of the provisions of the Contract and shall designate one of such firms to act as a leader with authority to bind the joint venture. The composition or the constitution of the joint venture shall not be altered without the prior written consent of the Employer.

2.10 Non-Waiver

2.10.1 Subject to GCC Sub-Clause 2.10.2 below, no relaxation, forbearance, delay or indulgence by either party in enforcing any of the terms and conditions of the Contract or the granting of time by either party to the other shall prejudice, affect or restrict the rights of that party under the Contract, nor shall any waiver by either party of any breach of Contract operate as waiver of any subsequent or continuing breach of Contract.

2.10.2 Any waiver of a party's rights, powers or remedies under the Contract must be in writing, must be dated and signed by an authorized representative of the party granting such waiver, and must specify the right and the extent to which it is being waived.

2.11 Severability

If any provision or condition of the Contract is prohibited or rendered invalid or unenforceable, such prohibition, invalidity or unenforceability shall not affect the validity or enforceability of any other provisions and conditions of the Contract.

2.12 Country of Origin

“Origin” means the place where the materials, equipment and other supplies for the Facilities are mined, grown, produced or manufactured, and from which the services are provided. Plant and equipment are produced when, through manufacturing, processing or substantial and major assembling of components, a commercially recognized product results that is substantially different in basic characteristics or in purpose or utility from its components.

2.13 Notices

2.13.1 Unless otherwise stated in the Contract, all notices to be given under the Contract shall be in writing, and shall be sent by personal delivery, special courier, telegraph, facsimile or Electronic Data Interchange (EDI) to the address of the relevant party set out in the Contract Agreement, with the following provisions:

- (a) Any notice sent by telegraph, facsimile or EDI shall be confirmed within two (2) days after dispatch by notice sent by special courier, except as otherwise specified in the Contract.
- (b) Any notice sent by special courier shall be deemed (in the absence of evidence of earlier receipt) to have been delivered ten (10) days after dispatch. In proving the fact of dispatch, it shall be sufficient to show that the envelope containing such notice was properly addressed, stamped and conveyed to the postal authorities or courier service for transmission by special courier. Provided further that whenever the postal authorities or courier service provide a proof of delivery, the same shall also be applicable for presenting the fact of dispatch.
- (c) Any notice delivered personally or sent by telegraph, facsimile or EDI shall be deemed to have been delivered on date of its dispatch.
- (d) Either party may change its postal, facsimile or EDI address or addressee for receipt of such notices by ten (10) days' notice to the other party in writing.

2.13.2 Notices shall be deemed to include any approvals, consents, instructions, orders and certificates to be given under the Contract.

2.14 Governing Law & its Jurisdiction

The Contract shall be governed by and interpreted in accordance with laws of Union of India and the Courts of Ajmer, Rajasthan shall have exclusive jurisdiction in all matters arising under this Contract. Further, the provision contained in RTPP Act 2012 and RTPP Rules 2013 shall prevail wherever applicable.

B. Subject Matter of Contract

3. Scope of Facilities

3.1 Standards and Regulations: 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)
- 3.2 Unless otherwise expressly limited in the Technical Specifications, the Contractor's obligation shall include the provision of all Plant and Equipment, the performance of all Installation Services required for the design, the manufacture (including procurement, quality assurance, construction, installation, associated civil works, Pre-commissioning and delivery) of the Plant and Equipment, the installation, completion, commissioning and performance testing of the facilities & operation & maintenance of Plant and Equipment and Facilities in accordance with the plans, procedures, specifications, drawings, codes and any other documents as specified in the Technical specifications. Such specifications include, but are not limited to, the provision of supervision and engineering services; the supply of labour, materials, equipment, spare parts (as specified in GCC Sub-Clause 3.3 below) and accessories; Contractor's Equipment; construction utilities and supplies; temporary materials, structures and facilities; transportation (including without limitation, custom clearance, port handling, unloading and hauling to, from and at the Site); storage and training except for those supplies, works and services that will be provided or performed by the Employer, as set forth in Appendix-6 (Scope of Works and Supply by the Employer) to the Contract Agreement.
- 3.3 The Contractor shall, unless specifically excluded in the Contract, perform all such work and/or supply all such items and materials not specifically mentioned in the Contract but that can be reasonably inferred from the Contract as being required for attaining Construction Completion & Operation & Maintenance Completion of the Facilities as if such work and/or items and materials were expressly mentioned in the Contract.
- 3.4 The Contractor shall ensure the availability of spare parts required for the operation and maintenance of the Facilities to the Employer for a minimum period of 10 years from Operational Acceptance of the Facilities. The Contractor shall carry sufficient inventories to ensure an ex-stock supply of consumable spares for the plant and equipment. If so desired by the Employer, the Contractor shall submit the specifications, price and the terms and conditions relating to the supply thereof for such spares identified by the Employer with validity period of 6 months within 7 days of receipt of request from Employer for its consideration and placement of order.
- 3.5 The Contractor shall guarantee that in the event of termination of production of spare parts by the Contractor:

- (i) The Contractor shall send advance notification to the Employer of the pending termination, with 2 (two) years' time to permit the Employer to procure needed requirements, and
 - (ii) Following such termination, the Contractor shall furnish at no cost to the Employer the blueprints, drawings and specification of the spare parts, if requested.
- 3.6 In case the Contractor fails to supply the spares parts in accordance with the terms stipulated above, the Employer shall sanction the Contractor declaring them ineligible for a stated period of time for future projects.

4. Time for Commencement and Completion

- 4.1 The Contractor shall commence work on the Facilities from the Effective Date of Contract i.e. date of issuance of Letter of Intent (LoI) and without prejudice to GCC Sub-Clause 21.2 hereof, the Contractor shall thereafter proceed with the Facilities in accordance with the time schedule specified in the corresponding Section E Clause 6 & Appendix – 4 (Time Schedule) to the Contract Agreement of Section N Format N6 A & B. The time for First Contract for Construction shall be from date of issue of LOI till O&M Completion of the all the GSS for which Second Contract for O&M shall be signed by Discom. The time for Second Contract for Operation & Maintenance shall start from date of achievement of Construction Completion of the respective GSS till O&M Completion of that GSS is achieved.
- 4.2 The Contractor shall attain Construction Completion & Operation Completion of the Facilities (or of a part where a separate time for Completion of such part is specified in the Contract) within the time stated under Time for Completion or within such extended time to which the Contractor shall be entitled under GCC Clause 34 hereof.

4.3 Deleted

5. Contractor's Responsibilities

- 5.1 The Contractor shall design, manufacture (including associated purchases), install and complete and operate & maintain for a period of 10 years the Facilities with due care and diligence in accordance with the Contract.
- 5.2 The Contractor confirms that it has entered into this Contract on the basis of a proper examination of the data relating to the Facilities (including any data as to boring tests) provided by the Employer, and on the basis of information that the Contractor could have obtained from a visual inspection of the Site (if access thereto was available) and of other data readily available to it relating to the Facilities as of the date seven (7) days prior to bid submission. The Contractor acknowledges that any failure to acquaint itself with all such data and information shall not relieve its responsibility for properly estimating the difficulty or cost of successfully performing the Facilities.
- 5.3 The Contractor shall acquire in its name all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the country where the Site is located that are necessary for the performance of the Contract, including, without limitation, visas for the Contractor's personnel and entry permits for all imported Contractor's Equipment. The Contractor shall acquire all other permits, approvals and/or licenses that are not the responsibility of the Employer under GCC Sub-Clause 6.3 hereof and that are necessary for the performance of the Contract.
- 5.4 The Contractor shall comply with all laws in force in India. The laws will include all local, state, national or other laws that affect the performance of the Contract and bind upon the

Contractor. The Contractor shall indemnify and hold harmless the Employer from and against any and all liabilities, damages, claims, fines, penalties and expenses of whatever nature arising or resulting from the violation of such laws by the Contractor or its personnel, but without prejudice to GCC Sub-Clause 6.1 hereof.

- 5.5 Any Plant, Material and Services including Operation & Maintenance that will be incorporated in or be required for the Facilities and other supplies shall have their origin as specified under GCC Sub-Clause 2.12 (Country of Origin).
- 5.6 The Contractor shall permit the Employer to inspect the Contractor's accounts and records relating to the performance of the Contractor.
- 5.7 First-aid: The Contractor shall provide necessary first-aid facilities for all his employees, representatives and workmen working at the Site. Enough number of Contractor's personnel shall be trained in administering first-aid.
- 5.8 Cleanliness: The Contractor shall be responsible for keeping the entire area allotted to him clean and free from rubbish, debris etc. during the period of Contract. The Contractor shall employ enough number of special personnel to thoroughly clean his work-area at least once in a day. All such rubbish and scrap material shall be stacked or disposed off in a place to be identified by the Project Manager. Materials and stores shall be so arranged to permit easy cleaning of the area. In areas where equipment might drip oil and cause damage to the floor surface, a suitable protective cover of a flame resistant, oil proof sheet shall be provided to protect the floor from such damage.

Similarly the labour colony, the offices and the residential areas of the Contractor's employees and workmen shall be kept clean and neat to the entire satisfaction of the Project Manager. Proper sanitary arrangement shall be provided by the Contractor, in the work-areas, office and residential areas of the Contractor.

- 5.9 Fire Protection: The work procedures that are to be used during the erection shall be those, which minimize fire hazards to the extent practicable. Combustible materials, combustible waste and rubbish shall be collected and removed from the Site at least once each day. Fuels, oils and volatile or inflammable materials shall be stored away from the construction and equipment and materials storage areas in safe containers. Un-treated materials shall not at all be used at Site for any other purpose unless otherwise specified. If any such materials are received with the equipment at the Site, the same shall be removed and replaced with acceptable materials before moving into the construction or storage area.

Similarly, corrugated paper fabricated cartons etc. will not be permitted in the construction area either storage or for handling of materials. All such materials used shall be of waterproof and flame resistant type. All other materials such as working drawings, plans etc., which are combustible but are essential for the works to be executed shall be protected against combustion resulting from welding sparks, cutting flames and other similar fire sources.

All the Contractor's supervisory personnel and sufficient number of workers shall be trained for firefighting and shall be assigned specific fire protection duties. Enough of such trained personnel must be available at the Site during the entire period of the Contract.

The Contractor shall provide enough fire protection equipment of the types and numbers for the warehouses, office, temporary structures, labour colony area etc. Access to such fire protection equipment shall be easy and kept open at all times.

- 5.10 Security: The Contractor shall have total responsibility for all equipment and materials in his custody/stores, loose, semi-assembled and/or erected by him at Site. The Contractor shall

make suitable security arrangements including employment of security personnel to ensure the protection of all materials, equipment and works from theft, fire, pilferage and any other damages and loss. All materials of the Contractor shall enter and leave the project site only with the written permission of the Project Manager in the prescribed manner.

- 5.11 **Contractor's Area Limits:** The Project Manager will mark-out the boundary limits of access roads, parking spaces, storage and construction areas for the Contractor and the Contractor shall not trespass the areas not so marked out for him. The Contractor shall be responsible to ensure none of his personnel move out of the areas marked out for his operations. In case of such a need for the Contractor's personnel to work out of the areas marked out for him, the same shall be done only with the written permission of the Project Manager.
- 5.12 **Contractor's Co-Operation with the Employer:** In case where the performance of the erection work by the Contractor affects the operation of the system facilities of the Employer, such erection work of the Contractor shall be scheduled to be performed only in the manner stipulated by the Project Manager and the same shall be acceptable at all times to the Contractor. The Project Manager may impose such restrictions on the facilities provided to the Contractor such as electricity, water, etc. as he may think fit in the interest of the Employer and the Contractor shall strictly adhere to such restrictions and co-operate with the Project Manager. It will be the responsibility of the Contractor to provide all necessary temporary instrumentation and other measuring devices required during start-up and operation of the equipment systems, which are erected by him. The Contractor shall also be responsible for flushing and initial filling of all the oil and lubricants required for the equipment furnished and erected by him, so as to make such equipment ready for operation. The Contractor shall be responsible for supplying such flushing oil and other lubricants unless otherwise specified elsewhere in the document and specifications.
- 5.13 **Updation of Progress on IT based Online Monitoring Tool:** If applicable, Contractors will have to update their on-field progress on the IT based online monitoring tool on regular basis as per the guidelines issued by Discom issued from time to time and subsequent amendments if any.
- 5.14 Contractor shall adhere to Quality Assurance Plan (QAP)/ Quality Standards of Discom and details of the same will be provided by the Discom. A checklist for quality assurance is attached in Section N Format N8.

6. Employer's Responsibilities

- 6.1 Employer shall provide Meters free of cost to Contractor(s). For this, Contractor has to provide timeline for requirement of material supported with site survey reports and including reports on deployment of sufficient manpower for erection, testing and commissioning of these materials. The requirement of meters must be conveyed to Employer in writing at least 7 days in advance. However the Discom may provide any item as free issue item besides items mentioned in the bidding document for which erection charges will be paid as per contract.
- 6.2 The Employer shall ensure the accuracy of all information and/or data to be supplied by the Employer as described in the corresponding Appendix - 6 (Scope of Works and Supply by the Employer) to the Contract, except when otherwise expressly stated in the Contract.
- 6.3 The Employer shall be responsible for acquiring and providing legal and physical possession of the Site and access thereto, and for providing possession of and access to all other areas reasonably required for the proper execution of the Contract, including all requisite rights of way, as specified in the corresponding Appendix - 6 (Scope of Works and Supply by the Employer) to the Contract Agreement. The Employer shall give full possession of and accord all rights of access thereto on or before the date(s) specified in that Appendix.

- 6.4 The Employer shall acquire and pay for all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the country where the Site is located which such authorities or undertakings require the Employer to obtain them in the Employer's name, are necessary for the execution of the Contract (they include those required for the performance by both the Contractor and the Employer of their respective obligations under the Contract), including those specified in Appendix 6 (Scope of Works and Supply by the Employer) to the Contract Agreement.
- 6.5 If requested by the Contractor, the Employer shall use its best endeavours to assist the Contractor in obtaining in a timely and expeditious manner all permits, approvals and/or licenses necessary for the execution of the Contract from all local, state or national government authorities or public service undertakings that such authorities or undertakings require the Contractor or the personnel of the Contractor, as the case may be, to obtain.
- 6.6 Unless otherwise specified in the Contract or agreed upon by the Employer and the Contractor, the Employer shall provide sufficient, properly qualified operating and maintenance personnel; shall supply and make available all raw materials, utilities, lubricants, chemicals, catalysts, other materials and facilities; and shall perform all work and services of whatsoever nature, to enable the Contractor to properly carry out Commissioning, all in accordance with the provisions of Appendix 6 (Scope of Works and Supply by the Employer) to the Contract Agreement at or before the time specified in the program furnished by the Contractor under GCC Sub-Clause 14.2 (Program of Performance) hereof and in the manner thereupon specified or as otherwise agreed upon by the Employer and the Contractor.
- 6.7 The Employer shall be responsible for the continued operation of the Facilities after Final Taking Over.
- 6.8 All costs and expenses involved in the performance of the obligations under this GCC Clause 6 shall be the responsibility of the Employer.
- 6.9 Facilities to be provided by the employer:
- a) Space: Land for Contractor's Office, Store, Workshop etc. –
The Project Manager shall at his discretion and for the duration of execution of the Contract make available at site, land for construction of Contractor's field office, workshop, stores, magazines for explosives in isolated locations, assembling yard, etc. required for execution of the Contract. Any construction of temporary roads, offices, workshop, etc. as per plan approved by the Project Manager shall be done by the Contractor at his cost.
 - b) Electricity (Construction Power supply): Where power supply is available with the Employer for construction purpose the same will be provided at the job site at one point of the distribution system on chargeable basis for consumption in works. Electricity provided for construction site will be of 440 volts, 3 phase, 50 cycles and 230 volts, 1 phase, 50 cycles. Contractor shall provide and install all necessary switchgears, wiring fixtures, bulbs and other temporary equipment for further distribution and utilization of energy for power and lighting and shall remove the same on completion of the work. Should, however, electricity be used in the Contractor's labour/staff colony, the power so consumed shall be charged at the prevailing tariff rate of State as prevalent for that area at the time of its use; the supply may be withdrawn if the power is used for purposes other than for the work of the project.

- c) Water: Free supply of water will be made available for the construction purpose wherever water is available and the same shall be given at an agreed single point at the Site. Any further distribution will be the responsibility of the Contractor. Free drinking water, if available, will also be provided at one agreed point in the Site. Further distribution either to his labour colony or his work Site or to his office shall be the responsibility of the Contractor. If water source is not available with the employer at site for construction works, the contractor at his own cost shall arrange the water supply.

c. Payment

7. Contract Price

- 7.1 The Contract Price shall be as specified in the Contract Agreement and shall be same as per the amount mentioned in the Work Order issued by Discom as per Section – I Clause 3.4.
- 7.2 The Contract Price shall be increased or reduced on account of variation in quantity in accordance with Clause 33 of GCC.
- 7.3 Subject to GCC Sub-Clauses 5.2 and 6.1 hereof, the Contractor shall be deemed to have satisfied itself as to the correctness and sufficiency of the Contract Price, which shall, except as otherwise provided for in the Contract, cover all its obligations under the Contract.

8. Terms of Payment

- 8.1 The Contract Price shall be paid as specified in this clause. The procedures to be followed in making application for and processing payments shall be those outlined in this clause.
- 8.1.1 The mounting accessories/structure supplied along with any material like circuit breaker, Lightning arrestor, Capacitor Bank, Control Panel, Isolator, AB Switch, CT/PT etc. as part of main equipment shall not be paid extra under Price Schedules. The equipment price in all such cases shall be inclusive of its mounting accessories/structure. For example: if Circuit Breaker has been supplied along with its mounting structure, the contractor shall not be paid separately for mounting structure/accessories associate with Circuit Breaker.
- 8.2 All payments shall be made in Indian Rupees under the Contract.
- 8.3 The Project Manager shall within twenty-one (21) days after receipt of invoices enclosing requisite documents as per payment terms release the payment through electronic mode in designated bank account of the contractor.
- 8.4 "Billable Items" are worked out and attached to Price Schedule to the Work Order. Items otherwise required for completion of work but not listed in the Price Schedule shall also be in the scope of the contractor. The costs of such "Non- billable Items" may be included in the quoted price of "Billable Items" by the bidder in the Price Schedule. The payment shall be made on billable item wise basis only as indicated in Price Schedule.
- 8.5 All progressive payments shall be released on validity of Performance Security.
- 8.6 The payment of the Contractor shall be computed GSS-wise. Once, a GSS has achieved Construction Completion accepted as per the terms & conditions by Issuing Interim-Taking Over Certificate under this Tender document, the bidder shall prepare the two bills "First

Bill" against Supply & Erection contract after completing and commissioning of work in that GSS and submit to Discom within 15 days of issue of Interim Taking Over Certificate of that GSS. The Discom shall review the Bill and approve the bill but will not release any payment at this stage.

- 8.7 After completion of 30 days from the date of Issue of Taking-Over Certificate, Contractor can raise "Subsequent Monthly Bill", including the bill amount as approved against First Bill of that GSS divided into 120 monthly amount and adding the monthly O&M charges (as per the amount of Work Order for O&M issued by Discom) of the respective commissioned GSS and submit to Discom. The total amount will then be reviewed by Discom and approved for payment. The Discom shall endeavour to pay this amount within 30 days of raising of bill. Now, every month till end of 10 years period of O&M Contract the Contractor shall raise such bill this amount. The Discom may deduct any penalties/ Liquidated Damages as applicable from such monthly payments.
- 8.8 The First Bill for payments against supply & erection contract & O&M Contract of various items including Taxes etc. shall be accepted by Discom on receipt and acceptance of material only on successful erection, testing and commissioning of the works in a particular GSS and issuance of taking over certificate by the Discom on submission of documents indicated herein under:
- 8.8.1 Unconditional acceptance of the Letter of Award and signing of contract agreement by the Contractor.
 - 8.8.2 An unconditional & irrevocable Bank Guarantee against Performance Security as per provisions of Section I Clause 4 as per applicable validity.
 - 8.8.3 Detailed Project Execution Plan/PERT chart and its approval by the Discom.
 - 8.8.4 Evidence of dispatch (R/R or receipted L/R)
 - 8.8.5 Contractor's detailed invoice & packing list identifying contents of each shipment.
 - 8.8.6 Invoice certifying payments of GST, Other taxes and Duties, etc.
 - 8.8.7 Certified copy of Insurance policy/Insurance Certificate.
 - 8.8.8 Manufacturer's/Contractor's guarantee certificate of Quality.
 - 8.8.9 Material Dispatch Clearance Certificate (MDCC) / Dispatch Instructions (DI) for dispatch of materials from the manufacturer's works. MDCC/DI shall be issued by authorized officer of Discom.
 - 8.8.10 Manufacturer's copy of challan
 - 8.8.11 Submission of the certificate by the Discom's representative that the item(s) have been received,
 - 8.8.12 Material reconciliation statement consisting of the materials utilized for erection, testing & commissioning of the respective GSS.
 - 8.8.13 Submission of certificate by Project Manager of Discom that materials have been supplied as per technical specification, scope of work & approved

drawings enclosing certified copy of inspection reports and dispatch clearances.

- 8.8.14 On submission of the certificate by the Project Manager of Discom that the item(s) have been received, erected, tested and commissioned.
- 8.8.15 'Commissioning' for the purpose of payments shall mean satisfactory completion of all supplies, erection, commissioning checks and successful completion of all site tests and continuous energisation of the equipment/materials at rated voltage as per the Contract and to the satisfaction/approval of the Discom.
- 8.8.16 Test check certification on Measurement Book be recorded by officers in hierarchy with the claim as per policy.
- 8.8.17 In case, for any reason not attributable to the contractor, the commissioning and charging of equipment/materials is delayed beyond 120 days of successful completion of final checking and testing of works, the payment shall be released against an unconditional & irrevocable bank guarantee of equivalent amount initially valid till 6 months from the readiness of works for commissioning and charging at rated voltage, to be extended till 90 days beyond actual commissioning & taking over.
- 8.9 The Subsequent Monthly Bills shall be submitted in Triplicate in subsequent month to concerned AEN for verification and carry the following certificates which shall be verified & recorded by Assistant Engineer (O&M) on each bill: -
- 8.9.1 The contractor has carried out all the operation & maintenance duties satisfactorily as specified in the specification during the month for which payment has been claimed.
- 8.9.2 All the records prescribed under the specification were regularly maintained by the contractor during the month _____ at each Sub-Station.
- 8.9.3 The power availability during the month of _____ has been _____ %
- 8.9.4 The contractor has deployed one ITI holder worker in each shift of 8 hours per day.
- 8.9.5 Weekly duty chart was displayed by the contractor on the notice board.
- 8.9.6 Appointment letter of workers were pasted by the contractor on the notice board.
- 8.9.7 The contractor had performed watch and ward of every Sub-station area and equipment and had maintained lighting arrangement properly.
- 8.9.8 Payment to worker should be ensured / verified by Contractor as per wages rules and next payment shall be released after verification of same through Bank Statement of worker.
- 8.9.9 During operation & maintenance of GSS & Associated Infra, proper supply as per prevailing Discom rules should be given by his deployed workman as intimated by Discom from time to time. The same labour must not be allowed to perform duty more than 8 hours duty during a day (24 hours), failing

which it will be treated violation of applicable Labour Act/ Rules and penalty will be imposed as per penal provision.

- 8.9.10 Receipt of copy of insurance premium receipt in respect of the workers engaged by contractor and copy of challans with supporting details of the workers engaged, wages paid, PF & ESI (if applicable) subscription and contribution duly tallied with the challan amount from the contractor in token of deposition of PF & ESI (if applicable) amount for the previous month as well as on completion of the contractual formalities as mentioned at clause No. 2,3,6,7 whichever is later
- 8.10 Unconditional acceptance of the Letter of Award and signing of contract agreement by the Contractor.
- 8.11 The payment shall be made by Sr. Accounts Officer (CPC), AVVNL, Ajmer at the certificate of the Engineer-in charge in accordance with the conditions set out herein.
- 8.12 Payment shall only be made after random checking of at least 3 Sub-stations per division by the officer(s) nominated by Circle SE for ensuring the compliance of the entire contractual obligation to be discharged by the contractor. The checking officer shall submit his report to Circle SE & Sr. Accounts Officer (CPC), AVVNL, Ajmer within a week from the date of nomination (by second week positively). The Sr. Accounts Officer (CPC), AVVNL, Ajmer on receipt of this report only shall arrange payment of the first bill to the contract as per the terms of payment.
- 8.13 The Contractor shall submit First Bill for respective GSS for the completed work as per provisions of above clauses in 2 (two) copies to the concerned Engineer-in-charge for checking and verification by him. Thereafter, it should be submitted to Nigam Sr. A.O. (CPC) for arranging due payment.
- 8.14 The payments of monthly installments shall be adjusted based on the Option selected in providing Performance Security by the Contractor.
- 8.15 For the delayed payments, if any, the Discom will not pay any interest.
- 8.16 In case of JV, The lead member shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture, and the entire execution of the Contract, including payment, shall be done exclusively with the lead member, provided otherwise requested by the joint venture and agreed between the Discom and the lead member of JV.
- 8.17 It is to be clearly noted that the Subsequently Monthly Bills shall be raised by Contractors for each GSS & related Associated Infrastructure Construction Completion which is currently 10 Nos. In case, there is recovery amount due to Discom from Contractor under this Tender Document under any GSS bill can be recovered or deducted or from other GSS bills from that respective Contractor by Discom.
- 8.18 The final bill shall also be routed through Executive Engineer concerned. All other statutory deductions like taxes and duties etc. as per prevailing rates shall be made by the Sr. Accounts Officer (CPC), AVVNL, Ajmer while payment to the contractor.
- 8.19 Ajmer Discom (AVVNL) shall pay the rental charges & free call/ minimum charges of BSNL/other company telephone only related to GSS. Excess call charges over the minimum charges shall be borne by the contractor. However when telephone is being used for JEN/AEN office, full charges shall be paid by the Discom.

9. Performance Security

9.1 Issuance of Performance Security

The Contractor shall provide the Performance security specified below in favor of the Employer at the times, and in the amount, manner and form specified below.

9.2 Deleted

9.3 Performance Security shall be as per Section: I Clause 4.

9.3.1 The Performance Security (ies) to be furnished by the Contractor under the Contract shall be in favour of the Employer.

9.3.2 The performance security shall be in the Form of unconditional Bank Guarantee attached hereto in the Section N Format N1.

9.3.3 However, if the Defects Liability Period has been extended on any part of the Facilities pursuant to GCC Sub-Clause 22.8 hereof, the Contractor shall issue an additional security in an amount proportionate to the Contract Price of that part. The security shall be returned to the Contractor immediately after its expiration, provided, however, that if the Contractor pursuant to GCC Sub-Clause 22, is liable for an extended warranty obligation, the performance security shall be reduced to ten percent (10%) of the value of the component covered by the extended warranty.

9.3.4 In case of award of the contract to a Joint Venture, the Bank Guarantees for performance security and the Bank Guarantee for advance payment shall be submitted in the name of all the partner(s) of the Joint Venture "OR" in the name of any "Partner" in the Joint Venture submitting the bid. In both cases all the partners of JV and applicability for invoking BG shall be equivalent.

9.4 Issuing Banks

The Bank Guarantee for Advance Payment Security and Performance Security are to be provided by the Contractor, which should be issued either:

(a) by a Public Sector Bank located in India, or

(b) a scheduled Indian Bank having paid up capital (net of any accumulated losses) of Rs. 1,000 Million or above (the latest annual report of the Bank should support compliance of capital adequacy ratio requirement) *as per attached list only* **[List is placed at Annexure-I to Section-V (SCC)]**, or

9.5 Indemnity

9.5.1 For the equipment/material to be provided by the Contractor, it will be the responsibility of the Contractor to take delivery, unload and store the materials at Site and execute an Indemnity Bond and obtain authorization letter from Employer as per proforma enclosed at Section N – 'Form for Indemnity Bond to be executed by the Contractor' at N5A, in favour of the Employer against loss, damage and any risks involved for the full value of the materials. This Indemnity Bond shall be furnished by the Contractor before commencement of the supplies and shall be valid till the scheduled date of Final Taking Over, as applicable of the equipment by the Employer.

9.5.2 In case of divisible Contracts, where the Employer hands over his equipment to the Contractor for executing the Contract, then the Contractor shall, at the time of taking delivery of the equipment through Bill of Landing or other dispatch documents, furnish

trust Receipt for Plant, Equipment and Materials and also execute an Indemnity Bond in favour of the Employer in the form acceptable to the Employer for keeping the equipment in safe custody and to utilize the same exclusively for the purpose of the said Contract. Samples of proforma for the Trust receipt and Indemnity Bond are enclosed Section N – 'Form for Indemnity Bond to be executed by the Contractor' at N5B. The Employer shall also issue a separate Authorization Letter to the Contractor to enable him to take physical delivery of plant, equipment and materials from the Employer.

9A Acceptance of Bank Guarantees:-

IT enabled confirmation system shall be used in addition to existing paper based confirmation system for verification of Bank Guarantee from issuing bank as under:

- i. Getting confirmation through digitally signed secured e-mails from issuing banks;
- ii. Online verification on company portal with user id and password followed by 2nd stage authentication system generated One Time Password (OTP) on portal for reconfirmation;
- iii. E-mail confirmation followed by 2nd stage authentication by system generated SMS through registered mobile and confirmation through SMS to the verifying officer.

Employer shall evolve its own procedure adopting any one or more of the above methods for ensuring genuineness of Bank Guarantees, which is compatible with the guidelines of Banks / Reserve Bank of India in addition to existing paper based confirmation system.

10. Taxes and Duties

- 10.1 The Contractor shall be entirely responsible for payment of all taxes, duties, license fees and other such levies legally payable/incurred until Construction Completion & O&M Completion to the Employer.

If it is statutory requirement to make deductions towards such taxes and duties or any other applicable taxes and duties, the same shall be made by the Employer and a certificate for the same shall be issued to the Contractor.

- 10.2 The Contractor shall be solely responsible for the taxes that may be levied on the Contractor's persons or on earnings of any of his employees and shall hold the Employer indemnified and harmless against any claims that may be made against the Employer. The Employer does not take any responsibility whatsoever regarding taxes under Indian Income Tax Act, for the Contractor or his personnel. If it is obligatory under the provisions of the Indian Income Tax Act, deduction of Income Tax at source shall be made by the Employer.

10.3 Deleted

a) Deleted

b) Deleted

10.4 Deleted

10.5 Deleted

10.6 Deleted

- 10.7 For the purpose of the Contract, it is agreed that the Contract Price specified in Article 2 (Contract Price and Terms of Payment) of the Contract Agreement is based on the GST ("Goods & Services Tax") and other taxes prevailing at the date seven (07) days prior to

the last date of bid submission (hereinafter called "Tax" in this GCC Sub-clause 10.7). If any rates of Tax are increased or decreased, a new Tax is introduced, an existing Tax is abolished, or any change in interpretation or application of any Tax occurs in the course of the performance of the Contract, which was or will be assessed on the Contractor in connection with performance of the Contract, an equitable adjustment of the Contract price shall be made to fully take into account **any such change by addition to the Contract price or deduction therefrom**, as the case may be, in accordance with GCC Clause 31 (Changes in Laws and Regulations) hereof.

Any downward variation in the applicable rates of existing taxes/duties or abolition of existing taxes/duties shall be passed on by the Contractor to the Discom irrespective of the timing of supply while in case of upward variation the same shall be allowed to the Contractor upto the stipulated delivery time. Any statutory levy and taxes imposed after submission of bids shall be on the Discom's account.

In respect of raw materials, intermediary components etc and bought out items, neither the Employer nor the Contractor shall be entitled to any claim arising due to increase or decrease in the rate of Tax, introduction of a new Tax or abolition of an existing Tax in the course of the performance of the Contract.

Notwithstanding anything, wherever applicable/mentioned in the bidding documents, Exice Duty (ED), Sales Tax or VAT, entry tax, the same shall be read/treated as per applicable provisions of GST.

The contractor shall furnish the relevant details/ documents for this purpose, as may be required by PIA

- 10.8 Deleted.
- 10.9 Contractor shall have to submit a C.A Certificate & duly authorized Signatory of Contractor, certifying that you have not claimed Refund of any applicable GST and Cess, charged to Discom or shall not claim any such Refund, on a future date, from the concerned Authorities and if, any Refund, in respect of such GST and Cess, is claimed by you, it will be immediately passed on to the Discom, without Discom making any specific Claim, for the same, either from the GST Department or from you.
- 10.10 Contractor shall charge GST in Invoice at the rate as agreed to / mentioned in acceptance of Tender Document only and any deviation in the same shall not be accepted. Further, any additional liability of GST (later on due to wrong mentioning of GST rate, mis-interpretation of HSN/SAC Code, etc.) over and above as charged in the invoice shall be borne by the Contractor.
- 10.11 However, any refund received by the Contractor on account of GST charged from the Discom; such refund shall have to be passed on to the Discom, along with interest if any. Such refund along with interest needs to be passed on suo-moto by the Contractor
- 10.12 Further, the Discom has a right to recover the amount of GST along with penal interest at the rate of 15% per annum if GST charged is not paid / short paid to the Government or fail to upload the details or uploads inaccurate particulars on GSTIN portal by the Contractor within the stipulated time limit. In case, Govt. revises the rate of GST rate / Code during the tenure of the contract, the provision of Discom's statutory variation clause shall apply.

10.13 Input Tax Credit Benefit

In the event of any statutory increase in the rate of Input Tax Credit and / or due to inclusion of any other additional item of their inputs / input services under the ambit of the Input Tax Credit provisions under the GST Act, subsequent to the date of submission of the Price Bids, the same shall be passed on to Discom by Contractor and Contractor shall inform such changes to Discom from time to time.

10.14 Statutory Deduction:-

Statutory deduction will be made as per applicable rules & rates for TDS, Worker welfare cess, or any other taxes applicable time to time etc. All other statutory liabilities towards this contract will be on the part of Contractor.

D. Intellectual Property**11. Copy Right**

- 11.1 The copyright in all drawings, documents and other materials containing data and information furnished to the Employer by the Contractor herein shall remain vested in the Contractor or, if they are furnished to the Employer directly or through the Contractor by any third party, including supplies of materials, the copyright in such materials shall remain vested in such third party.

The Employer shall however be free to reproduce all drawings, documents and other material furnished to the Employer for the purpose of the Contract including, if required, for operation and maintenance.

The copyright in all drawings, documents and other materials containing data and information furnished to the Contractor by the Employer herein shall remain vested in the Employer.

12. Confidential Information

- 12.1 The Employer and the Contractor shall keep confidential and shall not, without the written consent of the other party hereto, divulge to any third party any documents, data or other information furnished directly or indirectly by the other party hereto in connection with the Contract, whether such information has been furnished prior to, during or following termination of the Contract.
- 12.2 The Employer shall not use such documents, data and other information received from the Contractor for any purpose other than the operation and maintenance of the Facilities. Similarly, the Contractor shall not use such documents, data and other information received from the Employer for any purpose other than the design, procurement of Plant and Equipment, construction or such other work and services as are required for the performance of the Contract.
- 12.3 The obligation of a party under GCC Sub-Clauses 12.1 and 12.2 above, however, shall not apply to that information which
- (a) now or hereafter enters the public domain through no fault of that party
 - (b) can be proven to have been possessed by that party at the time of disclosure and which was not previously obtained, directly or indirectly, from the other party hereto
 - (c) otherwise lawfully becomes available to that party from a third party that has no obligation of confidentiality.

- 12.4 The above provisions of this GCC Clause 12 shall not in any way modify any undertaking of confidentiality given by either of the parties hereto prior to the date of the Contract in respect of the Facilities or any part thereof.
- 12.5 The provisions of this GCC Clause 12 shall survive termination, for whatever reason, of the Contract.

E. Execution of the Facilities

13. Representatives

- 13.1 If the Project Manager is not named in the Contract, then within seven (7) days of the Effective Date, the Employer shall appoint and notify the Contractor in writing of the name of Project Manager. The Employer may from time to time appoint some other person as the project Manager in place of the person previously so appointed, and shall give a notice of the name of such other person to the Contractor without delay. The Employer shall take all reasonable care to see that no such appointment is made at such a time or in such a manner as to impede the progress of work on the Facilities. The Project Manager shall represent and act for the Employer at all times during the currency of the Contract. All notices, instructions, orders, certificates, approvals and all other communications under the Contract shall be given by the Project Manager, except as herein otherwise provided. All notices, instructions, information and other communications given by the Contractor to the Employer under the Contract shall be given to the Project Manager, except as herein otherwise provided.
- 13.2 Contractor's Representative & Construction Manager
- 13.2.1 If the Contractor's Representative is not named in the Contract, then within seven (7) days of the Effective Date, the Contractor shall appoint the Contractor's Representative and shall request the Employer in writing to approve the person so appointed. If the Employer makes no objection to the appointment within Three(3) days, the Contractor's Representative shall be deemed to have been approved. If the Employer objects to the appointment within three(3) days giving the reason therefor, then the Contractor shall appoint a replacement within seven (7) days of such objection, and the foregoing provisions of this GCC Sub-Clause 13.2.1 shall apply thereto.
- 13.2.2 The Contractor's Representative shall represent and act for the Contractor at all times during the currency of the Contract and shall give to the Project Manager all the Contractor's notices, instructions, information and all other communications under the Contract. All notices, instructions, information and all other communications given by the Employer or the Project Manager to the Contractor under the Contract shall be given to the Contractor's Representative or, in its absence, its deputy, except as herein otherwise provided. The Contractor shall not revoke the appointment of the Contractor's Representative without the Employer's prior written consent, which shall not be unreasonably withheld. If the Employer consents thereto, the Contractor shall appoint some other person as the Contractor's Representative, pursuant to the procedure set out in GCC Sub-Clause 13.2.1.
- 13.2.3 The Contractor's Representative may, subject to the approval of the Employer (which shall not be unreasonably withheld), at any time delegate to any person any of the powers, functions and authorities vested in him or her. Any such delegation may be revoked at any time. Any such delegation or revocation shall be subject to a prior notice signed by the Contractor's Representative, and shall specify the powers, functions and authorities thereby delegated or revoked. No such delegation or revocation shall take effect unless and until a copy thereof has been delivered to the Employer and the Project

Manager. Any act or exercise by any person of powers, functions and authorities so delegated to him or her in accordance with this GCC Sub-Clause 13.2.3 shall be deemed to be an act or exercise by the Contractor's Representative.

- 13.2.3.1 Notwithstanding anything stated in GCC Sub-Clause 13.1 and 13.2.1 above, for the purpose of execution of Contract, the Employer and the Contractor shall finalize and agree to a Contract Co-ordination Procedure and all the communication under the Contract shall be in accordance with such Contract Coordination Procedure.
- 13.2.4 From the commencement of installation of the Facilities at the Site until Operational Acceptance, the Contractor's Representative shall appoint a suitable person as the construction manager, (hereinafter referred to as "the Construction Manager"). The Construction Manager shall supervise all work done at the Site by the Contractor and shall be present at the Site through-out normal working hours except when on leave, sick or absent for reasons connected with the proper performance of the Contract. Whenever the Construction Manager is absent from the Site, a suitable person shall be appointed to act as his or her deputy.
- 13.2.5 The Employer may by notice to the Contractor object to any representative or person employed by the Contractor in the execution of the Contract who, in the reasonable opinion of the Employer, may behave inappropriately, may be incompetent or negligent, or may commit a serious breach of the Site regulations provided under GCC Sub-Clause 18.3. The Employer shall provide evidence of the same, whereupon the Contractor shall remove such person from the Facilities.
- 13.2.6 If any representative or person employed by the Contractor is removed in accordance with GCC Sub-Clause 13.2.5, the Contractor shall, where required, promptly appoint a replacement.
- 13.2.7 From the Operational Acceptance of the Facilities at the Site until O&M Completion, the Contractor's Representative shall appoint a suitable person as the O&M manager, (hereinafter referred to as "the O&M Manager"). The O&M Manager shall supervise all O&M work done at the Site by the Contractor and shall be present at the Site through-out normal working hours except when on leave, sick or absent for reasons connected with the proper performance of the Contract. Whenever the O&M Manager is absent from the Site, a suitable person shall be appointed to act as his or her deputy.

14. Work Program

14.1 Contractor's Organization

The Contractor shall supply to the Employer and the Project Manager a chart showing the proposed organization to be established by the Contractor for carrying out work on the Facilities. The chart shall include the identities of the key personnel together with the curricula vitae of such key personnel to be employed within seven (7) days of the Effective Date. The Contractor shall promptly inform the Employer and the Project Manager in writing of any revision or alteration of such an organization chart.

14.2 Joint Survey

- a) After issue of LOI, a detailed GPS based survey shall be required to be done by the Contractor along with Discom's Authorized Engineer to assess actual quantum of work and a single line diagram shall be prepared on AutoCAD with mentioning GPS coordinates on political map with fair correctness. **The contractor shall also submit the soft copy of the single line diagram so prepared.** The contractor shall have to execute the works in accordance with the quantities so assessed and

approved by the Discom. Further the contractor is also to carry out the detailed survey of individual work as per work order placed on them, to finalize route/ marking of the lines, pole spotting, Sub-stations, to finalize different configurations of RMUs & its associated equipment for various locations and other activities.

Contractor shall carry out the joint survey within **15 (fifteen) days** after award of contract (issue of LOI) and submit the inception report for approval of final BOQ in respect of supply & erection of material duly signed by contractor's representative & Discom officer. He shall also prepare, as applicable, the route of 11 KV, LT Lines, location of distribution transformer on the district/town/city/village map. The final route map, as applicable, of 11 KV & LT lines shall be prepared and submitted by the Contractor showing the proposed pole position, ground clearance, conductor sag and various crossings i.e. railway lines, communication lines, EHT lines, rivers, road and stream crossings on the map.

At the time of submission of joint survey report, necessary proposal for forest, railway, highway and river crossing be submitted within the commencement period, otherwise delay in submission shall be on the part of contractor. However, wherever such approvals are required from the concerned authorities the delay in receipt of approval from the date of submission of proposal by contractor through Engineer In-charge (To the statutory agency) shall not be on the part of contractor.

The road restoration charges, clearance charges for forest, railways, highway, river crossing etc. wherever applicable shall be reimbursed by the Discom on actual basis against the documentary proof of having deposited the same with the respective civic authority through the invoice submitted for road restoration charges actually paid to civic authority along with receipt. However, the contractor has to submit the estimate against road cut restoration charges issued by local civic agency to Nodal Officer of the Discom for pre- examination /verification for according prior approval and only after approval these charges are to be deposited by the contractor with the respective local civic authority which shall be reimbursed by the Discom on the production of documentary proof having deposited the charges on actual basis. The permission for any required road cut is also to be arranged by the bidder/Contractor from the concerned civic agency. All assistance for coordinating in this regard will be provided by the Discom.

For the extra items identified at the time of Joint Survey, the erection and supply charges shall be paid on the basis of prevailing Standard Issue Rates (SIR) for the material and CLRC rates for erection. However, no additional O&M charges shall be payable on these extra items.

b) Check Survey of Pole Locations

The check survey has to be conducted by the Contractor to locate and peg marks pole positions on ground confirming to the approved profile and pole schedule. The Changes, if required, after detailed survey in the preliminary pole schedule shall be carried out by the Contractor and he shall thereafter submit a final pole schedule for the approval of Employer (PM). The poles schedule shall show position of all Poles, type of Poles, span length, type of foundation for each pole and the deviation at all angles as set out with other details.

- i.) Details En-route: - All topographical permanent features, such as trees, telecommunication lines, buildings etc., 5.5 meter on either side of the alignment shall be detailed on the route plan.
- ii.) Clearance from ground building, trees etc.:- Clearance from ground buildings, trees and telephones lines shall be provided in conformity with the Electricity Act, 2003, as amended up to date. The bidder shall select the height of the poles such that all the electrical clearances are maintained.

- iii.) The minimum planting depth of poles shall be governed by IS: 1678, However, if due to the ground conditions e.g. water logged area etc. depth of planting of poles shall be suitably increased, with appropriate extension arrangement in order to maintain the required clearances the vendor will submit the details of the same on case to case basis.
- iv.) Appropriate Guarding arrangement shall be used for crossings of electric line / telecom line / road / drain / canal crossing and at all points as per statutory requirements. The Contractor shall provide provide/install anti-climbing device and danger plates on all poles and DT stations.

14.3 Program of Performance

Within seven (7) days after the date of Notification of Award, the Contractor shall prepare and submit to the Project Manager a detailed program of performance of the Contract (L2 Network) in the form of the Critical Path Method (CPM), the PERT network, or other internationally used programs and showing the sequence in which it proposes to design, manufacture, transport, assemble, install and pre-commissioning the Facilities and operation & maintenance, as well as the date by which the Contractor reasonably requires that the Employer shall have fulfilled its obligations under the Contract so as to enable the Contractor to execute the Contract in accordance with the program and to achieve Completion, Commissioning and Acceptance of the Facilities in accordance with the Contract. The program so submitted by the Contractor shall accord with the Time Schedule included in Appendix-4 (Time Schedule) to the Contract Agreement and any other dates and periods specified in the Contract. The Contractor shall update and revise the program as and when appropriate or when required by the Project Manager, but without modification in the Times for Completion under GCC Sub-Clause 4.2 and any extension granted in accordance with GCC Clause 34, and shall submit all such revisions to the Project Manager.

14.4 Progress Report

The Contractor shall monitor progress of all the activities specified in the program referred to in GCC Sub-Clause 14.2 above, and supply a progress report to the Project Manager every month and as & when required.

The progress report shall be in a form acceptable to the Project Manager and shall indicate: (a) percentage completion achieved compared with the planned percentage completion for each activity; and (b) where any activity is behind the program, giving comments and likely consequences and stating the corrective action being taken. The frequency of progress report can be daily/ weekly / monthly as may be desired by Project Manager/ Discom.

14.5 Progress of Performance

If at any time the Contractor's actual progress falls behind the program referred to in GCC Sub-Clause 14.2, or it becomes apparent that it will so fall behind, the Contractor shall, at the request of the Employer or Project Manager, prepare and submit to the Project Manager a revised program, taking into account the prevailing circumstances, and shall notify the Project Manager of the steps being taken to expedite progress so as to attain Completion of the Facilities within the Time for Completion under GCC Sub-Clause 4.2, any extension thereof entitled under GCC Sub-Clause 34.1, or any extended period as may otherwise be agreed upon between the Employer and the Contractor.

14.6 Work Procedures

The Contract shall be executed in accordance with the Contract Documents and the procedures given in the section Section N.

The Contractor may execute the Contract in accordance with its own standard project execution plans and procedures to the extent that they do not conflict with the provisions contained in the Contract.

14.7 It is emphasized to conduct monthly contract review meeting with senior most officers of Contractor at their headquarters or at project site. Employer shall decide venue of such monthly contract review meeting. In this meeting, three months rolling plan of mobilisation of materials and manpower shall be reviewed. Progress of works achieved on ground shall also be reviewed along with all pending issues related to availability of fronts, payments, contractual issues, if any, etc. Minutes of the meeting shall be issued by Employer within a week time. Performance of contractor shall be reviewed based on commitment and actual achievement on ground. Planning, commitment, review and evaluation of performance of contractor through this meeting shall be under overall agreed project execution plan (PERT Chart).

14.8 It is also emphasized to conduct monthly contract review meeting with working teams in presence of senior most officers of the Contractor at their headquarters or at project site. Employer shall decide venue of such review meeting. In this meeting, three months rolling plan of mobilisation of materials and manpower shall be reviewed. Progress of works achieved on ground shall also be reviewed along with all pending issues related to availability of fronts, payments, contractual issues, if any, etc.

~~14.9 Retrieval of material~~

15. Deleted

16. Design and Engineering

16.1 Specifications and Drawings

16.1.1 The Contractor shall execute the basic and detailed design and the engineering work in compliance with the provisions of the Contract, or where not so specified, in accordance with good engineering practice.

The Contractor shall be responsible for any discrepancies, errors or omissions in the specifications, drawings and other technical documents that it has prepared, whether such specifications, drawings and other documents have been approved by the Project Manager or not, provided that such discrepancies, errors or omissions are not because of inaccurate information furnished in writing to the Contractor by or on behalf of the Employer.

16.1.2 The Contractor shall be entitled to disclaim responsibility for any design, data, drawing, specification or other document, or any modification thereof provided or designated by or on behalf of the Employer, by giving a notice of such disclaimer to the Project Manager.

16.2 Codes and Standards

Wherever references are made in the Contract to codes and standards in accordance with which the Contract shall be executed, the edition or the revised version of such codes and standards current at the date seven (7) days prior to date of bid submission

shall apply unless otherwise specified. During Contract execution, any changes in such codes and standards shall be applied after approval by the Employer and shall be treated in accordance with GCC Clause 33.

16.3 Approval/Review of Technical Documents by Project Manager

- 16.3.1 The Contractor shall prepare and furnish to the Project Manager the documents listed in Appendix-7 (List of Documents for Approval or Review) to the Contract Agreement for its approval or review as specified and as in accordance with the requirements of GCC Sub-Clause 14.2 (Program of Performance).

Any part of the Facilities covered by or related to the documents to be approved by the Project Manager shall be executed only after the Project Manager's approval thereof.

GCC Sub-Clauses 16.3.2 through 16.3.7 shall apply to those documents requiring the Project Manager's approval, but not to those furnished to the Project Manager for its review only.

- 16.3.2 Within twenty one (21) days after receipt by the Project Manager of any document requiring the Project Manager's approval in accordance with GCC Sub-Clause 16.3.1, the Project Manager shall either return one copy thereof to the Contractor with its approval endorsed thereon or shall notify the Contractor in writing of its disapproval thereof and the reasons therefore and the modifications that the Project Manager proposes.

- 16.3.3 The Project Manager shall not disapprove any document, except on the grounds that the document does not comply with some specified provision of the Contract or that it is contrary to good engineering practice.

- 16.3.4 If the Project Manager disapproves the document, the Contractor shall modify the document and resubmit it for the Project Manager's approval in accordance with GCC Sub-Clause 16.3.2. If the Project Manager approves the document subject to modification(s), the Contractor shall make the required modification(s), and upon resubmission with the required modifications the document shall be deemed to have been approved.

The procedure for submission of the documents by the Contractor and their approval by the Project Manager shall be discussed and finalized with the Contractor.

- 16.3.5 If any dispute or difference occurs between the Employer and the Contractor in connection with or arising out of the disapproval by the Project Manager of any document and/or any modification(s) thereto that cannot be settled between the parties within a reasonable period, then for disposal of such dispute or difference, Contractor may appear before the Settlement Committee of various level of Ajmer Discom according to financial involvement of dispute, after deposition of non-refundable fee prevailing at that time as per norms.

Decision of the Settlement Committee shall be final and binding to both of them. However appeal may be done by discontented in next level committee, as per norms /rules prevailing at that time.

- 16.3.6 The Project Manager's approval, with or without modification of the document furnished by the Contractor, shall not relieve the Contractor of any responsibility or liability imposed upon it by any provisions of the Contract except to the extent that any subsequent failure results from modifications required by the Project Manager.

16.3.7 The Contractor shall not depart from any approved document unless the Contractor has first submitted to the Project Manager an amended document and obtained the Project Manager's approval thereof, pursuant to the provisions of this GCC Sub-Clause 16.3. If the Project Manager requests any change in any already approved document and/or in any document based thereon, the provisions of GCC Clause 33 shall apply to such request.

17. Plant and Equipment

17.1 Subject to GCC Sub-Clause 10.2, the Contractor shall manufacture or procure and transport all the Plant and Equipment in an expeditious and orderly manner to the Site.

17.2 Employer-Supplied Plant, Equipment, and Materials

If the corresponding Appendix – 6 (Scope of Works and Supply by the Employer) to the Contract Agreement provides that the Employer shall furnish any specific items of machinery, equipment or materials to the Contractor, the following provisions shall apply:

17.2.1 The Employer shall, at its own risk and expense, transport each item to the place on or near the Site as agreed upon by the parties and make such item available to the Contractor at the time specified in the program furnished by the Contractor, pursuant to GCC Sub-Clause 14.2, unless otherwise mutually agreed.

17.2.2 The equipment & materials to be furnished by the Employer shall be supplied to the Contractor at the depots established by the Contractor or the Employer. The Lorry Receipts for the materials will be handed over to the Contractor by the representative of the Employer as and when the same are received. The Contractor shall be responsible for taking delivery of these materials from the railways/road transporter, unloading them from the transporter, carting them to different stores built by him for the purpose, the unloading and cartage being at the cost of the Contractor. All wharf age and demurrage charges incurred due to delay in taking delivery will be to the Contractor's account, except those due to reasons beyond his control in which case the Contractor shall immediately intimate the Project Manager for settling the claims. The Contractor shall be responsible for proper handling and storage of these materials from the time of receipt upto the time of Final Taking Over of the Facilities by the Employer.

17.2.3 Yards and store provided by the Contractor for stacking and storage of materials shall be open for inspection by the Employer as and when required. The cost of handling and storage shall be to the Contractor's account.

17.2.4 Upon receipt of such item, the Contractor shall inspect the same visually and notify the Project Manager of any detected shortage, defect or default. For the material being arranged by the Employer and supplied to the Contractor for erection, are received short, broken or damaged, an entry shall be made in the delivery register of the railway authorities/road transporter as far as possible and a report of the same giving full details of shortage and damages along with a copy of report entered in the delivery register of the road transporter/railways shall be submitted by the Contractor to the Project Manager and Employer's consignee immediately. The Employer shall immediately remedy any shortage, defect or default, or the Contractor shall, if practicable and possible, at the request of the Employer, remedy such shortage, defect or default at the Employer's cost and expense. After inspection, such item shall fall under the care, custody and control of the Contractor. The provision of this GCC Sub-Clause 17.2.4 shall apply to any item supplied to remedy any such shortage or default or to substitute for any defective item, or shall apply to defective items that have been repaired.

- 17.2.5 The foregoing responsibilities of the Contractor and its obligations of care, custody and control shall not relieve the Employer of liability for any undetected shortage, defect or default, nor place the Contractor under any liability for any such shortage, defect or default whether under GCC Clause 22 or under any other provision of Contract.
- 17.3 Transportation
- 17.3.1 The Contractor shall at its own risk and expense transport all the Plant and Equipment and the Contractor's Equipment to the Site by the mode of transport that the Contractor judges most suitable under all the circumstances.
- 17.3.2 Unless otherwise provided in the Contract, the Contractor shall be entitled to select any safe mode of transport operated by any person to carry the Plant and Equipment and the Contractor's Equipment.
- 17.3.3 Upon dispatch of each shipment of the Plant and Equipment and the Contractor's Equipment, the Contractor shall notify the Employer by e-mail, telex, facsimile or Electronic Data Interchange (EDI) of the description of the Plant and Equipment and of the Contractor's Equipment, the point and means of dispatch, and the estimated time and point of arrival in the country where the Site is located, if applicable, and at the Site. The Contractor shall furnish the Employer with relevant shipping documents to be agreed upon between the parties.
- 17.3.4 The Contractor shall be responsible for obtaining, if necessary, approvals from the authorities for transportation of the Plant and Equipment and the Contractor's Equipment to the Site. The Employer shall use its best endeavours in a timely and expeditious manner to assist the Contractor in obtaining such approvals, if requested by the Contractor. The Contractor shall indemnify and hold harmless the Employer from and against any claim for damage to roads, bridges or any other traffic facilities that may be caused by the transport of the Plant and Equipment and the Contractor's Equipment to the Site.
- 17.4 Delivery and Documents
- 17.4.1 Delivery Documents
- Upon shipment, the Contractor shall notify the Employer with full details of the dispatch and shall furnish the documents as specified in the GCC Clause 8.
- 17.4.2 Packing
- 17.4.2.1 The Contractor shall provide such packing of the Goods as it is required to prevent their damage or deterioration during transit to their final destination as indicated in the Contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit and open storage. Packing case size and weights shall take into consideration, where appropriate, the remoteness of the Goods final destination and the absence of heavy handling facilities at all points in transit.
- 17.4.2.2 The packing, marking and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the Contract and, subject to any subsequent instruction ordered by the Employer consistent with the requirements of the Contract.
- 17.4.3 Materials Handling and Storage:

All the equipment furnished under the Contract and arriving at Site shall be promptly received, unloaded, transported and stored in the storage spaces by the Contractor.

Contractor shall be responsible for examining all the shipment and notify the Project Manager immediately of any damages, storage, discrepancy etc, for the purpose of Project Manager's information only. The Contractor shall submit to the Project Manager every week a report detailing all the receipts during the week. However, the Contractor shall be solely responsible for any shortages or damages in transit, handling and/ or in storage and erection of the equipment at Site. Any demurrage, wharf age and other such charges claimed by the transporters, railways etc, shall be to the account of the Contractor.

The Contractor shall maintain an accurate and exhaustive record detailing out the list of all equipment received by him for the purpose of erection and keep such record open for the inspection of the Project Manager.

All equipment shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings, etc. shall be used for unloading and/or handling of the equipment without the specific written permission of the Project Manager. The equipment stored shall be properly protected to prevent damage either to the equipment or to the floor where they are stored. The equipment from the store shall be moved to the actual location at the appropriate time so as to avoid damage of such equipment at Site.

All electrical panels, control gears, motors and such other devices shall be properly dried by heating before they are installed and energized. Motor bearings, slip ring, commutators and other exposed parts shall be protected against moisture ingress and corrosion during storage and periodically inspected.

All the electrical equipment such as transformers, cables, insulators, motors, generators, etc. shall be tested for insulation resistance at least once in three months from the date of receipt till the date of commissioning and a record of such measured insulation values maintained by the Contractor. Such records shall be opened for inspection by the Project Manager.

The Contractor shall ensure that all the packing materials and protection devices, used for various equipment during transit and storage, are removed before the equipment are installed.

The consumable and other supplies likely to deteriorate due to storage must be thoroughly protected and stored in a suitable manner to prevent damage or deterioration in quality by storage.

All the materials stored in the open or dusty location must be covered with suitable weatherproof and flame proof covering material wherever applicable.

If the materials belonging to the Contractor are stored in areas other than those earmarked for him, the Project Manager will have the right to get it moved to the area earmarked for the Contractor at the Contractor's cost.

The Contractor shall be responsible for making suitable indoor storage facilities to store all equipment, which require indoor storage. Normally all the electrical equipment such as motors, control gears, generators, exciters and consumables like electrodes, lubricants etc. shall be stored in the closed storage space. The Project Manager, in addition, may direct the Contractor to move certain other materials, which in his opinion

will require indoor storage, to indoor storage areas, which the Contractor shall strictly comply with.

18. Installation

18.1 Setting Out/Supervision/Labor

18.1.1 Bench Mark: The Contractor shall be responsible for the true and proper setting-out of the Facilities in relation to bench marks, reference marks and lines provided to it in writing by or on behalf of the Employer.

If, at any time during the progress of installation of the Facilities, any error shall appear in the position, level or alignment of the Facilities, the Contractor shall forthwith notify the Project Manager of such error and, at its own expense, immediately rectify such error to the reasonable satisfaction of the Project Manager. If such error is based on incorrect data provided in writing by or on behalf of the Employer, the expense of rectifying the same shall be borne by the Employer.

18.1.2 Contractor's Supervision: The Contractor shall give or provide all necessary superintendence during the installation of the Facilities, and the Construction Manager or its deputy shall be constantly on the Site to provide full-time superintendence of the installation. The Contractor shall provide and employ only technical personnel who are skilled and experienced in their respective callings and supervisory staff who are competent to adequately supervise the work at hand.

18.1.3 Labour:

(a) The Contractor shall provide and employ on the Site in the installation of the Facilities such skilled, semi-skilled and unskilled labor as is necessary for the proper and timely execution of the Contract. The Contractor is encouraged to use local labour that has the necessary skills.

(b) Unless otherwise provided in the Contract, the Contractor at its own expense shall be responsible for the recruitment, transportation, accommodation and catering of all labour, local or expatriate, required for the execution of the Contract and for all payments in connection therewith.

(c) The Contractor shall at all times during the progress of the Contract use its best endeavors to prevent any unlawful, riotous or disorderly conduct or behavior by or amongst its employees and the labor.

(d) The Contractor shall, in all dealings with its labor currently employed on or connected with the Contract, pay due regard to all recognized festivals, official holidays, religious or other customs and all local laws and regulations pertaining to the employment of labour.

18.2 Contractor's Equipment

18.2.1 All Contractor's Equipment brought by the Contractor onto the Site shall be deemed to be intended to be used exclusively for the execution of the Contract. The Contractor shall not remove the same from the Site without the Project Manager's consent that such Contractor's Equipment is no longer required for the execution of the Contract.

18.2.2 Unless otherwise specified in the Contract, upon completion of the Facilities, the Contractor shall remove from the Site all Equipment brought by the Contractor onto the Site and any surplus materials remaining thereon.

18.2.3 The Employer will, if requested, use its best endeavours to assist the Contractor in obtaining any local, state or national government permission required by the Contractor for the export of the Contractor's Equipment imported by the Contractor for use in the execution of the Contract that is no longer required for the execution of the Contract.

18.3 Site Regulations and Safety

The Employer and the Contractor shall establish Site regulations setting out the rules to be observed in the execution of the Contract at the Site and shall comply therewith. The Contractor shall prepare and submit to the Employer, with a copy to the Project Manager, proposed Site regulations for the Employer's approval, which approval shall not be unreasonably withheld.

Such Site regulations shall include, but shall not be limited to, rules in respect of security, safety of the Facilities, gate control, sanitation, medical care, and fire prevention.

18.3.1 Compliance with Labour Regulations

18.3.1.1 During continuance of the contract, the Contractor shall abide at all times by all applicable existing labour enactments and rules made thereunder, regulations notifications and byelaws of the State or Central Government or local authority and any other labour law (including rules), regulations bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. The employees of the Contractor in no case shall be treated as the employees of the Employer at any point of time. **It is to be clearly noted that this clause shall be equally applicable for the period of O&M of the Facilities.**

18.3.1.2 The Contractor shall keep the Project Manager indemnified in case any action is taken against the Contractor by the competent authority on account of contravention of any of the provisions of any Act or rules made thereunder, regulations or notifications including amendments.

18.3.1.3 If the Project Manager/Employer is caused to pay under any law as principal employer such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/ byelaws/Acts/ Rules/regulations including amendments, if any, on the part of the Contractor, the Project Manager shall have the right to deduct any money due to the Contractor under this contract or any other contract with the Project Manager/Employer including his amount of performance security for adjusting the aforesaid payment. The Project Manager shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Project Manager/Employer.

Notwithstanding the above, the Contractor shall furnish to the Project Manager the details/documents evidencing the Contractor's compliance to the laws applicable to establishments engaged in building and other construction works, as may be sought by the Project Manager. In particular the Contractor shall submit quarterly certificate regarding compliance in respect of provisions of Employees' Provident Fund and Misc. Provisions Act 1952 or latest to the Project Manager.

- 18.3.1.4 Salient features of some major laws applicable to establishments engaged in building and other construction works:
- (a) Workmen Compensation Act 1923 or latest: The Act provides for compensation in case of injury by accident arising out of and during the course of employment.
 - (b) Payment of Gratuity Act 1972 or latest: Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.
 - (c) Employee P.F. and Miscellaneous Provision Act 1952 or latest: The Act provides for monthly contribution by the Contractor plus his workers as per the latest prevalent applicable rate. The benefits under the Act are:
 - (i) Pension or family pension on retirement or death, as the case may be.
 - (ii) Deposit linked insurance on death in harness of the worker.
 - (iii) Payment of P.F. accumulation on retirement/death etc.
 - (d) Maternity Benefit Act 1951 or latest: The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.
 - (e) Contract Labour (Regulation & Abolition) Act 1970 or latest: The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by law. The Principal Employer is required to take Certification of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ 20 or more contract labour.
 - (f) Minimum Wages Act 1948 or latest: The Contractor is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provision of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employments.
 - (g) Payment of Wages Act 1936 or latest: It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.
 - (h) Equal Remuneration Act 1979 or latest: The Act provides for payment of equal wages for work of equal nature to Male and Female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.
 - (i) Payment of Bonus Act 1965 or latest: The Act is applicable to all establishments employing 20 or more employees. The Act provides for payments of annual bonus subject to a minimum and maximum % of wages to employees drawing certain amount per month or less. The bonus is to be paid to employees getting specified amount as per the latest prevalent applicable provisions of the The Act. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act. The above guidelines shall be liable to change with the change in act/notification by relevant statutory authority.

- (j) Industrial Dispute Act 1947 or latest: the Act lays down the machinery the procedure for resolution of Industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.
- (k) Industrial Employment (Standing Orders) Act 1946 or latest: It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer (i.e. Contractor) on matters provided in the Act and get the same certified by the designated Authority.
- (l) Trade Unions Act 1926 or latest: The Act lays down the procedure for registration of trade unions of workmen and contractors. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.
- (m) Child Labour (Prohibition & Regulation) Act 1986 or latest: The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of Child Labour is prohibited in Building and Construction Industry.
- (n) Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service Act 1979 or latest: The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home upto the establishment and back, etc.
- (o) The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 or latest and the Cess Act of 1996 or latest: All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay cess at the prevalent applicable rate of the cost of construction as may be modified by the Government. The Contractor of the establishment is required to provide safety measures at the electrical construction site, substations, building or construction work and other welfare measures, such as Canteens, First-Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Contractor to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the government.
- (p) Factories Act 1948 or latest: The Act lays down the procedure for approval at plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

18.3.2 Protection of Environment

The Contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others

resulting from pollution, noise or other causes arising as consequence of his methods of operation.

During continuance of the Contract, the Contractor shall abide at all times by all existing enactments on environmental protection and rules made thereunder, regulations, notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority.

Salient features of some of the major laws that are applicable are given below:

The Water (Prevention and Control of Pollution) Act, 1974 or latest, This provides for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water. 'Pollution' means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms.

The Air (Prevention and Control of Pollution) Act, 1981 or latest, This provides for prevention, control and abatement of air pollution. 'Air Pollution' means the presence in the atmosphere of any 'air pollutant', which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

The Environment (Protection) Act, 1986 or latest, This provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. 'Environment' includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.

The Public Liability Insurance Act, 1991 or latest, This provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under Environment (Protection) Act, 1986 or latest, and exceeding such quantity as may be specified by notification by the Central Government.

18.3.3 Safety Precautions

18.3.3.1 The Contractor shall observe all applicable regulations regarding safety on the Site.

Unless otherwise agreed, the Contractor shall, from the commencement of work on Site until Final Taking Over, 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 Employer / his representatives and occupiers of adjacent property, the public and others.

- 18.3.3.2 The Contractor shall ensure proper safety of all the workmen, materials, plant and equipment belonging to him or to Employer or to others, working at the Site. The Contractor shall also be responsible for provision of all safety notices and safety equipment required both by the relevant legislations and the Project Manager, as he may deem necessary.
- 18.3.3.3 The Contractor will notify well in advance to the Project Manager of his intention to bring to the Site any container filled with liquid or gaseous fuel or explosive or petroleum substance or such chemicals which may involve hazards. The Project Manager shall have the right to prescribe the conditions, under which such container is to be stored, handled and used during the performance of the works and the Contractor shall strictly adhere to and comply with such instructions. The Project Manager shall have the right at his sole discretion to inspect any such container or such construction plant/equipment for which material in the container is required to be used and if in his opinion, its use is not safe, he may forbid its use. No claim due to such prohibition shall be entertained by the Employer and the Employer shall not entertain any claim of the Contractor towards additional safety provisions/conditions to be provided for/constructed as per the Project Manager's instructions.

Further, any such decision of the Project Manager shall not, in any way, absolve the Contractor of his responsibilities and in case, use of such a container or entry thereof into the Site area is forbidden by the Project Manager, the Contractor shall use alternative methods with the approval of the Project Manager without any cost implication to the Employer or extension of work schedule.

- 18.3.3.4 Where it is necessary to provide and/or store petroleum products or petroleum mixtures and explosives, the Contractor shall be responsible for carrying-out such provision and/or storage in accordance with the rules and regulations laid down in Petroleum Act 1934 or latest, Explosives Act, 1948 or latest and Petroleum and Carbide of Calcium Manual published by the Chief Inspector of Explosives of India. All such storage shall have prior approval of the Project Manager. In case, any approvals are necessary from the Chief Inspector (Explosives) or any statutory authorities, the Contractor shall be responsible for obtaining the same.
- 18.3.3.5 All equipment used in construction and erection by Contractor shall meet Indian/International Standards and where such standards do not exist, the Contractor shall ensure these to be absolutely safe. All equipment shall be strictly operated and maintained by the Contractor in accordance with manufacturer's Operation Manual and safety instructions and as per Guidelines/rules of Employer in this regard.
- 18.3.3.6 Periodical examinations and all tests for all lifting/hoisting equipment & tackles shall be carried-out in accordance with the relevant provisions of Factories Act 1948 or latest or latest, Indian Electricity Act 2003 and associated Laws/Rules in force from time to time. A register of such examinations and tests shall be properly maintained by the Contractor and will be promptly produced as and when desired by the Project Manager or by the person authorised by him.
- 18.3.3.7 The Contractor shall be fully responsible for the safe storage of his radioactive sources in accordance with BARC/DAE Rules and other applicable provisions. All precautionary measures stipulated by BARC/DAE in connection with use, storage and handling of such material will be taken by the Contractor.
- 18.3.3.8 The Contractor shall provide suitable safety equipment of prescribed standard to all employees and workmen according to the need, as may be directed by the Project

Manager who will also have right to examine these safety equipment to determine their suitability, reliability, acceptability and adaptability.

- 18.3.3.9 Where explosives are to be used, the same shall be used under the direct control and supervision of an expert, experienced, qualified and competent person strictly in accordance with the Code of Practice/Rules framed under Indian Explosives Act pertaining to handling, storage and use of explosives.
- 18.3.3.10 The Contractor shall provide safe working conditions to all workmen and employees at the Site including safe means of access, railings, stairs, ladders, scaffoldings etc. The scaffoldings shall be erected under the control and supervision of an experienced and competent person. For erection, good and standard quality of material only shall be used by the Contractor.
- 18.3.3.11 The Contractor shall not interfere or disturb electric fuses, wiring and other electrical equipment belonging to the Employer or other Contractors under any circumstances, whatsoever, unless expressly permitted in writing by Employer to handle such fuses, wiring or electrical equipment
- 18.3.3.12 Before the Contractor connects any electrical appliances to any plug or socket belonging to the other Contractor or Employer, he shall:
- a. Satisfy the Project Manager that the appliance is in good working condition;
 - b. Inform the Project Manager of the maximum current rating, voltage and phases of the appliances;
 - c. Obtain permission of the Project Manager detailing the sockets to which the appliances may be connected.
- 18.3.3.13 The Project Manager will not grant permission to connect until he is satisfied that;
- a. The appliance is in good condition and is fitted with suitable plug;
 - b. The appliance is fitted with a suitable cable having two earth conductors, one of which shall be an earthed metal sheath surrounding the cores.
- 18.3.3.14 No electric cable in use by the Contractor/Employer will be disturbed without prior permission. No weight of any description will be imposed on any cable and no ladder or similar equipment will rest against or attached to it.
- 18.3.3.15 No repair work shall be carried out on any live equipment. The equipment must be declared safe by the Project Manager and a permit to work shall be issued by the Project Manager before any repair work is carried out by the Contractor. While working on electric lines/equipment, whether live or dead, suitable type and sufficient quantity of tools will have to be provided by the Contractor to electricians/workmen/officers.
- 18.3.3.16 The Contractors shall employ necessary number of qualified, full time electricians/electrical supervisors to maintain his temporary electrical installation.
- 18.3.3.17 The Contractor employing more than 250 workmen whether temporary, casual, probationer, regular or permanent or on contract, shall employ at least one full time officer exclusively as safety officer to supervise safety aspects of the equipment and workmen, who will coordinate with the Project Safety Officer.

The name and address of such Safety Officers of the Contractor will be promptly informed in writing to Project Manager with a copy to Safety Officer-In charge before he starts work or immediately after any change of the incumbent is made during currency of the Contract.

- 18.3.3.18 In case any accident occurs during the construction/ erection or other associated activities undertaken by the Contractor thereby causing any minor or major or fatal injury to his employees due to any reason, whatsoever, it shall be the responsibility of the Contractor to promptly inform the same to the Project Manager in prescribed form and also to all the authorities envisaged under the applicable laws.
- 18.3.3.19 The Project Manager shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and/or property, and/or equipment. In such cases, the Contractor shall be informed in writing about the nature of hazards and possible injury/accident and he shall comply to remove shortcomings promptly. The Contractor after stopping the specific work can, if felt necessary, appeal against the order of stoppage of work to the Project Manager within 3 days of such stoppage of work and decision of the Project Manager in this respect shall be conclusive and binding on the Contractor.
- 18.3.3.20 The Contractor shall not be entitled for any damages/compensation for stoppage of work due to safety reasons as provided in GCC Sub-Clause 18.3.3.19 above and the period of such stoppage of work will not be taken as an extension of time for completion of work and will not be the ground for waiver of levy of liquidated damages.
- 18.3.3.21 It is mandatory for the Contractor to observe during the execution of the works, requirements of Safety Rules which would generally include but not limited to following:

Safety Rules

- a) Each employee shall be provided with initial indoctrination regarding safety by the Contractor, so as to enable him to conduct his work in a safe manner.
- b) No employee shall be given a new assignment of work unfamiliar to him without proper introduction as to the hazards incident thereto, both to himself and his fellow employees.
- c) Under no circumstances shall an employee hurry or take unnecessary chance when working under hazardous conditions.
- d) Employees must not leave naked fires unattended. Smoking shall not be permitted around fire prone areas and adequate firefighting equipment shall be provided at crucial location.
- e) Employees under the influence of any intoxicating beverage, even to the slightest degree shall not be permitted to remain at work.
- f) There shall be a suitable arrangement at every work site for rendering prompt and sufficient first aid to the injured.
- g) The staircases and passageways shall be adequately lighted.
- h) The employees when working around moving machinery, must not be permitted to wear loose garments. Safety shoes are recommended when working in shops

or places where materials or tools are likely to fall. Only experienced workers shall be permitted to go behind guard rails or to clean around energized or moving equipment.

- i) The employees must use the standard protection equipment intended for each job. Each piece of equipment shall be inspected before and after it is used.
- j) Requirements of ventilation in underwater working to licensed and experienced divers, use of gum boots for working in slushy or in inundated conditions are essential requirements to be fulfilled.
- k) In case of rock excavation, blasting shall invariably be done through licensed blasters and other precautions during blasting and storage/transport of charge material shall be observed strictly.

18.3.3.22 The Contractor shall follow and comply with all Employer Safety Rules, relevant provisions of applicable laws pertaining to the safety of workmen, employees, plant and equipment as may be prescribed from time to time without any demur, protest or contest or reservations. In case of any discrepancy between statutory requirement and Employer Safety Rules referred above, the latter shall be binding on the Contractor unless the statutory provisions are more stringent.

18.3.3.23 If the Contractor fails in providing safe working environment as per Employer Safety Rules or continues the work even after being instructed to stop work by the Project Manager as provided in GCC Sub-Clause 18.3.3.19 above, the Contractor shall promptly pay to Employer, on demand by the Employer, compensation at the rate of Rs. 5,000/- per day of part thereof till the instructions are complied with and so certified by the Project Manager. However, in case of accident taking place causing injury to any individual, the provisions contained in GCC Sub-Clause 18.3.3.24 shall also apply in addition to compensation mentioned in this Clause.

18.3.3.24 If the Contractor does not take adequate safety precautions and/or fails to comply with the Safety Rules as prescribed by the Employer or under the applicable law for the safety of the equipment and plant or for the safety of personnel or the Contractor does not prevent hazardous conditions which cause injury to his own employees or employees of other Contractors or Employer's employees or any other person who are at Site or adjacent thereto, then the Contractor shall be responsible for payment of a sum as indicated below to be deposited with the Employer, which will be passed on by the Employer to such person or next to kith and kin of the deceased:

| | | |
|----|--|----------------------------|
| a. | Fatal injury or accident causing death | Rs. 10,00,000/- per person |
| b. | Major injuries or accident causing 25% or more permanent disablement | Rs. 100,000/- per person |

Permanent disablement shall have same meaning as indicated in Workmen's Compensation Act. The amount to be deposited with Employer and passed on to the person mentioned above shall be in addition to the compensation payable under the relevant provisions of the Workmen's Compensation Act and rules framed there under or any other applicable laws as applicable from time to time. In case the Contractor does not deposit the above mentioned amount with Employer, such amount shall be recovered by Employer from any monies due or becoming due to the Contractor under the contract or any other on-going contract.

- 18.3.3.25 If the Contractor observes all the Safety Rules and Codes, Statutory Laws and Rules during the currency of Contract awarded by the Employer and no accident occurs then Employer may consider the performance of the Contractor and award suitable 'ACCIDENT FREE SAFETY MERITORIOUS AWARD' as per scheme as may be announced separately from time to time.
- 18.3.3.26 The Contractor shall also submit 'Safety Plan' as per proforma specified in Section – N Format N7 of the Bidding Documents along with all the requisite documents mentioned therein and as per check-list contained therein to the Project Manager for its approval within 60 days of award of Contract.

Further, one of the conditions for release of first progressive payment / subsequent payment towards Services Contract shall be submission of 'Safety Plan' along with all requisite documents and approval of the same by the Project Manager.

18.4 Opportunities for Other Contractors

- 18.4.1 The Contractor shall, upon written request from the Employer or the Project Manager, give all reasonable opportunities for carrying out the work to any other contractors employed by the Employer on or near the Site.
- 18.4.2 If the Contractor, upon written request from the Employer or the Project Manager, makes available to other contractors any roads or ways the maintenance for which the Contractor is responsible, permits the use by such other contractors of the Contractor's Equipment, or provides any other service of whatsoever nature for such other contractors, the Employer shall fully compensate the Contractor for any loss or damage caused or occasioned by such other contractors in respect of any such use or service, and shall pay to the Contractor reasonable remuneration for the use of such equipment or the provision of such services.
- 18.4.3 The Contractor shall also so arrange to perform its work as to minimize, to the extent possible, interference with the work of other contractors. The Project Manager shall determine the resolution of any difference or conflict that may arise between the Contractor and other contractors and the workers of the Employer in regard to their work.
- 18.4.4 The Contractor shall notify the Project Manager promptly of any defects in the other contractors' work that come to its notice, and that could affect the Contractor's work. The Project Manager shall determine the corrective measures, if any, required to rectify the situation after inspection of the Facilities. Decisions made by the Project Manager shall be binding on the Contractor.

18.5 Emergency Work

If, by reason of an emergency arising in connection with and during the execution of the Contract, any protective or remedial work is necessary as a matter of urgency to prevent damage to the Facilities, the Contractor shall immediately carry out such work.

If the Contractor is unable or unwilling to do such work immediately, the Employer may do or cause such work to be done as the Employer may determine is necessary in order to prevent damage to the Facilities. In such event the Employer shall, as soon as practicable after the occurrence of any such emergency, notify the Contractor in writing of such emergency, the work done and the reasons therefor. If the work done or caused to be done by the Employer is work that the Contractor was liable to do at its own expense under the Contract, the reasonable costs incurred by the Employer in

connection therewith shall be paid by the Contractor to the Employer. In case such work is not in the scope of the Contractor, the cost of such remedial work shall be borne by the Employer.

18.6 Site Clearance

18.6.1 Site Clearance in Course of Performance: In the course of carrying out the Contract, the Contractor shall keep the Site reasonably free from all unnecessary obstruction, store or remove any surplus materials, clear away any wreckage, rubbish or temporary works from the Site, and remove any Contractor's Equipment no longer required for execution of the Contract.

18.6.2 Clearance of Site after Completion: After Completion of all parts of the Facilities, the Contractor shall clear away and remove all wreckage, rubbish and debris of any kind from the Site, and shall leave the Site and Facilities clean and safe.

18.7 Watching and Lighting

The Contractor shall provide and maintain at its own expense all lighting, fencing, and watching when and where necessary for the proper execution and the protection of the Facilities, or for the safety of the owners and occupiers of adjacent property and for the safety of the public.

18.8 Work at Night and on Holidays

18.8.1 Unless otherwise provided in the Contract, no work shall be carried out during the night and on public holidays of the country where the Site is located without prior written consent of the Employer, except where work is necessary or required to ensure safety of the Facilities or for the protection of life, or to prevent loss or damage to property, when the Contractor shall immediately advise the Project Manager, provided that provisions of this GCC Sub-Clause 18.8.1 shall not apply to any work which is customarily carried out by rotary or double-shifts.

18.8.2 Notwithstanding GCC Sub-Clauses 18.8.1 or 18.1.3, if and when the Contractor considers it necessary to carry out work at night or on public holidays so as to meet the Time for Completion and requests the Employer's consent thereto, the Employer shall not unreasonably withhold such consent.

19. Test and Inspection

19.1 The Contractor shall at its own expense carry out at the place of manufacture and/or on the Site all such tests and/or inspections of the Plant and Equipment and any part of the Facilities as are specified in the Contract.

19.2 The Employer and the Project Manager or their designated representatives shall be entitled to attend the aforesaid test and/or inspection, provided that the Employer shall bear all costs and expenses incurred in connection with such attendance including, but not limited to, all traveling and board and lodging expenses.

19.3 Whenever the Contractor is ready to carry out any such test and/or inspection, the Contractor shall give four weeks advance notice of such test and/or inspection and of the place and time thereof to the Project Manager. The Contractor shall obtain from any relevant third party or manufacturer any necessary permission or consent to enable the Employer and the Project Manager (or their designated representatives) to attend the test and/or inspection.

- 19.4 The Contractor shall provide the Project Manager with a certified report of the results of any such test and/or inspection.

If the Employer or Project Manager (or their designated representatives) fails to attend the test and/or inspection, or if it is agreed between the parties that such persons shall not do so, then the Contractor may proceed with the test and/or inspection in the absence of such persons, and may provide the Project Manager with a certified report of the results thereof.

- 19.5 The Project Manager may require the Contractor to carry out any test and/or inspection not required by the Contract, provided that the Contractor's reasonable costs and expenses incurred in the carrying out of such test and/or inspection shall be added to the Contract Price. Further, if such test and/or inspection impedes the progress of work on the Facilities and/or the Contractor's performance of its other obligations under the Contract, due allowance will be made in respect of the Time for Completion and the other obligations so affected.

- 19.6 If any Plant and Equipment or any part of the Facilities fails to pass any test and/or inspection, the Contractor shall either rectify or replace such Plant and Equipment or part of the Facilities and shall repeat the test and/or inspection upon giving a notice under GCC Sub-Clause 19.3.

- 19.7 If any dispute or difference of opinion shall arise between the parties in connection with or arising out of the test and/or inspection of the Plant and Equipment or part of the Facilities that cannot be settled between the parties within a reasonable period of time, it may be referred to the Settlement Committee for determination in accordance with GCC Sub-Clause 38.1.

- 19.8 The Contractor shall afford the Employer and the Project Manager, at the Employer's expense, access at any reasonable time to any place where the Plant and Equipment are being manufactured or the Facilities are being installed, in order to inspect the progress and the manner of manufacture or installation, provided that the Project Manager shall give the Contractor a reasonable prior notice.

- 19.9 The Contractor agrees that neither the execution of a test and/or inspection of Plant and Equipment or any part of the Facilities, nor the attendance by the Employer or the Project Manager, nor the issue of any test certificate pursuant to GCC Sub-Clause 19.4, shall release the Contractor from any other responsibilities under the Contract.

- 19.10 No part of the Facilities or foundations shall be covered up on the Site without the Contractor carrying out any test and/or inspection required under the Contract. The Contractor shall give a reasonable notice to the Project Manager whenever any such part of the Facilities or foundations are ready or about to be ready for test and/or inspection; such test and/or inspection and notice thereof shall be subject to the requirements of the Contract.

- 19.11 The Contractor shall uncover any part of the Facilities or foundations, or shall make openings in or through the same as the Project Manager may from time to time require at the Site, and shall reinstate and make good such part or parts.

If any parts of the Facilities or foundations have been covered up at the Site after compliance with the requirement of GCC Sub-Clause 19.10 and are found to be executed in accordance with the Contract, the expenses of uncovering, making openings in or through, reinstating, and making good the same shall be borne by the Employer, and the Time for Completion shall be reasonably adjusted to the extent that the Contractor

has thereby been delayed or impeded in the performance of any of its obligations under the Contract.

20. Construction Completion of the Facilities and Operational Acceptance

20.1 Construction Completion of the Facilities

20.1.1 Physical Completion

20.1.1.1 As soon as the Facilities or any part thereof has, in the opinion of the Contractor, been completed operationally and structurally and put in a tight and clean condition as specified in the Technical Specifications, excluding minor items not materially affecting the operation or safety of the Facilities, the Contractor shall so notify the Employer in writing.

20.1.2 Pre-Commissioning

20.1.2.1 Within seven (7) days after receipt of the notice from the Contractor under GCC Sub-Clause 20.1.1.1, the Project Manager shall deploy the operating and maintenance personnel and other material if so specified in the corresponding Appendix – 6 (Scope of Works and Supply by the Employer) to the Contract Agreement for Pre-commissioning of the Facilities or any part thereof.

20.1.2.2 As soon as reasonably practicable after the operation and maintenance personnel have been deployed by the Employer and other materials have been provided by the Employer in accordance with GCC Sub-Clause 20.1.2.1, the Contractor shall commence Pre-commissioning of the Facilities or the relevant part thereof, in presence of the Employer's representatives, as per procedures detailed in Technical Specifications in preparation for Commissioning.

20.1.2.3 As soon as all works in respect of Pre-commissioning are successfully completed and, in the opinion of the Contractor, the Facilities or any part thereof is ready for Commissioning, the Contractor shall notify the Project Manager in writing.

20.1.2.4 The Project Manager shall, within fourteen (14) days after receipt of the Contractor's notice under GCC Sub-Clause 20.1.2.3, notify the Contractor in writing of any defects and/or deficiencies.

20.1.2.5 If the Project Manager notifies the Contractor of any defects and/or deficiencies, the Contractor shall then correct such defects and/or deficiencies, and shall repeat the procedure described in GCC Sub-Clause 20.1.2.2. If in the opinion of the Contractor, the Facilities or any part thereof is now ready for Commissioning, the Contractor shall again notify the Project Manager in writing. If further defects and/or deficiencies are not notified by the Project Manager and if the Project Manager is satisfied that the Pre-commissioning of Facilities or that part thereof have been successfully completed, the Project Manager shall, within seven (7) days after receipt of the Contractor's such notice, advise the Contractor to proceed with the Commissioning of the Facilities or part thereof.

20.1.2.6 If the Project Manager fails to inform the Contractor of any defects and/or deficiencies within fourteen (14) days after receipt of the Contractor's notice under GCC Sub-Clause 20.1.2.4 or within seven (7) days after receipt of the Contractor's notice on completion of repeat procedure under GCC Sub-Clause 20.1.2.5, then the Pre-commissioning of the Facilities or that part thereof shall be considered to have been successfully completed as of the date of the Contractor's notice.

20.1.2.7 As soon as possible after Pre-commissioning, the Contractor shall complete all outstanding minor items so that the Facilities are fully in accordance with the requirements of the Contract, failing which the Employer will undertake such completion and deduct the costs thereof from any monies owing to the Contractor.

20.1.2.8 In the event that the Contractor is unable to proceed with the Pre-commissioning of the Facilities pursuant to Sub-Clause 20.1.2 for reasons attributable to the Employer either on account of non-availability of other facilities under the responsibilities of other contractor(s), or for reasons beyond the Employer's control, the following provisions shall apply:

When the Contractor is notified by the Project Manager that he will be unable to proceed with the activities and obligations pursuant to above GCC Sub-Clause 20.1.2.8, the Contractor shall be entitled to the following:

- a) the Time of Completion shall be extended for the period of suspension without imposition of liquidated damages pursuant to GCC Sub-Clause 21.2.
- b) payments due to the Contractor in accordance with the provisions specified in GCC Clause 8, which would have not been payable in normal circumstances due to non-completion of the said activities and obligations, shall be released to the Contractor against submission of a security in the form of a bank guarantee of equivalent amount acceptable to the Employer, and which shall become null and void when the Contractor will have complied with its obligations regarding these payments, subject to the provisions of GCC Sub-Clause 21.2.9 below.
- c) the expenses payable by the Contractor to the Bankers toward the extension of above security and extension of other securities under the Contract, of which validity need to be extended, shall be reimbursed to the Contractor by the Employer against documentary evidence.
- d) the additional charges toward the care of the Facilities pursuant to GCC Sub-Clause 28.1 shall be reimbursed to the Contractor by the Employer for the period between the notification mentioned above and the notification mentioned in GCC Sub-Clause 20.1.2.10 below. The provisions of GCC Sub-Clause 29.2 shall apply to the Facilities during the same period.

20.1.2.9 In the event that the period of suspension under GCC Sub-Clause 20.1.2.8 actually exceeds one hundred eighty (180) days, the Employer and the Contractor shall mutually agree to any additional compensation payable to the Contractor.

20.1.2.10 As and when, after the period of suspension under GCC Sub-Clause 20.1.2.8, the Contractor is notified by the Project Manager that the Facilities are ready for Pre-commissioning, the Contractor shall proceed without delay in performing all activities and obligations under the Contract.

20.1.3 Commissioning

20.1.3.1 Commissioning of the Facilities or any part thereof shall be commenced by the Contractor immediately after being advised by the Project Manager, pursuant to GCC Sub-Clause 20.1.2.5 or immediately after the Pre-commissioning is considered to be completed under GCC Sub-Clause 20.1.2.6.

20.1.3.1.1 Commissioning of the Facilities or any part thereof shall be completed by the Contractor as per procedures detailed in bid documents.

- 20.1.3.2 The Employer shall, to the extent specified in Appendix – 6 (Scope of works and supply by the Employer), deploy the operating and maintenance personnel and supply all raw materials, utilities, lubricants, chemicals, catalysts, facilities, services and other materials required for commissioning.
- 20.1.3.3 In the event that the Contractor is unable to proceed with the Commissioning of the Facilities pursuant to Sub-Clause 20.1.3 for reasons attributable to the Employer either on account of non-availability of other facilities under the responsibilities of other contractor(s), or for reasons beyond the Employer's control, the provisions of GCC Sub-Clause 20.1.2.8 to 20.1.2.9 shall apply.
- 20.1.3.4 As and when, after the period of suspension under GCC Sub-Clause 20.1.2.8, the Contractor is notified by the Project Manager that the Facilities are ready for Commissioning, the Contractor shall proceed without delay in performing all activities and obligations under the Contract.
- 20.1.4 Trial - Operation
- 20.1.4.1 Trial – Operation of the Facilities or any part thereof shall be commenced by the Contractor immediately after the Commissioning is completed pursuant to GCC Sub-Clause 20.1.3.1.1.
- 20.1.4.2 Trial – Operation of the Facilities or any part thereof shall be completed by the Contractor for the period specified in Technical Specification (or for a continuous period of 24 hours where such period is not specified in Technical Specification) and as per procedures detailed in Technical Specifications.
- 20.1.4.3 At any time after the events set out in GCC Sub-Clause 20.1.4.2 have occurred, the Contractor may give a notice to the Project Manager requesting the issue of an Interim-Taking Over Certificate in the form provided in the Bidding Documents or in another form acceptable to the Employer in respect of the Facilities or the part thereof specified in such notice as of the date of such notice.
- 20.1.4.4 The Project Manager shall within twenty-one (21) days after receipt of the Contractor's notice, issue a Interim-Taking Over Certificate.
- 20.1.5 Interim-Taking Over
- 20.1.5.1 Upon successful Trial – Operation of the Facilities or any part thereof, pursuant to GCC Sub-Clause 20.1.4, the Project Manager shall issue to the Contractor a Interim Taking Over Certificate as a proof of the acceptance of the Facilities of respective GSS or any part thereof. Such certificate shall not relieve the Contractor of any of his obligations which otherwise survive, by the terms and conditions of Contract after issue of such certificate.
- 20.1.5.2 If within twenty one (21) days after receipt of the Contractor's notice, the Project Manager fails to issue the Interim - Taking Over Certificate or fails to inform the Contractor in writing of the justifiable reasons why the Project Manager has not issued the Interim - Taking Over Certificate, the Facilities or the relevant part thereof shall be deemed to have been Taken Over as at the date of the Contractor's said notice.
- 20.1.5.3 Upon Interim - Taking Over of the Facilities or any part thereof, the Employer shall be responsible for the care and custody of the Facilities or the relevant part thereof, together

with the risk of loss or damage thereto, and shall thereafter take over the Facilities or the relevant part thereof.

20.2 Operational Acceptance

20.2.1 Guarantee Test

20.2.1.1 The Guarantee Test (and repeats thereof), if any specified in the SCC and/or the Technical Specification, shall be conducted by the Contractor after successful Trial – Operation of the Facilities or the relevant part thereof to ascertain whether the Facilities or the relevant part can attain the Functional Guarantees specified in the Contract Documents or if otherwise required as per the Technical Specifications. The Contractor's and Project Manager's advisory personnel may witness the Guarantee Test. The Contractor shall promptly provide the Employer with such information as the Employer may reasonably require in relation to the conduct and results of the Guarantee Test (and any repeats thereof).

20.2.1.2 If for reasons not attributable to the Contractor, the Guarantee Test of the Facilities or the relevant part thereof cannot be successfully completed within the time stipulated in the Technical Specifications the period for completing the same shall be as agreed upon by the Employer and the Contractor.

20.2.2 Operational Acceptance

20.2.2.1 Operational Acceptance of respective GSS and associated infra shall occur in respect of the Facilities or any part thereof as mentioned below:

(I) In case no Functional Guarantees are applicable, Operational Acceptance shall occur when the Facilities or part thereof have been successfully Commissioned and Trial – Operation for the specified period have been successfully completed

(II) In case Functional Guarantees are applicable, Operational Acceptance shall occur when the Functional Guarantees are met or the Contractor has paid liquidated damages specified in GCC Sub-Clause 23.3 hereof; or

20.2.2.2 At any time after any of the events set out in GCC Sub-Clause 20.2.2.1 have occurred, the Contractor may give a notice to the Project Manager requesting the issue of an Operational Acceptance Certificate in the form provided in the Bidding Documents or in another form acceptable to the Employer in respect of the Facilities or the part thereof specified in such notice as of the date of such notice.

20.2.2.3 The Project Manager shall within seven (7) days after receipt of the Contractor's notice, issue an Operational Acceptance Certificate of concerned GSS.

20.2.2.4 Upon Operational Acceptance, pursuant to GCC Sub-Clause 20.2.2.2, the Project Manager shall issue to the Contractor an Operational Acceptance Certificate as a proof of the final acceptance of the Plant and Equipment. Such certificate shall not relieve the Contractor of any of his obligations which otherwise survive, by the terms and conditions of Contract after issue of such certificate.

20.2.2.5 If within fourteen (14) days after receipt of the Contractor's notice, the Project Manager fails to issue the Operational Acceptance Certificate or fails to inform the Contractor in writing of the justifiable reasons why the Project Manager has not issued the Operational Acceptance Certificate, the Facilities or the relevant part thereof shall be deemed to have been accepted as at the date of the Contractor's said notice.

20.3 Partial Acceptance

- 20.3.1 If the Contract specifies that Commissioning shall be carried out in respect of parts of the Facilities, the provisions relating to Commissioning including the Trial – Operation and Guarantee Test shall apply to each such part of the Facilities individually, and the Operational Acceptance Certificate shall be issued accordingly for each such part of the Facilities.

20A. Quantity Variation

The quantity of all equipment/materials given in the Price Schedule of the bidding documents are provisional. Further, This quantity may further increase as per increase in Nos. of GSS upto 50% and decreased as required by Discom. This shall be based on the joint survey with Discom Officers during commencement period and submitted with inception report or as may be required by Discoms.

20B. Electrical Inspector inspection:

After Construction Completion of the work permission from State Electrical Inspectorate is required. Necessary fee etc. shall be paid by the Employer. However if Contractor pays such fee it shall be reimbursed on actual basis on documentary evidence.

Defects / in-complete works notified by Electrical Inspectorate shall be completed by the agency at no extra cost implication to Employer.

F. Guarantees and Liabilities

21. Completion Time Guarantee

- 21.1 The Contractor guarantees that it shall attain Construction Completion of the Facilities (or a part for which a separate time for completion is specified in the **GCC Clause 1.1 (ee)**) within the Time for Completion specified in the **GCC Clause 1.1 (ee)** pursuant to GCC Sub-Clause 4.2, or within such extended time to which the Contractor shall be entitled under GCC Clause 34 hereof.

- 21.2 If the Contractor fails to achieve Construction Completion in compliance with the Time for Completion in accordance with Clause GCC 21 for the whole of the facilities with regard to GSS and Associated Infrastructure, (or a part for which a separate time for completion is agreed) then the Contractor shall pay to the Employer a sum equivalent to a **quarter of a percent (0.25%) of the Contract Price** for the whole of the facilities, (or a part for which a separate time for completion is agreed) as liquidated damages for such default and not as a penalty, without prejudice to the Employer's other remedies under the Contract, for each week or part thereof which shall elapse between the relevant Time for Completion and the date stated in Interim-Taking Over Certificate of the whole of the Works (or a part for which a separate time for completion is agreed) subject to the limit of **ten percent (10%)** of Contract Price for the whole of the facilities, (or a part for which a separate time for completion is agreed).

However, if the Contractor completes the work for whole of the facilities and achieve Construction Completion within the contracted time period, the Employer may then refund back the LD which was deducted on account of delay in completion of a part of a work for which a separate time for completion is agreed.

The Employer may, without prejudice to any other method of recovery, deduct the amount of such damages from any monies due or to become due to the Contractor. The

payment or deduction of such damages shall not relieve the Contractor from his obligation to complete the Works, or from any other of his obligations and liabilities under the Contract.

21.3 No bonus will be given for earlier Completion of the Facilities or part thereof.

21A. **Pre-dispatch Inspection:**

- i. Pre-dispatch inspection shall be performed on various 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 Employer, PMA/TPIA and/or REC/MoP or any appointed agency.
- ii. 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 Employer in performance of dispatch instruction shall be recovered from Contractor.
- iii. The 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 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 Discom projects.
- iv. It is clarified that the Samples from the material received in stores shall be selected by the Nodal/Nominated officer within a period of 3 days and the same shall be tested within a weeks' time in the CTL thereafter.
- v. In case of re-inspection of the material on account of failure of CTL testing, the re-inspection charges of Rs 7,500 from the local supplier and Rs 15,000 from the outside supplier would be recovered at every occasion.
- vi. **Packing:-** The material/equipment shall be offered duly packed so as to enable the inspecting Officer to seal the inspected / cleared material for identification. The supplier / contractor shall provide such packing of the goods as is required to prevent their damages or deterioration during transit to their final destination as indicated in the contract. The packing shall be sufficient to withstand without limitation rough handling during transit to their final destination as indicated in the contract. The packing shall be sufficient to withstand without limitation rough handling during transit and exposure to extreme temperature, salt and precipitation during transport and open storage. Packing case size and weights shall be taken into consideration where appropriate keeping in view, remoteness of the good's final destination and absence of heavy mechanized handling facilities at all points in transit as well as at the destination. The packing, marking and documentation within and outside the packages shall comply strictly with

such special requirements as shall be expressly provided for in the contract or in any subsequent instructions imparted by the Discom.

- vii. When the tests have been satisfactorily completed at the Contractor's works the Engineer shall issue a certificate to that effect but if the tests were not witnessed by the Engineer or his representative, the certificate would be issued after the receipt of test certificate by the Engineer, No equipment shall be shipped / dispatched before such a certificate has been issued.
- viii. Unless the inspection is specifically waived, no material shall be dispatched without inspection and clearance for dispatch by the Discom's representative.
- ix. The Discom reserves the right to reject all or any part of the material being manufactured or awaiting dispatch, due to any defect or deviations from the standard specifications prescribed, as observed during the inspection. In case of any dispute / difference in this regard the decision of the Superintending Engineer (TW) shall be final and binding.
- x. The Discom also reserves the right to get the material / equipment tested in any recognized Government Laboratory & claiming any compensation or rejecting the material/ equipment, if not found in accordance with the specification. All charges whatsoever consequent to such rejection and replacement / rectification shall be borne by the contractor.

21B. TYPE TEST CERTIFICATES:-

- i. Original/attested photocopies of the latest Type test certificate(s) not older than three years from any recognized Government Laboratory, for all type tests wherever prescribed in the relevant latest edition of ISS (as applicable) as mentioned in technical specification shall be furnished by the successful bidder of the placement of award only. However the bidder shall have to furnish declaration to this effect that in the event of order they shall submit type test reports with the proposal for approval of sub-vendors. However, the Discom reserves the right to get type tests conducted afresh by the contractor.
- ii. In case of any specific alternative requirement of type tests, the same shall be furnished as per Technical specification.
- iii. The contractor shall be required to furnish the routine/manufacturer(s) factory test certificate(s) for the tests carried out during manufacture in accordance with the relevant standard specifications.

21C. Random checking of material at site:

- i. In addition of material testing in CTL and after issuing the material from ACOS for further use at site. The Discom or his representative may take random sample of material from site in presence of contractor representative available at site and to get it tested in CTL, failure of material in testing shall lead to rejection of balance material with contractor and same should not be allowed for further used and have to be replaced by fresh material after successful testing in CTL.

21D. Random checking of workmanship of work going on:-

The Discom or his representative shall on giving seven days' notice in writing to the agency setting out any grounds of objections which he may have in respect of the work, be at liberty to reject all or any part of the remaining work and all or any workmanship connected with such work which in his opinion are not in accordance with the contract or are in his opinion

defective with reasons. In case of any dispute / difference in this regard the decision of the concerned Engineer In Charge i.e. Circle Superintending Engineer & Superintending Engineer (TW), AVVNL shall be final and binding.

22. Defect Liability/Performance Period

22.1 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 and Equipment supplied and of the work executed.

22.1.1 Volume of concreting: If it was observed by Discom, quality monitoring agencies and/or REC/ MoP that volume and quality of concreting used in foundation of support, equipment foundation, gantry structure foundation, stay set, etc. are not as per requirement specified in the scope of work/ technical specifications, the contractor has to dismantle the supports, foundation and redo the concreting of all the supports in that particular section of line/redo all the foundations in that particular substation at his own cost. To ensure this, the employer reserves the right to withhold the payment of contractor for such defective works till such time the contractor conforms to scope of works, technical specification and tender drawings.

22.1.2 Galvanization of metallic structure: All Metallic structures & fabricated items excluding metallic supports (Steel tubular poles/H-Beam) must be galvanized. In case any metallic item found rusted during execution of works, the contractor has to replace the item used at all places. To ensure this, the employer reserves the right to withhold the payment of contractor for such works till such time the contractor conforms to scope of works, technical specification and tender drawings.

22.1.3 Painting of metallic supports (Steel tubular poles/H-Beam): Painting of metallic supports in overhead lines, distribution transformer substation and Power substation shall be ensured as per specifications. In case metallic supports found rusted during execution of works, the contractor has to remove inferior painting, clean the surface and re-paint it as per given specifications. To ensure this, the employer reserves the right to withhold the payment of contractor for such works till such time the contractor conforms to scope of works, technical specification and tender drawings.

22.2 **The Defect Liability Period/Performance** Period shall be **10 years for a particular period** from the date of Interim-Taking Over of the project completed in all respect. (i.e. through complete O&M period of 10 years from the Construction Completion.

If during the Defect Liability Period any defect should be found in the design, engineering, materials and workmanship of the Plant and Equipment supplied or of the work executed by the Contractor, the Contractor shall promptly, in consultation and agreement with the Employer regarding appropriate remedying of the defects, and at its cost, repair, replace or otherwise make good (as the Contractor shall, at its discretion, determine) such defect as well as any damage to the Facilities caused by such defect. The Contractor shall not be responsible for the repair, replacement or making good of any defects 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 Employer

(b) operation of the Facilities outside specifications provided in the Contract

(c) Normal wear and tear.

22.3 The Contractor's obligations under this GCC Clause 22 shall not apply to

(a) Any materials that are supplied by the Employer under GCC Sub-Clause 17.2, 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 Employer or any matters for which the Contractor has disclaimed responsibility herein

(c) Any other materials supplied or any other work executed by or on behalf of the Employer, except for the work executed by the Employer under GCC Sub-Clause 22.7.

22.4 The Employer 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 Employer/Owner shall afford all reasonable opportunity for the Contractor to inspect any such defect.

22.5 The Employer shall afford the Contractor all necessary access to the Facilities and the Site to enable the Contractor to perform its obligations under this GCC Clause 22. The Contractor may, with the consent of the Employer, remove from the Site any Plant and Equipment 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.

22.6 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 Employer 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.

22.7 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 Employer may, following notice to the Contractor, proceed to do such work, and the reasonable costs incurred by the Employer in connection therewith shall be paid to the Employer by the Contractor or may be deducted by the Employer from any monies due the Contractor or claimed under the Performance Security.

22.8 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 Employer because of any of the aforesaid reasons.

Upon correction of the defects in the Facilities or any part thereof by repair/replacement, such repair/replacement shall have the Defect Liability Period extended by a period mentioned in GCC Sub-Clause 22.2 from the time of such replacement/repair of the facilities or any part thereof.

- 22.8.1 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 of ten (10) years from the end of Defect Liability Period. 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 GCC Clause 22, but later.
- 22.9 Except as provided in GCC Clauses 22 and 29, 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 and Equipment, design or engineering or work executed that appear after Defect Liability Period except for the liability towards obligations that may survive in terms of the Contract after Defect Liability Period, except where such defects are the result of the gross negligence, fraud, criminal or willful action of the Contractor.

23. Deleted ~~Functional Guarantees~~

- 23.1 Deleted
 23.2 Deleted
 23.3 Deleted
 (a) Deleted
 (b) Deleted
 23.4 Deleted

24. Equipment Performance Guarantees

- 24.1 The Contractor guarantees that the 12/10/8/6.3/5/3.15/1.6 MVA, 33/11kV or 66/11 KV, 3-Phase Power Transformer, 100 KVA, 11/0.433kV, 3-phase Station Transformer and 1000/630/500/315/200/100/63/25/16 KVA 3-phase and 16/10 KVA, 11/0.250kV, 1-phase Distribution Transformers, shall attain the rating and performance requirements specified in Appendix – 8 (Guarantees, Liquidated Damages for Non – Performance) to the Contract Agreement, subject to and upon the conditions therein specified.
- 24.2 If the guarantees specified in Appendix – 8 (Guarantees, Liquidated Damages for Non – Performance) to the Contract Agreement are not established, then the Employer shall reject the equipment.
- 24.3 In case the Employer rejects the equipment, the Contractor shall at its cost and expense make such changes, modifications and/or additions to the equipment or any part thereof as may be necessary to meet the specified guarantees. The Contractor shall notify the Employer upon completion of the necessary changes, modifications and/or additions, and shall request the Employer to repeat the Test until the level of the specified guarantee has been met.
- 24.4 Whenever the Employer exercises its option to accept the equipment after levy of liquidated damages, the payment of liquidated damages under GCC Sub-Clause 24.2, upto the limitation of liability specified below, shall completely satisfy the Contractor's guarantees under GCC Sub-Clause 24.2, and the Contractor shall have no further liability whatsoever to the Employer in respect thereof.

25. Patent Indemnity

- 25.1 The Contractor shall, subject to the Employer's compliance with GCC Sub-Clause 25.2, indemnify and hold harmless the Employer and its employees and officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses,

damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, which the Employer may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Contract by reason of: (a) the installation of the Facilities by the Contractor or the use of the Facilities in the country where the Site is located; and (b) the sale of the products produced by the Facilities in any country.

Such indemnity shall not cover any use of the Facilities or any part thereof other than for the purpose indicated by or to be reasonably inferred from the Contract, any infringement resulting from the use of the Facilities or any part thereof, or any products produced thereby in association or combination with any other equipment, plant or materials not supplied by the Contractor, pursuant to the Contract Agreement.

- 25.2 If any proceedings are brought or any claim is made against the Employer arising out of the matters referred to in GCC Sub-Clause 25.1, the Employer shall promptly give the Contractor a notice thereof, and the Contractor may at its own expense and in the Employer's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim. If the Contractor fails to notify the Employer within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Employer shall be free to conduct the same on its own behalf. Unless the Contractor has so failed to notify the Employer within the twenty-eight (28) day period, the Employer shall make no admission that may be prejudicial to the defense of any such proceedings or claim.

The Employer shall, at the Contractor's request, afford all available assistance to the Contractor in conducting such proceedings or claim, and shall be reimbursed by the Contractor for all reasonable expenses incurred in so doing.

- 25.3 The Employer shall indemnify and hold harmless the Contractor and its employees, officers and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, which the Contractor may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Contract arising out of or in connection with any design, data, drawing, specification, or other documents or materials provided or designed by or on behalf of the Employer.

26. Limitation of Liability

- 26.1 Except in cases of gross negligence or willful misconduct,
- (a) the Contractor and the Employer shall not be liable to the other party for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the Contractor to pay liquidated damages to the Employer and
 - (b) the aggregate liability of the Contractor to the Employer, whether under the Contract, in tort or otherwise, shall not exceed the total Contract Price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment, or to any obligation of the Contractor to indemnify the Employer with respect to patent infringement.

- 26.2 All payments to sub-vendor shall be made by contractor. Contractor shall indemnify Employer from any legal issues related to delay in payment or not making any payment to sub-vendor.

g. Risk Distribution

27. Transfer of Ownership

- 27.1 Imported finished items are not covered under the contract. Only indigenous finished items are covered under the contract.
- 27.2 Ownership of the Plant and Equipment (including spare parts) procured in India, shall be transferred to the Employer upon loading on to the mode of transport to be used to carry the Plant and Equipment from the works to the site and upon endorsement of the dispatch documents in favour of the Employer.
- 27.3 Ownership of the Contractor's Equipment used by the Contractor in connection with the Contract shall remain with the Contractor.
- 27.4 Ownership of any Plant and Equipment in excess of the requirements for the Facilities shall revert to the Contractor upon Completion of the Facilities or at such earlier time when the Employer and the Contractor agree that the Plant and Equipment in question are no longer required for the Facilities provided quantity of any Plant and Equipment specifically stipulated in the Contract shall be the property of the Employer whether or not incorporated in the Facilities.
- 27.5 Notwithstanding the transfer of ownership of the Plant and Equipment, the responsibility for care and custody thereof together with the risk of loss or damage thereto shall remain with the Contractor pursuant to GCC Clause 28 (Care of Facilities) hereof until Completion of the Facilities and Final Taking Over pursuant to GCC Clause 20 or the part thereof, if any, as per GCC Sub-Clause 1.1(e) in which such Plant and Equipment are incorporated.

28. Care of Facilities

- 28.1 The Contractor shall be responsible for the care and custody of the Facilities or any part thereof until the date of Final Taking Over Certificate pursuant to GCC Clause 20 or, where the Contract provides for Construction Completion of the Facilities in parts, until the date of Construction Completion of the relevant part, and shall make good at its own cost any loss or damage that may occur to the Facilities or the relevant part thereof from any cause whatsoever during such period. The Contractor shall also be responsible for any loss or damage to the Facilities caused by the Contractor in the course of any work carried out, pursuant to GCC Clause 22. Notwithstanding the foregoing, the Contractor shall not be liable for any loss or damage to the Facilities or that part thereof caused by any use or occupation by the Employer or any third party authorized by the Employer of any part of the Facilities.

29. Loss of or Damage to Property; Accident or Injury to Workers; Indemnification

- 29.1 The Contractor shall indemnify and hold harmless the Employer and its employees and officers from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs, and expenses of whatsoever nature, including attorney's fees and expenses, in respect of the death or injury of any person or loss of or damage to any property (other than the Facilities whether accepted or not), arising in connection with the supply and installation of the Facilities and by reason of the negligence of the Contractor, or their employees, officers or agents, except any injury, death or property damage caused by the negligence of the Employer, its contractors, employees, officers or agents.

- 29.2 If any proceedings are brought or any claim is made against the Employer that might subject the Contractor to liability under GCC Sub-Clause 29.1, the Employer shall promptly give the Contractor a notice thereof and the Contractor may at its own expense and in the Employer's name conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim.

If the Contractor fails to notify the Employer within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the Employer shall be free to conduct the same on its own behalf. Unless the Contractor has so failed to notify the Employer within the twenty-eight (28) day period, the Employer shall make no admission that may be prejudicial to the defense of any such proceedings or claim.

The Employer shall, at the Contractor's request, afford all available assistance to the Contractor in conducting such proceedings or claim, and shall be reimbursed by the Contractor for all reasonable expenses incurred in so doing.

- 29.3 Notwithstanding anything in this Contract to the contrary, it is agreed that neither the Contractor nor the Employer shall be liable to the other party for loss of production, loss of profit, loss of use or any other indirect or consequential damages.

30. Insurance

- 30.1 To the extent specified in the corresponding Appendix-3 (Insurance Requirements) to the Contract Agreement, 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 in the said Appendix. The identity of the insurers and the form of the policies shall be subject to the approval of the Employer, who should not unreasonably withhold such approval.

(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,

(I)(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 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 Employer 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 Employer and the Contractor. The policy shall indicate the Employer 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 Employer as jointly Insured in the endorsements to the open policy.
- (b) Erection and Operation & Maintenance 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 Employer and the Contractor. All these policies shall indicate Employer as the beneficiary. The policy shall be kept valid till the date of Operation & Maintenance Completion of the respective GSS and Associated Infrastructure and the period of the coverage shall be determined with the approval of the Employer.
- 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 Employer. In case no refund is payable by the insurance company then the certificate to that effect shall be submitted to Employer 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 100 crores, cover for offsite storage/fabrication (over 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 Employer's personnel) and loss of or damage to property (including the Employer's property and any parts of the Facilities which have been accepted by the Employer) occurring in connection with supply and installation of the Facilities.

- (V) As per para 30.8 below, the cost of insurance premium is to be reimbursed to the Contractor for Employer 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 Employer and Employer 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 Employer 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 (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 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 for the project are adequately covered under the policy.
- (II) The policy may either be project specific covering all men of the Contractor. The policy shall be kept valid till the date of Final Taking Over of the project.

Alternatively, if the Contractor has an existing 'Workmen Compensation Policy' for all its employees, the Contractor must include the interest of the Employer 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.

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

The Employer (including without limitation any consultant, servant, agent or employee of the Employer) 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.

- 30.2 The Employer shall be named as co-insured under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 30.1, except for the Third Party Liability, Workmen Compensation Policy Insurances, pursuant to GCC Sub-Clause 30.1 except for the Cargo Insurance during Transport, Workmen Compensation Policy Insurances. All insurer's rights of subrogation against such co-insured's for losses or claims arising out of the performance of the Contract shall be waived under such policies.
- 30.3 The Contractor shall, in accordance with the provisions of the corresponding Appendix – 3 (Insurance Requirements) to the Contract Agreement, deliver to the Employer 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 Employer by insurers prior to cancellation or material modification of a policy.
- 30.4 Deleted
- 30.5 The Employer shall at its expense take out and maintain in effect during the performance of the Contract those insurances specified in the corresponding Appendix – 3 (Insurance Requirements) to the Contract Agreement, in the sums and with the deductibles and other conditions specified in the said Appendix. The Contractor shall be named as co-insureds under all such policies. All insurers' 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. The Employer shall deliver to the Contractor satisfactory evidence that the required insurances are in full force and effect. The policies shall provide that not less than twenty-one (21) days' notice shall be given to the Contractor by all insurers prior to any cancellation or material modification of the policies. If so requested by the Contractor, the Employer shall provide copies of the policies taken out by the Employer under this GCC Sub-Clause 30.5.
- 30.6 If the Contractor fails to take out and/or maintain in effect the insurances referred to in GCC Sub-Clause 30.1, the Employer 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 Employer shall have paid to the insurer, or may otherwise recover such amount as a debt due from the Contractor. If the Employer fails to take out and/or maintain in effect the insurances referred to in GCC 30.5, the Contractor may take out and maintain in effect any such insurances and may from time to time deduct from any amount due the Employer under the Contract any premium that the Contractor shall have paid to the insurer, or may otherwise recover such amount as a debt due from the Employer.

- 30.7 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 GCC Clause 30, and the monies payable by any insurers under all the insurance except Third Party Liability Insurance and Workmen Compensation Policy, shall be paid to the joint account of the Employer and the Contractor as mutually agreed and such amounts paid shall be apportioned between the Employer and the Contractor in accordance with the respective responsibilities under the Contract. The Employer shall give to the Contractor all such reasonable assistance as may be required by the Contractor. With respect to insurance claims in which the Employer'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 Employer. With respect to insurance claims in which the Contractor's interest is involved, the Employer shall not give any release or make any compromise with the insurer without the prior written consent of the Contractor.
- 30.8 Further all equipment and materials being supplied by Employer for the erection (as per Technical Specification) shall be kept insured by the Contractor against any loss, damage, pilferage, theft, fire, etc. from the point of unloading up to the time of Final taking over by Employer including handling, transportation, storage, erection, testing and commissioning, operation & maintenance etc. The premium paid to the Insurance company by the Contractor for such insurance shall be reimbursed by Employer to the Contractor. The Contractor shall obtain competitive quotation for such insurance and shall take prior approval from Employer before taking the insurance. The insurable value of the equipment being supplied by Employer shall be intimated to the Contractor for arranging the insurance.
- 30.9 It will be the responsibility of the Contractor to lodge, pursue and settle all claims with the insurance company in case of any damage, loss, theft, pilferage or fire during execution of Contract and Employer shall be kept informed about it. The Contractor shall replace the lost/damaged materials promptly irrespective of the settlement of the claims by the underwriters and ensure that the work progress is as per agreed schedules. The losses, if any, in such replacement will have to be borne by the Contractor.

31. Change in Laws and Regulations

- 31.1 If, after the date seven (7) days prior to the date of Bid Opening, any law, regulation, ordinance, order or by-law having the force of law is enacted, promulgated, abrogated or changed in India (which shall be deemed to include any change in interpretation or application by the competent authorities) that subsequently affects the costs and expenses of the Contractor and/or the Time for Completion, the Contract Price shall be correspondingly increased or decreased, and/or the Time for Completion shall be reasonably adjusted to the extent that the Contractor has thereby been affected in the performance of any of its obligations under the Contract. However, these adjustments would be restricted to direct transactions between the Employer and the Contractor and not on procurement of raw materials, intermediary components etc. by the Contractor for which the Employer shall be the sole judge.

32. Force Majeure

- 32.1 "Force Majeure" shall mean any event beyond the reasonable control of the Employer or of the Contractor, as the case may be, and which is unavoidable notwithstanding the reasonable care of the party affected, and shall include, without limitation, the following:
- (a) war, hostilities or warlike operations (whether war be declared or not), invasion, act of foreign enemy and civil war,

- (b) rebellion, revolution, insurrection, mutiny, usurpation of government, conspiracy, riot and civil commotion,
 - (c) earthquake, landslide, volcanic activity, flood or cyclone, or other inclement weather condition, nuclear and pressure waves or other natural or physical disaster,
- 32.2 Neither party shall be considered to be in default or in breach of his obligations under the Contract to the extent that performance of such obligation is prevented by any circumstances of Force majeure, which arises after date of Notification of Award.
- 32.3 If either party is prevented, hindered or delayed from or in performing any of its obligations under the Contract by an event of Force Majeure, then it shall notify the other in writing of the occurrence of such event and the circumstances thereof within fourteen (14) days after the occurrence of such event.
- 32.4 The party who has given such notice shall be excused from the performance or punctual performance of its obligations under the Contract for so long as the relevant event of Force Majeure continues and to the extent that such party's performance is prevented, hindered or delayed. The Time for Completion shall be extended in accordance with GCC Clause 34.

H. Change in Contract Elements

33. Change in the Facilities

- 33.1 Introducing a Change
- 33.1.1 Subject to GCC Sub-Clause 33.2.5, the Employer shall have the right to propose, and subsequently require, that the Project Manager order the Contractor from time to time during the performance of the Contract to make any change, modification, addition or deletion to, in or from the Facilities (hereinafter called "Change"), provided that such Change falls within the general scope of the Facilities and does not constitute unrelated work and that it is technically practicable, taking into account both the state of advancement of the Facilities and the technical compatibility of the Change envisaged with the nature of the Facilities as specified in the Contract.
- 33.1.2 The Contractor may from time to time during its performance of the Contract propose to the Employer (with a copy to the Project Manager) any Change that the Contractor considers necessary or desirable to improve the quality, efficiency or safety of the Facilities. The Employer may at its discretion approve or reject any Change proposed by the Contractor, provided that the Employer shall approve any Change proposed by the Contractor to ensure the safety of the Facilities.
- 33.1.3 Changes made necessary because of any default of the Contractor in the performance of its obligations under the Contract shall be not be deemed to be a Change, and such change shall not result in any adjustment of the Contract Price or the Time for Completion.
- 33.1.4 The procedure on how to proceed with and execute Changes is specified in GCC Sub-Clauses 33.2 and 33.3.
- 33.2 Changes Originating from Employer

- 33.2.1 The pricing of any Change shall, as far as practicable, be calculated in accordance with the rates and prices included in the Contract. If such rates and prices are inequitable, the parties thereto shall agree on specific rates for the valuation of the Change.
- 33.2.2 The Contract Price for (i) the items for which quantities have been indicated as lumpsum or lot or set and/or (ii) where the quantities are to be estimated by the Contractor shall remain constant unless there is change made in the Scope of Work by Employer. The quantities and unit prices (i) subsequently arrived while approving the Bill of Quantities (BOQ)/Billing breakup of lumpsum quantities/lot/Set and/or (ii) estimated by the Contractor shall be for on account payment purpose only. In case additional quantities, over and above the quantities in BOQ/billing breakup and /or estimated by the Contractor, are required for successful completion of the scope of work as per Technical Specification, the Contractor shall execute additional quantities of these items for which no additional payment shall be made over and above the lumpsum Contract Price. In case quantities of these items supplied at site are in excess of that required for successful completion of scope of work, such additional quantities shall be the property of the Contractor and they shall be allowed to take back the same from the site for which no deduction from the lumpsum Contract Price shall be made. Further, in case actual requirement of quantities for successful completion of scope of work is less than the quantities identified in the approved BOQ /billing breakup and/or estimated by the Contractor, the lumpsum contract price shall remain unchanged and no deduction shall be made from the lumpsum price due to such reduction of quantities.

It shall be the responsibility of the Contractor to pay all statutory taxes, duties and levies to the concerned authorities for such surplus material which would otherwise have been, lawfully payable in case of non-deemed export contracts. The Contractor shall submit an indemnity bond to keep Employer harmless from any liability, before release of such material to the Contractor by Employer.

Set/Lot/Lumpsum shall be governed as per the requirement of the corresponding item description read in conjunction with relevant provisions of Technical Specifications and the Billing breakup referred to above shall be issued by the Employer based on Contractor's request, if and as may be required during the currency of the Contract.

- 33.2.3 If before or during the preparation of the Change Proposal it becomes apparent that the aggregate effect of compliance therewith and with all other Change Orders that have already become binding upon the Contractor under this GCC Clause 33 would be to increase or decrease the Contract Price as originally set forth in Article 2 (Contract Price and Terms of Payment) of the Contract Agreement by more than the percentage specified in below, the Employer and the Contractor shall mutually agree on specific rates for valuation of the Change beyond the specified percentage.

This quantity may further increase upto 50% and decreased as required by Discom.

For the said purpose, the Contract Price means the Contract Price of the Facilities notwithstanding the Construction of the Contract.

- 33.2.4 If rates and prices of any change are not available in the Contract, the parties thereto shall agree on specific rates for the valuation of the change and all matters therein related to the change. Based on the same, the Employer shall, if it intends to proceed with the Change, issue the Contractor with a Change Order.
- 33.2.5 The Employer shall issue the Contractor with a Change Order pursuant to GCC Sub-Clause 33.2 by way of amendment to the Contract or in any other manner deemed appropriate. Even if the Employer and the Contractor cannot reach agreement on the price for the Change, an equitable adjustment to the Time for Completion, or any other matters related

to the Change Proposal, the Employer may nevertheless instruct the Contractor to proceed with the Change by issue of a "Pending Agreement Change Order" ("Pending Agreement Amendment").

Upon receipt of a Pending Agreement Change Order, the Contractor shall immediately proceed with effecting the Changes covered by such Order. The parties shall thereafter attempt to reach agreement on the outstanding issues under the Change Proposal.

If the parties cannot reach agreement within sixty (60) days from the date of issue of the Pending Agreement Change Order, then the matter may be referred to the Settlement Committee in accordance with the provisions of GCC Clause 38.

33.3 Changes Originating from Contractor

33.3.1 If the Contractor proposes a Change pursuant to GCC Sub-Clause 33.1.2, the Contractor shall submit to the Project Manager a written "Request for Change Proposal", giving reasons for the proposed Change and which shall include the following:

- (a) brief description of the Change
- (b) effect on the Time for Completion
- (c) estimated cost of the Change
- (d) effect on Functional Guarantees (if any)
- (e) effect on any other provisions of the Contract.

Upon receipt of the Request for Change Proposal, the parties shall follow the procedures outlined in GCC Sub-Clauses 33.2.1 and 33.2.5. However, should the Employer choose not to proceed, the Contractor shall not be entitled to recover the costs of preparing the Request for Change Proposal.

33A. Surplus Materials

- a. On completion of the works all such materials supplied by contractor for erection that remain unutilized, if any, shall be taken back by Contractor after detailed materials and payment reconciliations.
- b. The Contractor, within seven (7) days from the taking over of the equipment/materials under the package, shall submit payment and materials account for the reconciliations, failing which necessary recoveries will be made from the outstanding bills of the Contractor for the cost of the materials left unaccounted as decided by the Project Manager.

34. Extension of Time for Completion

34.1 The Time(s) for Completion specified in the **GCC Clause 1.1 (ee)** shall be extended if the Contractor is delayed or impeded in the performance of any of its obligations under the Contract by reason of any of the following:

- (a) any Change in the Facilities as provided in GCC Clause 33
- (b) any occurrence of Force Majeure as provided in GCC Clause 32
- (c) any suspension order given by the Employer under GCC Clause 35 hereof or reduction in the rate of progress pursuant to GCC Sub-Clause 35.2 or
- (d) any changes in laws and regulations as provided in GCC Clause 31 or

(e) any other matter specifically mentioned in the Contract

by such period as shall be fair and reasonable in all the circumstances and as shall fairly reflect the delay or impediment sustained by the Contractor.

34.2 Except where otherwise specifically provided in the Contract, the Contractor shall submit to the Project Manager a notice of a claim for an extension of the Time for Completion, together with particulars of the event or circumstance justifying such extension as soon as reasonably practicable after the commencement of such event or circumstance. As soon as reasonably practicable after receipt of such notice and supporting particulars of the claim, the Employer and the Contractor shall agree upon the period of such extension. In the event that the Contractor does not accept the Employer's estimate of a fair and reasonable time extension, the Contractor shall be entitled to refer the matter to the Settlement Committee, pursuant to GCC Clause 38.

34.3 The Contractor shall at all times use its reasonable efforts to minimize any delay in the performance of its obligations under the Contract.

35. Suspension

35.1 The Employer may request the Project Manager, by notice to the Contractor, to order the Contractor to suspend performance of any or all of its obligations under the Contract. Such notice shall specify the obligation of which performance is to be suspended, the effective date of the suspension and the reasons therefore. The Contractor shall thereupon suspend performance of such obligation (except those obligations necessary for the care or preservation of the Facilities) until ordered in writing to resume such performance by the Project Manager.

If, by virtue of a suspension order given by the Project Manager, other than by reason of the Contractor's default or breach of the Contract, the Contractor's performance of any of its obligations is suspended for an aggregate period of more than ninety (90) days, then at any time thereafter and provided that at that time such performance is still suspended, the Contractor may give a notice to the Project Manager requiring that the Employer shall, within twenty-eight (28) days of receipt of the notice, order the resumption of such performance or request and subsequently order a change in accordance with GCC Clause 33, excluding the performance of the suspended obligations from the Contract.

If the Employer fails to do so within such period, the Contractor may, by a further notice to the Project Manager, elect to treat the suspension, where it affects a part only of the Facilities, as a deletion of such part in accordance with GCC Clause 33 or, where it affects the whole of the Facilities, as termination of the Contract under GCC Sub-Clause 36.1.

35.2 If the Contractor's performance of its obligations is suspended or the rate of progress is reduced pursuant to this GCC Clause 35, then the Time for Completion shall be extended in accordance with GCC Sub-Clause 34.1, and any and all additional costs or expenses incurred by the Contractor as a result of such suspension or reduction shall be paid by the Employer to the Contractor in addition to the Contract Price, except in the case of suspension order or reduction in the rate of progress by reason of the Contractor's default or breach of the Contract.

35.3 During the period of suspension, the Contractor shall not remove from the Site any Plant and Equipment, any part of the Facilities or any Contractor's Equipment, without the prior written consent of the Employer.

36. Termination**36.1 Termination for Employer's Convenience**

36.1.1 The Employer may at any time terminate the Contract for any reason by giving the Contractor a notice of termination that refers to this GCC Sub-Clause 36.1.

36.1.2 Upon receipt of the notice of termination under GCC Sub-Clause 36.1.1, the Contractor shall either immediately or upon the date specified in the notice of termination

- (a) cease all further work, except for such work as the Employer may specify in the notice of termination for the sole purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition
- (b) Deleted
- (c) Remove all Contractor's Equipment from the Site, repatriate the Contractor's personnel from the Site, remove from the Site any wreckage, rubbish and debris of any kind, and leave the whole of the Site in a clean and safe condition
- (d) In addition, the Contractor, subject to the payment specified in GCC Sub-Clause 36.1.3, shall
 - (i) Deliver to the Employer the parts of the Facilities executed by the Contractor up to the date of termination
 - (ii) Deleted
 - (iii) Deliver to the Employer all non-proprietary drawings, specifications and other documents prepared by the Contractor as at the date of termination in connection with the Facilities.

36.1.3 In the event of termination of the Contract under GCC Sub-Clause 36.1.1, the Employer shall pay to the Contractor the following amounts:

- (a) The Contract Price, properly attributable to the parts of the Facilities executed by the Contractor as of the date of termination
- (b) The costs reasonably incurred by the Contractor in the removal of the Contractor's Equipment from the Site and in the repatriation of the Contractor's personnel
- (c) Any amounts to be paid by the Contractor to its Sub-vendors in connection with the termination of any contracts with such sub-vendors, including any cancellation charges
- (d) Costs incurred by the Contractor in protecting the Facilities and leaving the Site in a clean and safe condition pursuant to paragraph (a) of GCC Sub-Clause 36.1.2
- (e) The cost of satisfying all other obligations, commitments and claims that the Contractor may in good faith have undertaken with third parties in connection with the Contract and that are not covered by paragraphs (a) through (d) above.

36.2 Termination for Contractor's Default

36.2.1 The Employer, without prejudice to any other rights or remedies it may possess, may terminate the Contract forthwith in the following circumstances by giving a notice of termination and its reasons therefore to the Contractor, referring to this GCC Sub-Clause 36.2:

- (a) if the Contractor becomes bankrupt or insolvent, has a receiving order issued against it, compounds with its creditors, or, if the Contractor is a corporation, a resolution is passed or order is made for its winding up (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), a receiver is appointed over any part of its undertaking or assets, or if the Contractor takes or suffers any other analogous action in consequence of debt
- (b) If the Contractor assigns or transfers the Contract or any right or interest therein in violation of the provision of GCC Clause 37.
- (c) If the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.
- (d) If the contractor fails to achieve mutually agreed deadline (as set in mutually agreed Project Execution Plan/PERT chart) for consecutive 3 months, Employer shall issue contract termination notice giving suitable time to contractors which may be up to time agreed between employer and contractor. In case, contractor does not improve its performance as per contract termination notice, which shall be within overall plan under mutually agreed project execution plan, employer will terminate the contract and encash performance securities.

For the purpose of this Sub-Clause:

"Corrupt practice" is the offering, giving, receiving or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;

"fraudulent practice" is any act or omission, including a misrepresentation, that knowingly or recklessly misleads or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

"Collusive practice" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;

"Coercive practice" is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

"Obstructive practice" is

- (aa) deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede an Employer's investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation;

or

(bb) acts intended to materially impede the exercise of the Employer's inspection and audit rights.

In persuasions of its policy, the Employer will sanction a firm or individual, including declaring ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the firm has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for, or in executing, a contract.

36.2.2 If the Contractor

- (a) Has abandoned or repudiated the Contract
- (b) has without valid reason failed to commence work on the Facilities promptly or has suspended (other than pursuant to GCC Sub-Clause 35.2) the progress of Contract performance for more than fifteen (15) days after receiving a written instruction from the Employer to proceed
- (c) Persistently fails to execute the Contract in accordance with the Contract or persistently neglects to carry out its obligations under the Contract without just cause
- (d) refuses or is unable to provide sufficient materials, services or labor to execute and complete the Facilities in the manner specified in the program furnished under GCC Sub-Clause 14.2 at rates of progress that give reasonable assurance to the Employer that the Contractor can attain Completion of the Facilities by the Time for Completion as extended,

Then the Employer may, without prejudice to any other rights it may possess under the Contract, give a notice to the Contractor stating the nature of the default and requiring the Contractor to remedy the same. If the Contractor fails to remedy or to take steps to remedy the same within fourteen (14) days of its receipt of such notice, then the Employer may terminate the Contract forthwith by giving a notice of termination to the Contractor that refers to this GCC Sub-Clause 36.2.

36.2.3 Upon receipt of the notice of termination under GCC Sub-Clauses 36.2.1 or 36.2.2, the Contractor shall, either immediately or upon such date as is specified in the notice of termination,

- (a) cease all further work, except for such work as the Employer may specify in the notice of termination for the sole purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition
- (b) terminate all contracts with sub-vendors, except those to be assigned to the Employer pursuant to paragraph (d) below
- (c) deliver to the Employer the parts of the Facilities executed by the Contractor up to the date of termination
- (d) to the extent legally possible, assign to the Employer all right, title and benefit of the Contractor to the Facilities and to the Plant and Equipment as of the date of termination, and, as may be required by the Employer, in any contracts with sub-vendors concluded between the Contractor and its Sub-vendors

- (e) deliver to the Employer all drawings, specifications and other documents prepared by the Contractor as of the date of termination in connection with the Facilities.

36.2.4 The Employer may enter upon the Site, expel the Contractor, and complete the Facilities itself or by employing any third party. The Employer may, to the exclusion of any right of the Contractor over the same, take over and use with the payment of a fair rental rate to the Contractor, with all the maintenance costs to the account of the Employer and with an indemnification by the Employer for all liability including damage or injury to persons arising out of the Employer's use of such equipment, any Contractor's Equipment owned by the Contractor and on the Site in connection with the Facilities for such reasonable period as the Employer considers expedient for the supply and installation of the Facilities.

Upon completion of the Facilities or at such earlier date as the Employer thinks appropriate, the Employer shall give notice to the Contractor that such Contractor's Equipment will be returned to the Contractor at or near the Site and shall return such Contractor's Equipment to the Contractor in accordance with such notice. The Contractor shall thereafter without delay and at its cost remove or arrange removal of the same from the Site.

36.2.5 Subject to GCC Sub-Clause 36.2.6, the Contractor shall be entitled to be paid the Contract Price attributable to the Facilities executed as of the date of termination, the value of any unused or partially used Plant and Equipment on the Site, and the costs, if any, incurred in protecting the Facilities and in leaving the Site in a clean and safe condition pursuant to paragraph (a) of GCC Sub-Clause 36.2.3. Any sums due to the Employer from the Contractor accruing prior to the date of termination shall be deducted from the amount to be paid to the Contractor under this Contract.

36.2.6 If the Employer completes the Facilities, the cost of completing the Facilities by the Employer shall be determined.

If the sum that the Contractor is entitled to be paid, pursuant to GCC Sub-Clause 36.2.5, plus the reasonable costs incurred by the Employer in completing the Facilities, exceeds the Contract Price or the entire Facilities if entire Facilities have been completed or the price for part of the Facilities if part of the Facilities have been completed, the Contractor shall be liable for such excess.

If such excess is greater than the sums due the Contractor under GCC Sub-Clause 36.2.5, the Contractor shall pay the balance to the Employer, and if such excess is less than the sums due the Contractor under GCC Sub-Clause 36.2.5, the Employer shall pay the balance to the Contractor. For facilitating such payment the Employer shall encash the Bank Guarantees of the Contractor available with the Employer and retains such other payments due to the Contractor under the Contract in question or any other Contract that the Employer may have with the Contractor.

The Employer and the Contractor shall agree, in writing, on the computation described above and the manner in which any sums shall be paid.

36.3 In this GCC Clause 36, the expression "Facilities executed" shall include all work executed, Installation Services provided, and all Plant and Equipment acquired (or subject to a legally binding obligation to purchase) by the Contractor and used or intended to be used for the purpose of the Facilities, up to and including the date of termination.

36.4 In this GCC Clause 36, in calculating any monies due from the Employer to the Contractor, account shall be taken of any sum previously paid by the Employer to the Contractor

under the Contract, including any advance payment paid pursuant to the corresponding Appendix (Terms and Procedures of Payment) to the Contract Agreement.

37. Assignment

- 37.1 Neither the Employer nor the Contractor shall, without the express prior written consent of the other party (which consent shall not be unreasonably withheld), assign to any third party the Contract or any part thereof, or any right, benefit, obligation or interest therein or thereunder, except that the Contractor shall be entitled to assign either absolutely or by way of charge any monies due and payable to it or that may become due and payable to it under the Contract.

I. Resolution of Disputes

38. Settlement of Disputes

- 38.1 In any time any question, dispute or difference what so ever which may arise between the AVVNL and the agency, the same shall be decided by Settlement committee constituted for the purpose. The Settlement committee(s) have been constituted to settle the disputed purchase cases where the firm(s) do not agree with the Discom viewpoint and have given their representations. The settlement committee(s) will be empowered to decide disputed cases. The committee is also authorized to settle such cases which are subjudice in case firm make formal request in this regard. In case of disagreement amongst committee members, the case with full details shall be put-up before the next level committee for decision.
- 38.2 For settlement, firm shall furnish in writing their representation indicating the details of dispute / grievances along with requisite settlement fee within a period of 6 months after receiving communication form **TW Wing** giving rise to cause of dispute/ grievances. Appeal against any decision of settlement committee can be filed within three months from the date of conveying such decision to the firm.
- 38.3 The requisite fee either in demand draft/ pay order to be deposited to the **Senior Accounts Officer(EA and Cash), AVVNL, Ajmer** along with detailed representation for various settlement are detailed as under :-
- i. For CE Level Settlement Committee (Cases up to Rs.2.5 Lac) - Rs.1000/-
 - ii. For Discom Level Settlement Committee (Cases above Rs.2.5 Lac and Appeal Against CE level Committee) - Rs.3000/-
 - iii. For review of decision of Discom Level (Settlement Committee by BOD) - Rs.5000/-

39. Deleted - Arbitration

- 39.1 Deleted
- 39.2 Deleted
- 39.3 Deleted
- 39.4 Deleted
- 39.5 Deleted

40. Up-front intimation of approved manufacturers and criterion for Fresh Vendor approval:

Employer shall up-front intimate list containing name of already approved vendors/manufacturers of various sub-transmission and distribution materials. Employer shall up-load the list on their web portal. Contractor shall choose one or more than one vendors from the pre-approved lists depending upon capacity and capability of vendors to supply the materials for the works proposed under this tender. No separate approval for vendor shall be required from Employer.

Also, normal procedure being followed for empanelment of new vendors shall be uploaded and up-front intimated to all Contractors. In case Contractor desires to add new vendor, up-front intimation shall be available on criterion and procedure for selection of vendors.

41. Up-front intimation of Guaranteed Technical Particulars:

Technical Specifications are enclosed with the bid documents. Employer shall up-front intimate acceptable Guaranteed Technical Particulars of various materials through their web portal.

Contractor will examine these documents and supply only that material which meets the above acceptable criterion. In case there are Employer's approved vendor(s) (one or more) through which Contractor wish to procure the materials and are complying with the acceptable GTP parameters of Employer as available on their web portal, there would not be any formality needed like approval of sub-vendor or approval of GTP again.

In event of change in name of vendor or change in GTP parameter, separate approval of Employer shall be sought by successful Contractor.

42. Contractor's Store at Project site:

"Project wise separate Site Stores shall be maintained and manned by contractor. Same store shall not be used for more than one project even if neighboring districts' projects are awarded to the same agency. The Contractor shall deploy his own manpower in stores for round the clock security and for its day to day operation through trained Store-ki-per.

Since materials received in this store are owned by Employer and are pre-dispatch inspected by Employer's representative, materials in a lot shall not be issued to working teams of Contractor for physical execution by Contractor. Instead, day to day requirements shall be issued to the working teams of sub-vendors by authorized store-keeper. In exceptional cases, on prior written permission of Employer, materials for a week time may be issued to working teams of Contractor. Daily accounting of materials receipt, materials issues, materials in custody of working teams are to be maintained by contractor. Handing of Stores shall, in no circumstances, be off loaded.

In no case, inter-project transfer of materials shall be permitted.

43. Interim - Handing over of assets:

On completion of erection and testing of a section of line, DTR substation, power substation, contracting agency shall submit digital photographs in soft copies of each and every support structures along-with submission of Construction Completion report in support of their claim for energisation and Interim-handing over of assets. Project Manager within a week time, shall review the photographs for acceptance of quality of works and shall immediately deploy officials for joint measurement and inspection of executed works for energisation. In parallel,

a requisition to State Electrical Inspectorate shall also be submitted by Project Manager. Fee/Charges for inspection by electrical inspector shall be paid by Project Manager. Single Line Diagram of created assets using Autocad with GPS co-ordinates shall be submitted invariably while interim-handing over the system.

While offering section of work / substation for commissioning and interim-handing over, contractor shall provide pre-commissioning test reports and detail checklist which shall be provided later.

44. Supply of Materials in lots:

Item wise mobilization of materials shall be planned in 6 lots. Employer shall arrange pre-dispatch inspections for 6 lots at his own expenditure. Any additional resource mobilization for inspection of materials by employer beyond 6 lots shall be chargeable at actual. However, in case of approved quantity variation, employer may consider to increase the number of Lots.

45. Contract Closing:

On completion of Final handing over formality and successfully completion of defect liability / guarantee period including O&M period of all GSS under this Tender, the contract shall be closed on completion of following formality:

- I. Material reconciliation,
- II. Payment reconciliations, submission and verifications that reconciliation of payment toward statutory provisions like GST/Any other taxes, any other dues etc. Reconciliation statement shall be verified and vetted by chartered accountant.
- III. Approval for extension of Completion period, with or without compensation, as required.
- IV. Certification from agency regarding payment of dues to its
 - i. Sub-vendors
 - ii. Workers/ contract labourers,
 - iii. Payment of statutory dues toward Provident Funds, wages, etc. as required.
- V. Certification of Project Manager & agency to the effect that erection, testing and commissioning of the equipment have been completed as per specifications laid down in the contract and defects noted at the time of commissioning and notified to the agency have been liquidated to the satisfaction of Employer.
- VI. Removal of construction meant for site stores, hutment, labour colony etc. in the premises of EMPLOYER.
- VII. Certificate from Project Manager in charge regarding final amendment of drawings and detailed of such amendments,
- VIII. Drawing receipt certificate by the Project Manager,
- IX. Receipt of compliance report on Quality Assurance Mechanism along with photograph, Assurance documents by Project Manager

- X. Shortfall in equipment / Line performance Certificate issued by Project Manager,
- XI. No demand certificate issued by contractor,
- XII. Certificate about completion of Defect Liability Period of the package by Project Manager,
- XIII. Certificate regarding return of Performance Security / Indemnity Bond by Project Manager/Employer.

46. Banning of business dealings

- 46.1. Employer shall ban business dealings with contractor on following grounds for the period as decided by Project Manager:-
- a. If the contractor fails to submit Performance Security after issuance of Letter of Intent (LoI) within stipulated time.
 - b. If the Contractor fails to accept the award of contract or has abandoned or repudiated the Contract.
 - c. If the Contractor is found to be non-performing in execution of contract by the Employer.
 - d. If a disaster / major failure / accident / collapse of a structure / system is caused during erection or during defect liability period due to negligence of contractor or design deficiency or poor quality of execution.
 - e. Mis-behavior or physical manhandling by the Contractor or his representative or any person acting on his behalf with any official of the Company dealing with the concerned contract is established.
 - f. If the Director / Owner of the Contractor, proprietor or partner of the Contractor, is convicted by a Court of Law for offences involving corrupt and fraudulent practices including moral turpitude in relation to its business dealings with the government or State Public Sector Undertakings or Central Public Sector Undertakings or Employer or Employer's group companies, during the last five years.
 - g. If the proprietors of the Contractor have been guilty of malpractices such as bribery, corruption, fraud, substitution of the tenders, interpolations, etc.
 - h. If the Contractor continuously refuses to return / refund the dues of Employer or Employer's group companies, without showing adequate reason and this is not due to any reasonable dispute which would attract proceedings in arbitration or court of Law;
 - i. If the Contractor employs a public servant dismissed / removed or employs a person convicted for an offence involving corruption or abetment of such offences;
 - j. If business dealings with the Contractor have been banned by the Ministry of Power or Government of India and the ban is still in force,
 - k. If it is established that Contractor has resorted to corrupt, fraudulent practices including misrepresentation of facts;

- l. If the Contractor uses intimidation/threatening or brings undue outside pressure on the Project Manager or his authorised representatives or its officials in acceptance / performance of the job under the contract.
 - m. If the Contractor indulges in repeated and / or deliberate use of delay tactics in complying with contractual stipulations;
 - n. If the Contractor is found to be involved in cartel formation during bidding.
 - o. On willful indulgence by the Contractor in supplying sub-standard material with respect to Technical Specifications under the Contract irrespective of whether pre-dispatch inspection was carried out by Employer or not;
 - p. If the Contractor is declared bankrupt or insolvent or its financial position has become unsound, and in the case of a limited company, it is wound up or liquidated.
 - q. Established litigant nature of the Contractor to derive undue benefit;
 - r. Continued poor performance of the Contractor;
 - s. If the Contractor violates the provisions of the Integrity Pact provided in the Contract.
 - t. If the Contractor commits fraud as defined under the Fraud Prevention Policy of Employer.
 - u. If the Contractor has assigned or transferred the contract without the prior approval of the Competent Authority in violation of the provisions of the contract.
 - v. If the Contractor misuses the premises or facilities of the Employer, forcefully occupies, tampers or damages the Employer's properties including land, water resources, forests / trees, etc. If the security consideration, including questions of loyalty of the Contractor to the state, so warrants;
- 47.** Wherever applicable, The Contractor will submit the manufacturer Warranty on NJS of Rs 500/- .
- 48.** Any other item not specifically mentioned in the specifications but which are required for delivery of desired Scope of Work for the Project are deemed to be included in the scope of the specification as per relevant and latest IS, IEC, standards of Rural Electrification Corporation (REC) and specified by Discom unless specifically excluded. Specification of all the items covered under this Tender Document is given separately. However, if any item is left out, standard specification of relevant and latest IS, IEC, Central/ State Government Electrification Agencies and specified by Discom will be applicable for the same.
- 49. Discom's/ AVVNL Rights:**
- 1.2. Discom reserves the right to terminate the contract or part thereof at any time giving 01 (One) months' notice of Termination or the reasons thereof. Contractor/s will not be entitled for any compensation / damages / losses, whatsoever, on account of such termination of the Contract.
 - 1.3. Discom will be entitled to deduct directly, from the bills to be paid to the Contractor, any sum or sums payable by him and which sum/sums due to the Contractor or the

Discom is required to pay as a principal employer on account of Contractor's default in respect of all liabilities referred to.

- 1.4. The Contractor shall specifically note that any overwriting or corrections or manuscript in the offer shall be ignored and will not be considered authentic unless same are signed and Contractor's Stamp / Seal is affixed.
- 1.5. Discom/ AVVNL, as applicable, reserves the right to split the contract into two or more Agency per feeder. In such cases, the term for completion period will be negotiated and reduced proportionate to the offered quantity / value.
- 1.6. In case of any doubt or interpretation of the terms and condition, the decision of the AVVNL/ Discom as applicable will be final and binding upon the Contractor and no dispute in this regard will be entertained.
- 1.7. AVVNL reserves the right to accept any offer or reject any or all Bids or cancel / withdraw or re invitation to offer without assigning any reason. Such decision of the AVVNL shall not be subject to question by any Bidder and the AVVNL shall bear no liability whatsoever for such decision.
- 1.8. AVVNL/ Discom has right to make minor changes / modifications in the Technical & Site condition matter. In such matter, decision of AVVNL/ Discom as applicable shall be final and binding to the Contractor to carry out work accordingly.

50. Random Checking of Material at Site:-

- 51.** From the lots inspected by the Discom Inspector, the Inspector of designated Wing, Discom if required, may pick up samples from the lots supplied & Installed at beneficiaries' site at random for quality check only. The samples picked up will be tested for acceptance test as decided by Discom at MNRE/ Government approved laboratory in presence of representatives of Contractor and Discom as per relevant IEC/ISS/BIS/ Discom specifications. The test results will be binding on the Contractor and Discom, in general will not allow re-sampling. If the material fails in any of the acceptance tests carried out, the full lot of materials will be considered as rejected. The decision in this regard for acceptance as above of Discom shall be final and this will be binding on the supplier.

52. Final-Taking Over

- 52.1. Upon successful Construction Completion and Operation & Maintenance Completion of All GSS and Associated Infrastructure under this tender, the Project Manager shall issue to the Contractor a Final Taking Over Certificate as a proof of the acceptance of the All the Facilities under this tender. Such certificate shall not relieve the Contractor of any of his obligations which otherwise survive, by the terms and conditions of Contract after issue of such certificate.
- 52.2. If within twenty one (21) days after receipt of the Contractor's notice, the Project Manager fails to issue the Final - Taking Over Certificate or fails to inform the Contractor in writing of the justifiable reasons why the Project Manager has not issued the Final - Taking Over Certificate, the Facilities or the relevant part thereof shall be deemed to have been Taken Over as at the date of the Contractor's said notice.
- 52.3. Upon Final - Taking Over of the Facilities or any part thereof, the Employer shall be responsible for the care and custody of the Facilities or the relevant part thereof, together with the risk of loss or damage thereto, and shall thereafter take over the Facilities or the relevant part thereof.

53. Final - Handing over of assets:

On completion of Construction Completion & Operation and Maintenance Completion of all the Facilities under this Contract, Contractor shall submit Construction & Operation & Maintenance Completion report in support of their claim for energisation and final handing over of assets. Project Manager within a 15 days, shall review the acceptance of quality of works and shall immediately deploy officials for joint measurement and inspection of executed works for energisation.

54. Operation & Maintenance for period of 10 years for Each GSS and related Associated Infrastructure

54.1. Setting Out/Supervision/Labor

54.1.1. Bench Mark: The Contractor shall be responsible for the true and proper setting-out of the Facilities in relation to bench marks, reference marks and lines provided to it in writing by or on behalf of the Employer.

If, at any time during the progress of Operation & Maintenance of the Facilities, any error shall appear in the position, level or alignment of the Facilities, the Contractor shall forthwith notify the Project Manager of such error and, at its own expense, immediately rectify such error to the reasonable satisfaction of the Project Manager. If such error is based on incorrect data provided in writing by or on behalf of the Employer, the expense of rectifying the same shall be borne by the Employer.

54.1.2. Contractor's Supervision: The Contractor shall give or provide all necessary superintendence during the operation & maintenance of the Facilities, and the O&M Manager or its deputy shall be constantly on the Site to provide full-time superintendence of the operation & maintenance. The Contractor shall provide and employ only technical personnel who are skilled and experienced in their respective callings and supervisory staff who are competent to adequately supervise the work at hand.

54.1.3. Labour:

- (a) The Contractor shall provide and employ on the Site in the operation & maintenance of the Facilities such qualification as specified in the tender document and as is necessary for the proper and timely O&M under the Contract. The Contractor is encouraged to use local labour that has the necessary skills.
- (b) Unless otherwise provided in the Contract, the Contractor at its own expense shall be responsible for the recruitment, transportation, accommodation and catering of all labour, local or expatriate, required for the execution of the Contract and for all payments in connection therewith.
- (c) The Contractor shall at all times during the progress of the Contract use its best endeavors to prevent any unlawful, riotous or disorderly conduct or behavior by or amongst its employees and the labor.
- (d) The Contractor shall, in all dealings with its labor currently employed on or connected with the Contract, pay due regard to all recognized festivals, official holidays, religious or other customs and all local laws and regulations pertaining to the employment of labour.

54.2. Site Regulations and Safety

The Employer and the Contractor shall establish Site regulations setting out the rules to be observed in the execution of the Contract at the Site and shall comply therewith. The Contractor shall prepare and submit to the Employer, with a copy to the Project Manager, proposed Site regulations for the Employer's approval, which approval shall not be unreasonably withheld.

Such Site regulations shall include, but shall not be limited to, rules in respect of security, safety of the Facilities, gate control, sanitation, medical care, and fire prevention.

54.3. Compliance with Labour Regulations

54.3.1. During continuance of the contract, the Contractor shall abide at all times by all applicable existing labour enactments and rules made thereunder, regulations notifications and byelaws of the State or Central Government or local authority and any other labour law (including rules), regulations by laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. The employees of the Contractor in no case shall be treated as the employees of the Employer at any point of time.

54.3.2. The Contractor shall keep the Project Manager indemnified in case any action is taken against the Contractor by the competent authority on account of contravention of any of the provisions of any Act or rules made thereunder, regulations or notifications including amendments.

54.3.3. If the Project Manager/Employer is caused to pay under any law as principal employer such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/ byelaws/Acts/ Rules/regulations including amendments, if any, on the part of the Contractor, the Project Manager shall have the right to deduct any money due to the Contractor under this contract or any other contract with the Project Manager/Employer including his amount of performance security for adjusting the aforesaid payment. The Project Manager shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Project Manager/Employer.

54.3.4. Notwithstanding the above, the Contractor shall furnish to the Project Manager the details/documents evidencing the Contractor's compliance to the laws applicable to establishments engaged in building and other construction works, as may be sought by the Project Manager. In particular the Contractor shall submit quarterly certificate regarding compliance in respect of provisions of Employees' Provident Fund and Misc. Provisions Act 1952 or latest to the Project Manager.

54.3.5. Salient features of some major laws as may be applicable to establishments engaged :

- (a) Workmen Compensation Act 1923 or latest: The Act provides for compensation in case of injury by accident arising out of and during the course of employment.
- (b) Payment of Gratuity Act 1972 or latest: Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for

every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

- (c) Employee P.F. and Miscellaneous Provision Act 1952 or latest: The Act provides for monthly contribution by the Contractor plus his workers as per the latest prevalent applicable rate. The benefits under the Act are:
 - (i) Pension or family pension on retirement or death, as the case may be.
 - (ii) Deposit linked insurance on death in harness of the worker.
 - (iii) Payment of P.F. accumulation on retirement/death etc.
- (d) Maternity Benefit Act 1951 or latest: The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.
- (e) Contract Labour (Regulation & Abolition) Act 1970 or latest: The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by law. The Principal Employer is required to take Certification of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ 20 or more contract labour.
- (f) Minimum Wages Act 1948 or latest: The Contractor is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provision of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employments. The applicable Laws, Acts and Rules in Rajasthan State shall also be mandatorily followed.
- (g) Payment of Wages Act 1936 or latest: It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.
- (h) Equal Remuneration Act 1979 or latest: The Act provides for payment of equal wages for work of equal nature to Male and Female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.
- (i) Payment of Bonus Act 1965 or latest: The Act is applicable to all establishments employing 20 or more employees. The Act provides for payments of annual bonus subject to a minimum and maximum % of wages to employees drawing certain amount per month or less. The bonus is to be paid to employees getting specified amount as per the latest prevalent applicable provisions of the The Act. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act. The above guidelines shall be liable to change with the change in act/notification by relevant statutory authority.
- (j) Industrial Dispute Act 1947 or latest: the Act lays down the machinery the procedure for resolution of Industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.
- (k) Industrial Employment (Standing Orders) Act 1946 or latest: It is applicable to all establishments employing 100 or more workmen (employment size reduced by

some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer (i.e. Contractor) on matters provided in the Act and get the same certified by the designated Authority.

- (l) Trade Unions Act 1926 or latest: The Act lays down the procedure for registration of trade unions of workmen and contractors. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.
- (m) Child Labour (Prohibition & Regulation) Act 1986 or latest: The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of Child Labour is prohibited in Building and Construction Industry.
- (n) Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service Act 1979 or latest: The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home upto the establishment and back, etc.
- (o) The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 or latest and the Cess Act of 1996 or latest: All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay cess at the prevalent applicable rate of the cost of construction as may be modified by the Government. The Contractor of the establishment is required to provide safety measures at the electrical construction site, substations, building or construction work and other welfare measures, such as Canteens, First-Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Contractor to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the government.
- (p) Factories Act 1948 or latest: The Act lays down the procedure for approval at plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

54.3.6. Protection of Environment

The Contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as consequence of his methods of operation.

During continuance of the Contract, the Contractor shall abide at all times by all existing enactments on environmental protection and rules made thereunder, regulations, notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority.

Salient features of some of the major laws that are applicable are given below:

The Water (Prevention and Control of Pollution) Act, 1974 or latest, This provides for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water. 'Pollution' means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms.

The Air (Prevention and Control of Pollution) Act, 1981 or latest, This provides for prevention, control and abatement of air pollution. 'Air Pollution' means the presence in the atmosphere of any 'air pollutant', which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

The Environment (Protection) Act, 1986 or latest, This provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. 'Environment' includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.

The Public Liability Insurance Act, 1991 or latest, This provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under Environment (Protection) Act, 1986 or latest, and exceeding such quantity as may be specified by notification by the Central Government.

54.3.7. Safety Precautions

54.3.7.1. The Contractor shall observe all applicable regulations regarding safety on the Site.

54.3.7.2. The Contractor shall ensure proper safety of all the workmen, materials, plant and equipment belonging to him or to Employer or to others, working at the Site. The Contractor shall also be responsible for provision of all safety notices and safety equipment required both by the relevant legislations and the Project Manager, as he may deem necessary.

54.3.7.3. The Contractor shall provide suitable safety equipment of prescribed standard to all employees and workmen according to the need, as may be directed by the Project Manager who will also have right to examine these safety equipment to determine their suitability, reliability, acceptability and adaptability.

54.3.7.4. The Contractor shall provide safe working conditions to all workmen and employees at the Site including safe means of access, railings, stairs, ladders, scaffoldings etc. The scaffoldings shall be erected under the control and

supervision of an experienced and competent person. For erection, good and standard quality of material only shall be used by the Contractor.

54.3.7.5. The Contractor shall not be entitled for any damages/compensation for stoppage of work due to safety reasons as provided in Tender Document above and the period of such stoppage of work will not be taken as an extension of time for completion of work and will not be the ground for waiver of levy of liquidated damages.

54.3.7.6. It is mandatory for the Contractor to observe during the execution of the works, requirements of Safety Rules which would generally include but not limited to following:

Safety Rules

- a) Each employee shall be provided with initial indoctrination regarding safety by the Contractor, so as to enable him to conduct his work in a safe manner.
- b) No employee shall be given a new assignment of work unfamiliar to him without proper introduction as to the hazards incident thereto, both to himself and his fellow employees.
- c) Under no circumstances shall an employee hurry or take unnecessary chance when working under hazardous conditions.
- d) Employees must not leave naked fires unattended. Smoking shall not be permitted around fire prone areas and adequate firefighting equipment shall be provided at crucial location.
- e) Employees under the influence of any intoxicating beverage, even to the slightest degree shall not be permitted to remain at work.
- f) There shall be a suitable arrangement at every work site for rendering prompt and sufficient first aid to the injured.
- g) The staircases and passageways shall be adequately lighted.
- h) The employees when working around moving machinery, must not be permitted to wear loose garments. Safety shoes are recommended when working in shops or places where materials or tools are likely to fall. Only experienced workers shall be permitted to go behind guard rails or to clean around energized or moving equipment.
- i) The employees must use the standard protection equipment intended for each job. Each piece of equipment shall be inspected before and after it is used.
- j) Requirements of ventilation in underwater working to licensed and experienced divers, use of gum boots for working in slushy or in inundated conditions are essential requirements to be fulfilled.

54.3.7.7. The Contractor shall follow and comply with all Employer Safety Rules, relevant provisions of applicable laws pertaining to the safety of workmen, employees, plant and equipment as may be prescribed from time to time without any demur, protest or contest or reservations. In case of any discrepancy

between statutory requirement and Employer Safety Rules referred above, the latter shall be binding on the Contractor unless the statutory provisions are more stringent.

54.3.7.8. If the Contractor fails in providing safe working environment as per Employer Safety Rules or continues the work even after being instructed to stop work by the Project Manager as provided in the tender document, the Contractor shall promptly pay to Employer, on demand by the Employer, compensation at the rate of Rs. 5,000/- per day of part thereof till the instructions are complied with and so certified by the Project Manager. However, in case of accident taking place causing injury to any individual, the provisions contained in Tender Document shall also apply in addition to compensation mentioned in this Clause.

54.3.7.9. If the Contractor does not take adequate safety precautions and/or fails to comply with the Safety Rules as prescribed by the Employer or under the applicable law for the safety of the equipment and plant or for the safety of personnel or the Contractor does not prevent hazardous conditions which cause injury to his own employees or employees of other Contractors or Employer's employees or any other person who are at Site or adjacent thereto, then the Contractor shall be responsible for payment of a sum as indicated below to be deposited with the Employer, which will be passed on by the Employer to such person or next to kith and kin of the deceased:

| | | |
|----|--|----------------------------|
| a. | Fatal injury or accident causing death | Rs. 10,00,000/- per person |
| b. | Major injuries or accident causing 25% or more permanent disablement | Rs. 100,000/- per person |

Permanent disablement shall have same meaning as indicated in Workmen's Compensation Act. The amount to be deposited with Employer and passed on to the person mentioned above shall be in addition to the compensation payable under the relevant provisions of the Workmen's Compensation Act and rules framed there under or any other applicable laws as applicable from time to time. In case the Contractor does not deposit the above mentioned amount with Employer, such amount shall be recovered by Employer from any monies due or becoming due to the Contractor under the contract or any other on-going contract.

54.3.7.10. The Contractor shall also submit 'Safety Plan' as per proforma specified in Section N Format N7 of the Bidding Documents along with all the requisite documents mentioned therein and as per check-list contained therein to the Project Manager for its approval within 60 days of award of Contract.

Further, one of the conditions for release of first progressive payment / subsequent payment towards Services Contract shall be submission of 'Safety Plan' along with all requisite documents and approval of the same by the Project Manager.

54.4. Opportunities for Other Contractors

54.4.1. The Contractor shall, upon written request from the Employer or the Project Manager, give all reasonable opportunities for carrying out the work to any other contractors employed by the Employer on or near the Site.

54.4.2. If the Contractor, upon written request from the Employer or the Project Manager, makes available to other contractors any roads or ways the maintenance for which the Contractor is responsible, permits the use by such other contractors of the Contractor's

Equipment, or provides any other service of whatsoever nature for such other contractors, the Employer shall fully compensate the Contractor for any loss or damage caused or occasioned by such other contractors in respect of any such use or service, and shall pay to the Contractor reasonable remuneration for the use of such equipment or the provision of such services.

54.4.3. The Contractor shall also so arrange to perform its work as to minimize, to the extent possible, interference with the work of other contractors. The Project Manager shall determine the resolution of any difference or conflict that may arise between the Contractor and other contractors and the workers of the Employer in regard to their work.

54.4.4. The Contractor shall notify the Project Manager promptly of any defects in the other contractors' work that come to its notice, and that could affect the Contractor's work. The Project Manager shall determine the corrective measures, if any, required to rectify the situation after inspection of the Facilities. Decisions made by the Project Manager shall be binding on the Contractor.

54.5. Emergency Work

If, by reason of an emergency arising in connection with and during the execution of the Contract, any protective or remedial work is necessary as a matter of urgency to prevent damage to the Facilities, the Contractor shall immediately carry out such work.

If the Contractor is unable or unwilling to do such work immediately, the Employer may do or cause such work to be done as the Employer may determine is necessary in order to prevent damage to the Facilities. In such event the Employer shall, as soon as practicable after the occurrence of any such emergency, notify the Contractor in writing of such emergency, the work done and the reasons therefor. If the work done or caused to be done by the Employer is work that the Contractor was liable to do at its own expense under the Contract, the reasonable costs incurred by the Employer in connection therewith shall be paid by the Contractor to the Employer. In case such work is not in the scope of the Contractor, the cost of such remedial work shall be borne by the Employer.

54.6. Site Clearance

54.6.1. Site Clearance in Course of Performance: In the course of carrying out the Contract, the Contractor shall keep the Site reasonably free from all unnecessary obstruction, store or remove any surplus materials, clear away any wreckage, rubbish or temporary works from the Site, and remove any Contractor's Equipment no longer required for execution of the Contract.

54.6.2. Clearance of Site after Completion: After Completion of all parts of the Facilities, the Contractor shall clear away and remove all wreckage, rubbish and debris of any kind from the Site, and shall leave the Site and Facilities clean and safe.

54.7. Watching and Lighting

The Contractor shall provide and maintain at its own expense all lighting, fencing, and watching when and where necessary for the proper execution and the protection of the Facilities, or for the safety of the owners and occupiers of adjacent property and for the safety of the public.

54.8. Work at Night and on Holidays

54.8.1. Unless otherwise provided in the Contract, no work shall be carried out during the night and on public holidays of the country where the Site is located without prior written consent of the Employer, except where work is necessary or required to ensure safety of the Facilities or for the protection of life, or to prevent loss or damage to property, when the Contractor shall immediately advise the Project Manager, provided that provisions of this GCC Sub-Clause 18.8.1 shall not apply to any work which is customarily carried out by rotary or double-shifts.

Notwithstanding GCC Sub-Clauses 18.8.1 or 18.1.3, if and when the Contractor considers it necessary to carry out work at night or on public holidays so as to meet the Time for Completion and requests the Employer's consent thereto, the Employer shall not unreasonably withhold such consent.

54.9. Discom reserves right to withhold payment of the contractor for any liability put on the department due to workmen compensation Act or any other liability by any other court for the period beyond six month from the date of expiry of contract for which contractor shall give an undertaking on non-judicial stamp paper worth Rs. 500/- of Rajasthan Government. The contractor shall be solely responsible for payment of compensation to the workers in case of accident as provided by the Workmen Compensation Act.

54.10. Wherever during the operation & maintenance period, any activity which relates to installation, commissioning, testing, etc. is required relevant clauses in the Tender Document which pertain to this activity shall be made applicable.

55. Quality Assurance

55.1. To ensure that the equipment under the scope of this Contract whether manufactured within the Contractor's Works premises is in accordance with the Specification, the Contractor shall adopt suitable Quality Assurance Programme to control such activities at all points necessary.

55.2. A Quality Assurance Programme of the Contractor shall generally cover but not limited to the following.

55.2.1. His organization structure for the management and implementation of the proposed Quality Assurance Programme.

55.2.2. Documentation control system.

55.2.3. Qualification data for key personnel;

55.2.4. The 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.

55.2.5. System for shop manufacturing including process controls.

55.2.6. Control of non-conforming items and system for corrective action.

55.2.7. Control of calibration and testing of measuring and testing equipment.

55.2.8. Inspection and test procedure for manufacture.

55.2.9. System for indication and appraisal of inspection status.

55.2.10. System for quality audits.

55.2.11. System for authorizing release of manufactured product to the Purchaser.

55.2.12. System for maintenance of records.

55.2.13. System for handling storage and delivery and

55.3. A Quality Plan detailing out the specific quality control procedure adopted for controlling the quality characteristics of the product.

55.4. The Quality Plan shall be mutually discussed and approved by the Discom after incorporating necessary corrections by the Contractor as may be required.

55.5. Quality Assurance Documents

55.5.1. The Contractor shall be required to submit all the Quality Assurance Documents as stipulated in the Quality Plan at the time of Discom's inspection of equipment / material.

55.5.2. The Discom or his duly authorized representatives reserves the right to carry out Quality Audit and Quality surveillance of the systems and procedures of the Contractor's / his vendor's Quality Management and Control Activities.

SECTION - K: Special Conditions of Contract (SCC)

The following bid specific data for the Plant and Equipment to be procured shall amend and/or supplement the provisions in the General Conditions of Contract (GCC)

| Sl. No. | GCC Clause Ref. No. | Amendment/Supplement to GCC | | | | | | | | | | | | |
|---------|--|---|---|-----------|--|---|---|--|-------------------------------|---|--|--|-----------------------------|--|
| 1. | GCC 24.2 (b) & GCC 24.3 | <p>Supplementing Clause GCC 24.2 (b)</p> <p>LD for Non-Performance of the Equipment</p> <p>The guaranteed loss at rated voltage for each equipment shall be corrected in accordance with IS2026, Part-I for the purpose of comparison of guaranteed losses with measured losses for levy of liquidated damages. However, the equipment (i.e. Power Transformer/Station Transformer) under no circumstances shall be accepted if the measured losses are more than +15 percent of the guaranteed losses at rated voltage, specified in Appendix – 8 (Guarantees, Liquidated Damages for Non – Performance) to the Contract Agreement.</p> <p>In case of Distribution Transformer, the equipment under no circumstances shall be accepted if the total losses exceed the max. limit specified in Technical Specifications.</p> <p>Differential Price Factors for Liquidated Damages</p> <p>The factors and the respective Indian Rupees value per unit of differential loss (applicable for each item/unit of facilities) for purpose of calculation of liquidated damages shall be as stipulated below:</p> <table border="1"> <thead> <tr> <th>Sl. No</th> <th>Equipment</th> <th>Parameter to be taken for applying differential price factor (F)</th> <th>Value of F in Indian Rupees (applicable for each item/unit of the facilities) per unit of parameter differential per KW</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>12/10/8/6.3/5 /3.15/1.6 MVA, 33/11kV or 66/11kV, 3 ph. Power Transformer</td> <td>Differential Copper loss (KW)</td> <td>Rs. 1,18,643 /- (Indian Rupees One Lakh Eighteen Thousand Six Hundred Forty Three only)</td> </tr> <tr> <td></td> <td></td> <td>Differential Iron Loss (KW)</td> <td>Rs. 2,61,713/- (Indian Rupees Two Lakh Sixty One Thousand Seven Hundred Thirteen only)</td> </tr> </tbody> </table> <p>The amount of liquidated damages so recoverable shall be as per the aforesaid ceiling and shall not prejudice the contractor's other liabilities under the Contract in any manner. The liquidated damages for shortfall in guaranteed parameters and for delay in completion are independent of each other and shall be levied separately and concurrently.</p> | Sl. No | Equipment | Parameter to be taken for applying differential price factor (F) | Value of F in Indian Rupees (applicable for each item/unit of the facilities) per unit of parameter differential per KW | 1 | 12/10/8/6.3/5 /3.15/1.6 MVA, 33/11kV or 66/11kV, 3 ph. Power Transformer | Differential Copper loss (KW) | Rs. 1,18,643 /- (Indian Rupees One Lakh Eighteen Thousand Six Hundred Forty Three only) | | | Differential Iron Loss (KW) | Rs. 2,61,713/- (Indian Rupees Two Lakh Sixty One Thousand Seven Hundred Thirteen only) |
| Sl. No | Equipment | Parameter to be taken for applying differential price factor (F) | Value of F in Indian Rupees (applicable for each item/unit of the facilities) per unit of parameter differential per KW | | | | | | | | | | | |
| 1 | 12/10/8/6.3/5 /3.15/1.6 MVA, 33/11kV or 66/11kV, 3 ph. Power Transformer | Differential Copper loss (KW) | Rs. 1,18,643 /- (Indian Rupees One Lakh Eighteen Thousand Six Hundred Forty Three only) | | | | | | | | | | | |
| | | Differential Iron Loss (KW) | Rs. 2,61,713/- (Indian Rupees Two Lakh Sixty One Thousand Seven Hundred Thirteen only) | | | | | | | | | | | |

| Sl. No. | GCC Clause Ref. No. | Amendment/Supplement to GCC |
|---------|---------------------|--|
| 2. | Others | <p>Rating of Transformers - Standard Ratings of Distribution & Power Transformers as per IS are covered in bid documents. Transformer ratings must be confirming to IS specifications. Non Standard ratings shall not be permitted.</p> <p>The Distribution Transformers shall be BIS certified in line with Electrical Transformers (Quality Control) order, 2015 (along with its latest amendments) issued by Department of Heavy Industries, Ministry of Heavy Industries & Public Enterprise, Govt. of India.</p> <p>(i) The Bidder shall guarantee individually the no Load loss and Load loss without any positive tolerance. The Bidder shall also guarantee the total Losses (No Load + Load Losses at 75°C) at the 50% of rated load and total losses at 100% of rated shall not exceed the maximum total loss values given in Table- 3 & 9 of IS1180(Part-I):2014.</p> <p>(ii) The maximum allowable losses at rated voltage and rated frequency permitted at 75°C for 11/0.433 KV transformers be chosen as per Table-3 up to 200KVA and Table-6 for rating above 200 KVA and 6.35 KV / 240V transformers be as per table-9 for ratings 5,10,16,25 KVA as per <u>Energy Efficiency level-2 specified in IS 1180 (Part-1):2014</u> for all Distribution Transformers.</p> <p>(iii) The above losses are maximum allowable and there would not be any positive tolerance. Bids with higher losses than the above specified values would be treated as non-responsive. However, the manufacturer can offer losses less than above stated values.</p> |
| 3. | Others | <p>Performance Guarantee of major items such as Distribution Transformers and meters shall be given/ furnished by Manufacturers & shall be arranged by the Contractor directly in favour of the Discom for the period of complete O&M period of the Contract. For this purpose, Tripartite Agreement shall be executed to ensure the replacement/ repair of the guarantee period failed equipment in a time bound manner between Contractor, firm & Discom.</p> |

Annexure – I to SCC - LIST OF ELIGIBLE SCHEDULED COMMERCIAL PRIVATE INDIAN BANKS

| Sl. No. | Name of Banks |
|----------------|------------------------------|
| 1 | HDFC Bank Ltd. |
| 2 | Axis Bank Ltd. |
| 3 | Kotak Mahindra Bank Ltd. |
| 4 | Federal Bank Ltd. |
| 5 | Indusind Bank Ltd. |
| 6 | Development Credit Bank Ltd. |
| 7 | ING Vysya Bank Ltd. |
| 8 | Karnataka Bank Ltd. |
| 9 | Karur Vysya Bank Ltd. |
| 10 | Ratnakar Bank Ltd. |
| 11 | South Indian Bank Ltd. |
| 12 | Yes Bank Ltd. |
| 13 | ICICI Bank |
| 14 | IDFC Bank |

SECTION - L: Detailed Scope of Work

In addition to the summary scope of work mentioned in Section E, & Details as mentioned in the GCC in Section J, SCC in Section K and Detailed Technical Specification in Section P the section wise scope of works have been covered as under:

- New 33 kV Lines
- New 33/11 kV Power Station
- New 11 kV Lines
- DTR Sub-stations
- Metering

Discom has decided to place orders of under this tender excluding Meters which will be issued as "Free Issue Item". The technical specification for all items including high value items as per latest MM specifications approved by Discom will be considered for this Tender.

Free Issue Items

- i. The Discom shall provide meters as Free Issue Items to Contractors.
- ii. However the Discom may provide any item as free issue item besides items mentioned in the bidding document for which erection charges will be paid as per contract.

The scope of works also include Detailed Technical Specifications enclosed at Section P.

A. New 33 KV Lines

1.00 Survey

Mapping of route of proposed new 33 kV line shall be done by foot survey and single line diagram shall be prepared on AutoCAD with mentioning GPS coordinates on political map with fair correctness. While surveying, existing electrical infrastructure in the locality should also be mapped. This SLD on political map with GPS coordinates shall be approved by Project Manager and shall be used as basic document for assessment of works under the contract. On completion of line work, as built Single Line Diagram on AutoCAD with GPS coordinates and pole wise line diagram showing pole wise materials used and pole-to-pole span should also be submitted to Project Manager. These details shall be used as reference documents by Quality and Quantity Inspecting officials to execute inspection works.

2.00 Support (pole):

9.0 meter 200/400 Kg. PCC Poles as per AVVNL practice in rural areas shall be utilized. Before shifting to site for erection, poles shall be offered for inspection and approval by Project Manager.

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.

Items shall be offered for inspection and approval by Project Manager.

4.00 Hardware:

MS Nuts, bolts and washers – 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.. Before shifting them to site for erection, they shall be offered for inspection and approval by Project Manager.

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. GI Earthing spike made of 20mm solid
- b. 6 SWG GI wire for earthing and guard

Continuous earth wire of 6 swg GI wire shall run for guarding and 3 earthing rod of 20mm dia / one km of 33 kV line support shall be provided and its earth connection shall be done with 6 SWG GI wire.

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 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 Conductors:

Following ACSR Conductors is envisaged for new 33 kV lines:

- a. 6/4.72 mm+7/1.57 mm (100 mm² Al. Area) – Dog

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, Project Manager 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 of size 200X250 mm with pole clamps as per approved drawing. Danger board should be in bi-lingual languages (local language and English).

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 Project Manager. 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 except to PCC poles.

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 Project Manager. 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.

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,
- 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 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 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 Project Manager and compensation shall also be paid by the Project Manager. Necessary fee if required to pay to Govt. dept. for arranging such clearances shall paid by Project Manager. However, the contractor would require to provide all necessary assistance for execution of this work.

17.00 Statutory clearances:

During execution of 33 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.

B. Deleted**C. New 33/11 kV Power Station**

1.00 Electrical 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 |
|----|-----------------------------|----------|--------------------------|-----------------|--|
| | | | | | |
| | | | | | |
| | | | | | |

2.00 Following works are in the scope of Employer and shall be executed by 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 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.

Since above works are not covered under substation works, Employer/Owner shall provide all above input before start of substation work by 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 Project Manager and authorized representative of Contractor.

3.00 Types 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, feeder metering equipment & 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, feeder metering equipment, 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 9 meter 400 and 200 Kg. PCC poles as per Discom's practice.

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.

Transformer foundations shall be designed by Contractor considering manufacturer's recommendations. Cement concrete including reinforcement steel shall be used for the foundation. Project Manager 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 M.S 50x6 mm flat iron 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. And, two body earth connections shall be provided through M S flat iron 50X6 mm .

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 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 out door Vacuum Circuit Breakers shall be used for protection and control of power circuits. Control panels shall be installed indoor type. 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 Contractor for approval of Project Manager before commencing the work.

Cement concrete including reinforcement steel shall be used for the foundation. Project Manager 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. Project Manager 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 shall be provided of 10mm dia.

6.00 Station Transformer:

25 KVA, aluminium wound, 11/0.4 KV Station Transformers shall be installed on DP structure made of PCC pole of 8 meter long. Outdoor type Distribution Box for station transformer shall be comprising of 63 Amp. switch fuse unit, 2 Nos 32 A SP MCCB, 3-ph, 32A, contactor controlled yard lighting timer unit, three phase 10-60 Amp whole current push fit electronic energy meter. 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, 11 KV AB Switch and 11KV DO Fuse.

7.00 Gantry structures:

33 KV and 11 KV yard shall be framed through 9 and 8 meter PCC poles as per approved drawing of AVVNL.

8.00 AC Distribution board (ACDB)

415 Volts, ACDB 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, 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. ~~Deleted~~
- 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)
 - 3.5Cx70mm² (between 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 Su 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 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 Deleted Capacitor banks:~~

14.00DC 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.

15.00Station 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 Project Manager. 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 Project Manager 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,

16.00Outdoor 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 Project Manager.

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 owner. 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 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 Project Manager 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 project manager.

20.00Yard 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) 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.

21.00ACSR Conductor:

Following ACSR conductors are envisaged for bus bars, jumpers, droppers:

- a. 6/4.72 mm + 7/1.57 mm (100 sqmm Dog 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 aluminum grade T-1F as per IS – 8309 having good electrical quality aluminum 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 Deleted:~~

~~24.00 Deleted:~~

25.00 Yard Earthing:

Yard Earthing shall be provided with GI solid rod 20 mm dia and 50x6mm MS flat forming earth mat. 50x6mm MS flat iron shall be used for earth-riser. Project Manager 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 |

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 MS flat. Connections of other equipments may be provided with 8 SWG GI wire or GI Stay wire as per approval of Project Manager. Following arrangements are envisaged for earth connection:

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.

GI flats and GI wires must be properly dressed, bundled and fixed on supporting structure at 1 to 2 feet intervals.

26.0033 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 Project Manager 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.

27.00 Fabricated steel items:

Fabricated steel structure items DC cross arm, clamp, 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 shall 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.

Items shall be offered for inspection and approval by Project Manager.

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 Project Manager.

29.00 Fire Protection System:

Fire Buckets filled with sand: The fire buckets conforming 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.

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.

Project Manager 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 owner 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.

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, Project Manager 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 owner 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 owner without any extra cost to the Owner. The Contractor shall arrange all instruments required for conducting these tests along with calibration certificates and shall furnish the list of instruments to the Owner for approval. Detail test certificates duly signed by Employer'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 Project Manager 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 Employer.

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 point M below.**

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. Project Manager shall approve foundation designs.

41.00 Basic Reference Drawings:

The reference drawings, which are indicative of the type of specifications owner 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 owner.

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 Owner 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 Owner and shall be finalized after mutual discussions.

D. 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 Project Manager 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 Project Manager. 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 project manager who will take a decision for feeder separation works.

2.00 Support (pole):

9 meter PCC poles are envisaged as support for 11 KV overhead line in rural areas.

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.

Items shall be offered for inspection and approval by Project Manager.

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 Project Manager.

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) 3 meter long GI Earthing spike made of 20mm solid rod
- b) Chemical rod earthing including electrode, chemical, with 2000mm long, 50 mm diameter GI pipe, GI Strip of 24x3mm minimum in hard rock locations only.
- c) 8 SWG GI wire for earthing and guarding

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. Project Manager 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 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 are envisaged for new 11 kV lines:

- a) 6/2.59 + 1/2.59 mm (30 mm² Al. Area) – Weasel for single phase lines.
- b) 6/3.35 + 1/3.35 mm (50 mm² Al. Area) – Rabbit for three phase lines.

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.

9.00 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 Project Manager. 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, Project Manager 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:

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-Beam & Tubular poles. Prior approval of Project Manager 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 Project Manager. 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.

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 lightning 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

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 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 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 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 the Project Manager and compensation shall also be paid by the Project Manager. Necessary fee if required to pay to Govt. dept. for arranging such clearances shall paid by Project Manager. However, the contractor 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.

E. Distribution Transformer Substations

1.00 Survey of Distribution Transformer Substations:

A detailed survey of existing habitation/village shall be performed in presentable document showing population residing in the un-electrified area/existing electrified area of habitation/ village, 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, Project Manager shall decide type, capacity and location of Distribution Transformer sub-station.

2.00 9/8 meter 200 kg PCC Poles as per AVVNL practice in rural areas, are envisaged as Substation support for 11/0.4 or 11/0.25 KV Distribution Transformers

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.

Before shifting to site for erection, items shall be offered for inspection and approval by Project Manager.

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. Before shifting them to site for erection, they shall be offered for inspection and approval by Project Manager.

5.00 Stay Set:

Galvanized Stay Set with 50x6 mm stay clamp, guy insulator , anchor plate (200x200x6mm), nut-bolts, 1 Nos turn-buckle, 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. 1 Nos. guy insulator shall be provided in 7/3.15 mm dia stranded GI wire at middle locations between one turn buckles.

6.00 Distribution Transformer:

Following type and sizes of 3 star rated {as per Bureau of Energy Efficiency (BEE)}, distribution transformers shall be utilized in the DDUGJY project:

- a) 11/0.230 kV 16 KVA 1 phase Aluminium wound DTR
- b) 11/0.4 KV 40 KVA 3 phase Aluminium wound DTR
- c) 11/0.4 KV 63 KVA 3 phase Aluminium wound DTR

The Distribution Transformers shall be 11/0.4 KV or 11KV/230 V non-sealed type BEE specified 3 Star Distribution Transformers. The transformers shall be double wound, three phase, CRGO M3 Grade (0.23mm) or better (The core shall be constructed from high grade, non-ageing, Cold Rolled Grain Oriented (CRGO) silicon steel of M3 Grade (0.23mm) laminations only. PRIME CORE M3 Grade (0.23mm) materials are to be used for transformers core..

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. Project Manager shall select samples from the core laminations and get the same tested in CPRI/ 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.

3 STAR LEVEL: Each Distribution Transformers must contain 3 Star Label with style and information provided by the Bureau of Energy Efficiency (B.E.E), Ministry of Power, Government of India.

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 Project Manager.

7.00 ACSR Conductor:

ACSR Weasel conductor is to be used for connection between overhead lines to transformer studs/bushing.

8.00 Distribution box and Power Cabling:

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 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, 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, 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 and 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:

The single core un-armored power cables shall be used for connection from Distribution Transformer to Distribution Box and 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.

1.1 KV LT AB cable XLPE Aluminium Conductor armored cable of size 3x25+1x35+1x16 shall be used for connection of transformer LV bushing to Distribution Box and Distribution box to overhead line.

9.00 Earthing:

Distribution Transformer earthing shall be done by using 3 nos. 20mmdia GI earthing rods which shall be buried in earth below 0.5 meter ground and shall be connected to body/neutral/LA by 8 SWG GI wire for making earthing connections. Nuts, bolts and washers must be used at all earthing connection joints.

Substation wise measurement of earth resistance of earth pits / mesh and corresponding drawing of existing earthing arrangement shall be recorded and submitted to Project Manager.

Following arrangement is envisaged for various equipment of distribution transformer substation:

- | | |
|---|-------------------|
| a) Transformer Neutral (Two distinct connections) | : GI wire 8 SWG |
| b) Transformer Body | : GI wire 8 SWG |
| c) Lightning Arrester | : : GI wire 8 SWG |
| d) Fencing (Wherever required) | : GI wire 8 SWG |
| e) LT Distribution Box (Two distinct connections) | : GI wire 8 SWG |
| f) AB Switch handle | : GI wire 8 SWG |
| g) Steel structure of substation | : GI wire 8 SWG |
| h) 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. Project Manager shall decide type of earthing pits.

10.00 Metering of DTR:

Single phase or three phase metering of DTR shall be provided. The meter shall be installed in a metallic enclosure. Enclosure shall be earthed at two locations. The meter board shall be provided with push-and clamp type terminals. All CT terminals are to be provided with ring type lugs. Meter shall be tested before installation as per prevailing practice Employer. There would be no testing charges levied by Employer for testing of meters in their authorized laboratories, if facilities are available. In case of CT operated meter, metallic LTCT cum Meter box shall be provided at working height.

Upto 25 KVA transformers, meter shall be installed in distribution box. For transformer capacity 63 KVA and above, LTCT-cum-meter box shall be installed at working height on substation support.

11.00 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.

12.00 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, Project Manager shall approve type and brand of enamel paint.

13.00 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.

14.00 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.

15.00 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 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 Project Manager. 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.

16.00 11 kV, 100 A, drop out cum isolator with 12 KV post insulators

11 kV, 3-ph, 100 A, drop out cum isolator with 12 KV post insulator for three phase transformers and 11 KV single phase 100 A drop out isolator with 12 KV post insulators for single phase transformers shall be utilized for isolation and protection purpose of transformers. These drop out cum isolator shall be of Vertical Mounting type... 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.

17.00 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.

18.00 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. 8 swg GI wire shall be used for earth connection.

F. Deleted

G. Deleted

H. Deleted

I. Feeder Metering (in existing substations):

The meters shall be procured by the Discom. Supply and erection of meter Box as well as other accessories shall be under the scope of contractor including erection of meters provided by DISCOM/Power Department. Taking delivery of meters from DISCOM/Power Deptt. stores, loading, transportation, unloading at site etc shall be under the scope of contractor. The size of meter shall be provided by the Project Manager.

- 1.00 In existing substations, feeder metering shall be provided through two composite items. Payments against supply and erection shall be released on completion of supply as well as erection works as per composite item-wise scope as under:

a.—Deleted

- b. 11 KV Feeder Metering - Under this composite item, all required works like supply & erection of outdoor oil immersed type metering equipment comprising of 11 kV/110 V, 3 ph 4 wire CT ratio 300-150/5A including supporting steel fabricated structure, earthing coil, 2Cx2.5 sqmm copper control stranded unarmoured cable, 16 mm dia nuts & bolts, danger board, 8 SWG GI earth wire etc. The meter shall be provided by the employer.

2.00 Metering Equipment:

Following two types of metering equipment are envisaged in the work comprising of:

a.—Deleted

- b. 11 kV/110 V Metering Equipment (CTPT Unit) with CT of ratio 300-150/5 A

- 3.00 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.

- 4.00 Fabricated steel items for mounting of metering equipment and meter-cum-meter box 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.

Fabricated steel structure items shall be hot dip galvanized and cleaned till good surface finish The minimum coating of the zinc shall comply with IS: 2629 and IS: 2633 (with

latest amendments). Galvanizing shall be checked and tested in accordance with IS: 2633. Items shall be offered for inspection and approval by Project Manager.

5.00 Hardware:

MS Nuts, bolts and washers (Galvanized) – 16 mm dia nuts, bolts & washers shall be used for tying of above steel overhead structure items.

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 Project Manager.

6.00 Earthing:

Following earthing arrangements are envisaged for feeder metering equipment:

- 1.1. GI Earthing spike made of 20mm solid rod or 8 SWG earthing coil
- 1.2. Chemical rod earthing including electrode, chemical, with 2000mm long, 50 mm diameter GI pipe, GI Strip of 24x3mm minimum in hard rock locations only.

a. 8 SWG GI wire for earthing

Each 11 kV or 33 kV metering equipment 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.

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, bundled and fixed on supporting structure at 1 to 2 feet intervals.

Project Manager shall decide use of chemical earthing or GI Earth Coil or 20mm dia GI Solid Rod for individual pole earthing.

7.00 Meter-cum-meter box and Control Cabling:

Meter-cum-meter box are to be installed on support gantry structure of substation 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 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 should be provided of 10mm dia.

8.00 Meter identification :

Each 33 kV/ 11 kV meter box shall be 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, Project Manager shall approve type and brand of enamel paint.

9.00 Danger board:

Each 33 kV/ 11 kV meter box shall be provided with a danger board 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.

J. Deleted**K. DISTRIBUTION TRANSFORMER / STATION TRANSFORMER METERING**

The energy meters shall be procured by the Discom. Supply and erection of meter Box as well as other accessories shall be under the scope of contractor including erection of meters provided by DISCOM/Power Department. Taking delivery of meters from DISCOM/Power Deptt. stores, loading, transportation, unloading at site etc shall be under the scope of contractor. The size of meter shall be provided by the Project Manager.

1.00 Existing Distribution Transformer shall be metered on LT side as per following arrangement:

- a) Whole current meter for three phase 16 KVA transformer
- b) Whole current meter for three phase 25 KVA transformer
- c) CT operated meter for three phase 63 KVA transformer

2.00 The metering shall be of two types:

- a. For transformer upto and including 25KVA transformers: Meter shall be installed inside the distribution box. The existing power cables shall be routed through the meter.
- b. For transformer of capacity 63KVA, separate LT CT cum Meter box shall be installed and existing power cables shall be routed through CTs.

3.00 Meter shall be HT tri-vector DLMS compliant category suitable for DTR substation metering. Meter shall be 3 ph 4 w 110 V 5 A accuracy class 0.2s with GSM (GPRS compatible) modem.

4.00 Fabricated steel items for mounting of meter-cum- distribution box, LTCT box 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.

Items shall be offered for inspection and approval by Project Manager.

5.00 Hardware:

MS Nuts, bolts and washers (Galvanized) – 16 mm dia nuts, bolts & washers shall be used for tying of above steel overhead structure items.

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.

Before shifting them to site for erection, they shall be offered for inspection and approval by Project Manager.

6.00 Meter-cum-Distribution box, LTCT cum Meter box and Control Cabling:

Meter-cum-Distribution box, LTCT cum Meter box are to be installed on substation support. 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 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.

Meter-cum-Distribution box / LTCT cum Meter box are to be earthed using 8 SWG GI wire direct connection to the earthing. 2 Nos Earthing bolts on the Meter-cum-Distribution box/ LTCT cum Meter box should be provided of 10mm dia. Meter-cum-Distribution box/ LTCT cum Meter box identification.

7.00 Labelling:

Each Meter-cum-Distribution box/LTCT cum Meter box shall be 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 erection. Base painting and marking of digits should be performed by a skilled and trained painter using branded enamel paint, Project Manager shall approve type and brand of enamel paint.

8.00 Danger board:

Each Meter-cum-Distribution box/LTCT cum Meter box shall be provided with a danger board 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.

L. Deleted

M. Deleted

N. Deleted

O. Deleted

P. Testing during pre-commissioning and post commissioning

1.00 Type Test, Routine and Acceptance Tests:

All equipment with their terminal connectors, control cabinets, main protective relays, etc. as well as insulators, insulator strings with hardware, clamps and connectors, marshalling boxes, etc., shall conform to type tests and shall be subjected to routine and acceptance tests in accordance with the requirements stipulated under respective equipment sections.

Contractor shall submit all type test reports/certificates according to the relevant standards and/or specifications for all the equipments/material for Owner's review as a proof of their conformity to type tests along with a certificate regarding conformity of equipments to be supplied with the type test.

The test certificates submitted shall be of the tests conducted within 5 years prior to the date of bid opening. In case the test reports are of the tests conducted earlier than 5 years prior to the date of bid opening, or they do not meet the requirements of the specifications/relevant standards, or they are not available, the Contractor shall conduct these type test(s) under this contract at no extra cost to the Owner.

The Owner will have the right of getting any test of reasonable nature carried out on any component or completely assembled equipment at Contractor's premises or at site or in any other place in addition to the aforesaid type and routine tests, to satisfy that the materials/equipment comply with the specifications.

Failure of any equipment to meet the specified requirements of tests carried out at works or at site shall be sufficient cause for rejection of that equipment lot. Rejection of any equipment lot will not be held as a valid reason for delay in the completion of the works as per schedule. Contractor shall be responsible for removing all deficiencies, and supplying the equipment that meet the requirement.

Test results / Test reports of various tests performed under this contract shall be furnished by the agency in two copies signed jointly by agency and representative of Project Manager along with a soft copy in excel file in the office of Employer.

2.00 General Checks:

- i. Check for physical damages.
- ii. Visual examination of zinc coating/ painting.
- iii. Check from name plate that all items are as per order/ specification.
- iv. Check tightness of all bolts, clamp and connecting terminals using torque wrenches.
- v. For oil filled equipment check for oil leakage, if any. Also check oil level and top up.
- vi. Check ground connections for quality of weld and application of zinc rich paint over weld joint of galvanized surfaces.
- vii. Check cleanliness of insulator and bushings.
- viii. All checks and tests specified by the manufacturers in their drawings and manuals as well as tests specified in the relevant code of erection.
- ix. Visual examination of labelling, danger board, anti-climbing device, muffing, painting, tension on stay wires, straightening of poles, alignment of line/supports etc

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 Project Manager 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.

3.00 Power Transformer:

- i. Check for Vector group.
- ii. Checking for transformation ratio.
- iii. Checks for winding resistances,
- iv. Insulation resistance of windings, live parts, transformer oil,
- v. Operation of WTI, OTI, Buchholtz relays,
- vi. Calibration of OTI & WTI,
- vii. Functional checking for tripping of transformer on field inputs,
- viii. Transformer oil testing - BDV
- ix. Visual examination of statutory clearances
- x. Visual examination of earthing connections
- xi. Measurement of earth resistance of individual earth pit
- xii. Visual examination of termination of wires and cables
- xiii. Visual examination of Oil leakage in power transformer
- xiv. Visual examination of breather, filling of oil and silica gel in breather of power transformer

- xv. Visual examination of two separate earth connection to neutral bushing of power transformer
- xvi. Visual examination of valves between transformer tank and breathers
- xvii. Checking of transformer oil in conservator tank
- xviii. Visual examination of explosion vent

4.00 Circuit Breakers:

- i. Insulation resistance of each pole.
- ii. Check adjustment, if any, suggested by manufacturer.
- iii. Breaker closing and tripping time.
- iv. Slow and power closing operation and opening.
- v. Trip free and anti-pumping operation.
- vi. Minimum pick up volts of coils
- vii. Contact resistance.
- viii. Interlock with other breakers/circuits,
- ix. Functional checking of all accessories.
- x. Functional checking of control circuits, interlocks, tripping through protective relays and auto-reclose operation.
- xi. Insulation resistance of control circuits, motor etc.
- xii. Resistance of closing and tripping coils.

5.00 Isolators:

- i. Alignment,
- ii. Insulation resistance of each pole.
- iii. Manual and electrical operation on interlocks.
- iv. Insulation resistance of control circuit and motors.
- v. Ground connections
- vi. Contact resistance
- vii. Proper alignment to minimize the vibration to the extreme possible during operation.
- viii. Measurement of operating torque for isolator and earth switch
- ix. Resistance of operating and interlocking coils.

6.00 Current Transformers:

- i. Insulation Resistance Test
- ii. Polarity test.
- iii. Ratio identification test-checking of all ratios on all cores by primary injection of current.
- iv. Dielectric test of oil (Wherever applicable)
- v. Magnetizing characteristics test.

7.00 Voltage Transformers:

- i. Insulation resistance test
- ii. Polarity test.
- iii. Ratio test
- iv. Dielectric test of oil (if applicable)

8.00 Surge Arrester

- i. Grading leakage current
- ii. Resistance of ground connection

9.00 Phasing Out

The phasing out of all supplies in the Sub-station system shall be carried out.

10.00 Station Earthing

- i. Check soil Resistivity
- ii. Check continuity of grid wires
- iii. Check earth resistance of the entire grid as well as various sections of the same.
- iv. Check for weld joint and application of zinc rich paint on galvanized surface.
- v. Dip test on earth conductor prior to use.

11.00 Conductor Stringing and Power Connectors

- i. Physical check for finish
- ii. Electrical clearance check
- iii. Testing of torque by torque wrenches on all bus power connectors and other accessories.
- iv. Milli volt drop test on all power connectors
- v. Sag and tension check on conductors.

12.00 Insulators

- i. Visual examination for finish damage, creepage distance, etc.
- ii. Insulation resistance

13.00 33 kV & 11 kV Line testing

- i. Visual examination of statutory clearances
- ii. Visual examination of earthing connections
- iii. Measurement of earth resistance of individual earth pit
- iv. Checking of sag chart
- v. Visual examination of tensioning of wires, evenness of sag
- vi. Visual examination of straightening of individual pole
- vii. Visual examination of painting of support and fabricated items
- viii. Insulation resistance of line conductor
- ix. Visual examination of labelling, danger board, anti-climbing device, muffing
- x. Visual examination of unguarded road/line crossings
- xi. Visual examination of alignment of lines
- xii. Visual examination of position correctness of pre-fabricated items
- xiii. Visual examination of tightness and tidiness of stays

14.00 Distribution Transformer substation testing

- i. Visual examination of statutory clearances
- ii. Visual examination of earthing connections for tightness and tidiness
- iii. Measurement of earth resistance of individual earth pit
- iv. Visual examination of termination of wires and cables
- v. Visual examination of operation of AB switch and DO fuse units
- vi. Visual examination of straightening of individual substation pole, composite DP structure
- vii. Visual examination of painting of support and fabricated items
- viii. Insulation resistance of transformer and distribution board
- ix. BDV test of transformer oil
- x. Visual examination of Oil and silica gel leakage in distribution transformer
- xi. Visual examination of breather, filling of oil & silica gel in breather of distribution transformer

- xii. Visual examination of two separate earth connection to neutral bushing of distribution transformer
- xiii. Testing and recording of LV voltages (Ph-Ph and Ph-N) after commissioning of distribution transformer
- xiv. Testing and recording of neutral current after commissioning of distribution transformer
- xv. Checking of transformer oil in conservator tank
- xvi. Visual examination of valves between transformer tank and breathers
- xvii. Visual examination of labelling, danger board, anti-climbing device, muffing
- xviii. Visual examination of tightness and tidiness of stays

15.00 LT Line testing

- i. Visual examination of statutory clearances
- ii. Visual examination of earthing connections for tightness and tidiness
- iii. Measurement of earth resistance of individual earth pit
- iv. Checking of sag for evenness of sag
- v. Visual examination of tensioning of cables and wires
- vi. Visual examination of straightening of individual pole
- vii. Visual examination of painting of support and fabricated items
- viii. Insulation resistance of line conductor/ABC conductor
- ix. Visual examination of labelling, danger board, anti-climbing device, muffing
- x. Visual examination of alignment of line
- xi. Visual examination of tightness and tidiness of stay sets

Q. 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, metering, 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 Employer.

The work shall be carried out according to the design/drawings to be developed by the Contractor and approved by the Project Manager based on Tender Drawings Supplied to the Contractor by the Project Manager 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 Project Manager. Certain minimum requirements are indicated in this specification for guidance purposes only.

All the work shall be carried out as per latest edition of the corresponding Indian Standard Codes.

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.

2.00 Site Preparation

The Employer shall be responsible for proper leveling of switchyard site as per layout and levels of switchyard finalised during detailed engineering stage. The Employer 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 Project Manager. The Contractor shall give all help in instruments, materials and personnel to the Project Manager 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 Employer. 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 strengthened, 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.

3.00 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 access 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 Project Manager.
2. Limit state method of design shall be adopted unless specified otherwise in the specification.

The key civil work activities as mentioned in the Price BOQ are mentioned below are required to be executed by Contractor:

| S.No. | Work Particular |
|-------|---|
| A | Part A (Building Work) |
| 1 | Earth work in excavation in foundation trenches or drains including dressing of sides and ramming of bottoms, lift up to 1.5 Mtr. Including taking out the excavated soil and depositing and refilling of jhiri with watering & ramming and disposal of surplus excavated soil as directed with in a lead of 50 meter. All kind of soil |
| 2 | P & Laying in position cement concrete including curing, compaction etc. complete in specified grade excluding the cost of centering and shuttering-all work up to plinth level.1:4:8(1 cement: 4 coarse sand: 8 graded stone aggregate 40 mm nominal size). |

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| 3 | Random Rubble stone masonry for foundation and plinth in Cement sand mortar above 30cm thick wall in :Cement Mortar 1:6 (1-cement:6 sand) |
| 4 | P & F in position specified grade of cement concrete for all RCC structural elements upto plinth level including curing, compaction, finishing with rendering in cement sand mortar 1:3 (1 cement: 3 coarse sand) and making good the joints excluding the cost of centering, shuttering and reinforcement. M20 grade Nominal Mix (with graded stone aggregate 20mm nominal size). |
| 5 | Centering and shuttering with plywood or steel sheets including strutting, propping bracing bothways and removal of formwork for foundation inbasement, rafts, footing, strap beam, bases of columns etc upto plinth level. |
| 6 | Random Rubble stone masonry for superstructure above plinth level one storey height above 30cm. Thick walls in :Cement Mortar 1:6 (1-cement:6 sand).Add extra for wall upto 30 cm. and less thickness. |
| 7 | Add extra for Pillar masonry including bed plates as per specifications. (Bed plates to be paid separately). Upto 90 cm length and all sides are free |
| 8 | P & laying in position specified grade of cement concrete for RCC structural elements upto floor three level including curing, compaction, finishing with rendering in cement sand mortar 1:3 (1 cement :3 coarse sand) and making good the joints excluding the cost of centering, shuttering and reinforcement for:- Beams, suspended floors, roofs, grids having slopes up to 15°, landings, balconies, shelves, chajjas , lintels, bands, plain windows sills, staircases and sprial staircases M20 grade Nominal Mix. |
| 9 | Centering and shuttering with plywood or steel sheets including strutting, propping bracing bothways with wooden members and and removal of formwork for upto floor three level for: Suspended floors, roofs landings staircases, balconies, girders, cantilevers, bands, coping bed plated, anchor blocks, sills, chhajjas, lintel, beam etc. |
| 10 | Providing and fabricating reinforcement using steel of SAIL/VIZAK-RINL/ TATA TISCON/ ESSAR/ ZINDAL VIJAINAGAR IS :1786-1989 for R.C.C. work including straightening, cutting, bending, placing in position and binding (including cost of binding wire) all complete up to floor three levels. hot rolled deformed bars (IS: 1139) |
| 11 | P & F steel glazed doors windows and ventilator shutters of standard rolled steel section joints mitred and welded with steel lugs 13x3mm, 10cm long embedded in cement concrete block 15x10x10cm of 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20mm nominal size) or with wooden plugs and screws or rawl plugs and screws with fixing clips or with bolts and nuts as required including providing and fixing of pin added glass panes 4mm thick with cooper glazing clips and special metal sash putty of approved make or metal beading with screws complete including priming coat of approval steel primer, excluding the cost of metal beading and other fittings except necessary hinges of pivots steel handles peg stay etc. as required Windows side hung (openable). |
| 12 | S & F fixed wire gauge of 14 mesh X 24 gauge to the metal frame of rolled section by metal beading 20x3mm with suitable screw at not exceeding 150mm distance. |
| 13 | P & F square bars or other flat welded to window, ventilators etc. |
| 14 | Brick work in partation in super structure upto third storey 7 cm thick (brick on edges) using bricks of class designation 75 in Cement mortar 1:6 (1 cement : 6 coarse sand) |
| 15 | P & FT -iron frames for doors, windows and ventilators and mild steel Tee-sections, joints mitred and welded with 15x3 mm lugs 10cm long embedded in cement concrete blocks 15x10x10 cm of 1:3:6 (1 cement:3coarse sand:6 graded stone aggregate 20mm nominal size) or with wooden plugs and screws or rawl plugs and screws or with fixing clips or with bolts and nuts as require including fixing of necessary butt hinges and screws and applying a priming coat of approved steel primer. |
| 16 | P & F precast cement concrete coping 1:2:4 mix 50mm thick complete as per specification: ---50 mm- |
| 17 | Grading for roof water proofing treatment with cement concrete 1:2:4 (1cement: 2coarse sand : 4 graded stone aggregate 20mm nominal size) |
| 18 | Providing batta (gola) 75mm x 75mm in cement concrete (1:2:4) including finishing with cement mortar 1:3 as per standard design. |
| 19 | S & F in walls machine cut and polished stone shelves, tands and sills in CM 1:3 with machine cut edges :Kota stone 25 to 30mm thick. |
| 20 | Plaster on new surface on walls in cement sand mortar 1:6 including raking of joints etc. complete fine finish 20mm thick. |
| 21 | Making grooves as per design in plaster in plaster 10mm to 20mm wide. |
| 22 | P & F rigid PVC pipe (IS:4985 mark) class II/ (4Kg./Cm2) approved quality/ make including joining the pipe with solvent cement rubber ring and lubricant. 110 mm dia |

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| 23 | Polished Blue Kota Stone flooring skirting, laid over 20 thick base of C.M. 1:4 and jointed with grey cement slurry to match the shade of the slab including rubbing and polishing complete: For area of each slab from 2001 to 5000 Sq. Cm :25mm thick slab. |
| 24 | P & F external grade board solid core single leaf flush door shutters ISI: 2202-67 marked using Phenol formal dehyderesin in glue both sides with approved steel fittings complete as per Annexur 'A': 30 mm thick Commercial Veneer both side |
| 25 | P & F external grade board solid core double leaf flush door shutters ISI: 2202-67 marked using Phenol formal dehyderesin in glue both sides with approved steel fittings complete as per Annexur 'A': 30 mm thick Commercial Veneer both side |
| 26 | P & F 1st quality standard white, grey, ivory, fume red brown, light green, light blue and other light shades glazed tiles ISI marked [IS: 13753] of size 300mm x 200mm in walls, floors, steps, pillars etc. laid on a bed of neat cement slurry finished with flush pointing in white cement mixed with pigment to match the shade of tile complete (excluding the cost of cement plaster on walls and pillar).Category-A: Kajaria, Jhonson, Somani make. |
| 27 | P & F 1st quality MAT finished ceramic tile size 300x300mm comfirming to IS: 13753 colour such as white, grey, ivory, fume red brown, light green, light blue and other light shades in floors, steps, pillars etc. laid on a bed of neat cement slurry including nicely finished joints using water proof joint filler powder (Untile or Roffe make) & finishing with flush pointing in white cement mixed with pigment to match the shade of tile complete (including the cost of cement mortar bed 1:4) Category-A: Kajaria, Jhonson, Somani make. |
| 28 | White washing with lime to give an even shade including all scaffolding: New work (Three or more coats.) |
| 29 | Structural steel work in single sections without connecting plate including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete above plinth level upto 4.5 mtr height.In flats, tees, angles and channels. |
| 30 | Finishing wall with water proofing cement paint of approved brand and manufacture and or required shade to give an even shade including all scaffolding: New Work (three or more coats) |
| 31 | Painting with enamel paint of approved brand and manufacture to give an even shade: Two or more coats on new work |
| 32 | Plaster on new surface on wall in cement sand mortar 1:4 including raking of joints etc. complete fine finish :12mm thick. |
| 33 | Cement concrete flooring grade 1:2:4 (1-cement : 2-coarse sand : 4-graded stone aggregate) rounding off edges etc. but excluding the cost of nosing of steps etc. complete:75mm thick with 20mm thick nominal size aggregate. |
| 34 | P & F M.S. sheet single leaf door shutter in angle iron frame 35x35x5mm suitably diagonally braced with 25x3mm flat iron above and below lock rail of size 50x5mm beading extra including all fittings, as per direction of Engg. incharge but excluding cost of chowkhats: including two coats of anti-corrosive red oxide primer paint.M.S. sheet 20 S.W.G. |
| B | Sanitary Work |
| 1 | P & F Indian type white glazed vitreous china 1st quality W.C. orissa pan (I.S.: 2556 Mark) with 100 mm vitreous china P or S trap including cutting and making good the wall and floor: Size 580 x 440 mm. |
| 2 | P & F WVC wash basin (1st quality, E.S. : 2556 Mark) of approved make with C.I brackets duly painted, 1 No. 15mm C.P. Pillar cock (I.S.: 8934 Mark) & 32mm. C.P. brass waste coupling of approved make, 25mm G.I. waste pipe complete including cutting & making good the wall Size 510mm*400mm |
| 3 | P & F Looking Mirrors with P.V.C frame of approved (Atul/equivalent) Size 500*400mm |
| 4 | P & F Towel Rail or Ring of approved quality/make: C.P. Brass Towel Ring revolving type |
| 5 | P & F Flush Cock / Flush Valve (IS : 9758 Mark) for WC of approved quality make: Brass/ Gun metal Half-turn wt.1kg. Of approved quality/ make, 25mm nominal bore. |
| 6 | P & F Full-way Valve (IS:778 Mark) or wheel valve of approved make: (a) Gun-metal 15mm nominal bore. |
| 7 | P & F Full-way Valve (IS:778 Mark) or wheel valve of approved make:do...25mm nominal bore. |
| 8 | P & F PVC Storage Tank (IS : 12701marked indicating the BIS license No.). Of approved make with cover, 25mm dia IM long G.I. over-flow pipe & 25 G.I. Over-flow pipe & 25 Cm. long wash out pipe with plug & socket, including making connection etc., complete of approved design.:300 (do-) |
| 9 | P&F Grating of approved quality/ make: Stainless Steel Sheet size 125mm dia. |

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| 10 | P & F Bib Cock (IS : 8931 Mark), Superior quality of approved make(a) :CP Brass Bib cock,15 nominal bore. |
| 11 | P & F Bib Cock (IS : 8931 Mark), Superior quality of approved make (b) :CP Brass Bib cock long body ,15 nominal bore weight not less then 690 gram. |
| 12 | P & F 15 mm. dia Connection pipe of aproved quality/make:450mm. |
| 13 | P & F Inlet Connection (angle valves) Superior quality, of approved make for Wash basin, Gyser etc.C.P. Inlet connection 15mm. Brass (IS: 8931 marked) |
| 14 | P & F Ball Cock (IS:1703 Mark) with Rod & P.V.C Ball complete:Bass wt.400 gm, 15mm. |
| 15 | Providing & fixing S.W. square mouth Gully trap 'A' grade (ISI marked) of approved make & design in existing man-hole.Size 100 * 100mm |
| 16 | P & F G.I. pipes (Internal Work) with G.I fittings (IS:1239) & MS clamps including cutting and making good the walls and floors exposed on walls (a) 15 mm dia nominal bore-"B" Class |
| 17 | P & F G.I. pipes (Internal Work) with G.I fittings (IS:1239) & MS clamps including cutting and making good the walls and floors exposed on walls (b) 25mm -do- |
| 18 | P & F G.I. pipes (External Work) with G.I. fittings (IS: 1239 Mark) including trenching & refilling earth etc.15mm dia nominal bore "B" Class |
| 19 | Construction of manhole in all type of soil inner size 90 * 60 Cm. thick masonry in CM 1;6, cm. thick cement concrete 1:5 10 in foundation, 20mm thick inside plaster in CM 1:6 , finished with floating neat cement, 50mm thick M-15 thick stone slab covering with 40mm thick M-15 grade c.C. flooring, 25 Kg. CI Cover with frame of 450mm dia, earthwork etc. complete as per design including disposal of surplus earth within 50 mtr. lead.Depth up to 0.5 M |
| 20 | Construction of chamber in all type of soil with 300 mm thick masonry in Cm 1:6 m 100mm thick C.C 1:5:10 in foundation, 20mm thick insider plaster in Cm 1:6 finished with floating neat cement, 50mm thick M-15 grade C.C flooring, earthwork etc. complete as per design including disposal of surplus earth within a lead of 50 mtr. Inside size 300 * 300 mm depth upto 0.5 M & 5 Kg. CI Cover with frame. |
| 21 | P &F rigid PVC Pipe (IS:4985 mark) class II/ (4Kg./Cm2.) approved quality / make including joining the pipe with solvent cement rubber ring and lubricant. (a) 75mm dia |
| 22 | P &F rigid PVC Pipe (IS:4985 mark) class II/ (4Kg./Cm2.) approved quality / make including joining the pipe with solvent cement rubber ring and lubricant. (b)110mm dia |
| 23 | P & F rigid PVC pipe fittings (IS: 4985 mark) of approved quality/ make including joining the pipe with solvent cement rubber ring and lubricant.Door Bend 110 mm dia (Top side) |
| 24 | P & F rigid PVC pipe fittings (IS: 4985 mark) of approved quality/ make including joining the pipe with solvent cement rubber ring and lubricant. Bend 87.5° 110 mm dia |
| 25 | P & F rigid PVC pipe fittings (IS: 4985 mark) of approved quality/ make including joining the pipe with solvent cement rubber ring and lubricant. Vent Cowel 110 mm dia |
| 26 | Construction of soakage well in all type of soil 300 mm thick dry masonry,top and bottom 300 mm course in CM 1;6, 80mm thick stone slab, jointing of slab in CM 1;3, Ralthal, Kharanja, 40 mm thick M-15 grade C.C. flooring, earthwork complete as per approved drawing including disposal of earth within a lead of 50mtr.:size 240 Cm. dia outside & 240 Cm. depth. |
| 27 | Construction of septic tank in all types of soil with 40 cm. Thick masonry in CM 1:6 15 Cm thick C.C bed of 1:5:10 M grade C.C flooring & over stone slab covering, 80 mm thick slab jointing of slab in CM 1:3 Ralthal, Kharajna, 50 mm thick stone pration walls, 20 mm thick plaster in CM 1:6 finished with neat floating cement, 4 Nos C.I foot rests of approved design, two No. 450 mm dia 25 Kg each CI cover with frame, earth work etc. complete as per approved drawing including disosal of surplus earth within a lead of 50 mtr.Size 200*100*130cm.(for 10 users) |
| 28 | Supply of ERW M.S. black casing pipe ISI marked (IS:4270/1992) of grade Fe 410 of following sizes at site of work nominal bore of pipe (mm)-150 out side dia of pipe (mm)-168.3, Thickness of pipe(mm)-5.0, Mass of plane tube (Kg. per meter) 20.13 |
| 29 | S & F tube well cover of M.S. sheet.(6mm thick) with nuts and bolts complete for casing size:- 150mm dia |
| 30 | S & F M.S. clamp, set of 50*6mm flat from ion with nuts and bolts etc. for holding the riser pipe assembly of submersible pump set. |
| 31 | Construction of Tube-well upto 100 Meter depth and above in all type of rocks by DTH system and over burden, to accommodate casing pipe of following sizes of all types of soils and over burden inclduing lowering of casing pipes, but excluding cost of casing pipes as per Is:2800 (part I &II) 1979 specifications. the work would be completed after obtaining sand free water. The tube well should have a throughout bore as per nominal dia of casing pipe:150mm dia Nominal bore. |

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| 32 | P & F Gun-metal Non-return Valve or Check Valve (IS : Make) of approved make, superior quality;25mm nominal bore-vertical. |
| C | Part "C" Electrification Work |
| 1 | Wiring of light point / fan point / exhaust fan point / call bell point with 1.5 sq. mm. nominal size FR PVC insulated unsheathed 1.1kV grade flexible copper conductor and 1.5 sq. mm nominal size FR PVC insulated copper earth conductor (IS:694) of approved make in double lock/ ISI marked single lock pvc casing capping & it's accessories, 18 SWG M.S. box with earth terminal, screwless cage connectors for neutral looping in switch board & false ceiling point, 6 A switch 3.0 mm thick phenolic laminated sheet, zinc plated / brass screws, cup washers , making connections, testing etc. as required. (Group 1) (a) Short point (up to 3mtr.) |
| 2 | Wiring of light point / fan point / exhaust fan point / call bell point with 1.5 sq. mm. nominal size FR PVC insulated unsheathed 1.1kV grade flexible copper conductor and 1.5 sq. mm nominal size FR PVC insulated copper earth conductor (IS:694) of approved make in double lock/ ISI marked single lock pvc casing capping & it's accessories, 18 SWG M.S. box with earth terminal, screwless cage connectors for neutral looping in switch board & false ceiling point, 6 A switch 3.0 mm thick phenolic laminated sheet, zinc plated / brass screws, cup washers , making connections, testing etc. as required. (Group 1) (b) Medium point (up to 6 mtr.) |
| 3 | Wiring of light point / fan point / exhaust fan point / call bell point with 1.5 sq. mm. nominal size FR PVC insulated unsheathed 1.1kV grade flexible copper conductor and 1.5 sq. mm nominal size FR PVC insulated copper earth conductor (IS:694) of approved make in double lock/ ISI marked single lock pvc casing capping & it's accessories, 18 SWG M.S. box with earth terminal, screwless cage connectors for neutral looping in switch board & false ceiling point, 6 A switch 3.0 mm thick phenolic laminated sheet, zinc plated / brass screws, cup washers , making connections, testing etc. as required. (Group 1) (c) Long point (up to 10 mtr.) |
| 4 | Wiring of 3 Pin 6 amp. Light point with 1.5 sqmm FR PVC insulated unsheathed 1.1 KV grade flexible copper conductor and 1.5 sqmm FR PVC insulated 1.1 grade copper earth conductor (IS:694) of approved make in double lock/ ISI marked single lock PVC casing capping and its accessories 18 SWG MS box with earthing terminal 6A switch 3.00 mm thick phenolic laminated sheet zinc plated/brass screws cup washers making connections, testing etc as required on Board. Gr-I |
| 5 | Supplying and drawing FR PVC insulated & unsheathed flexible copper conductor ISI marked (IS:694) of 1.1 kV grade and approved make in existing surface or recessed conduit/casing capping including making connections etc. as required.Group-I(a) 2 x 2.5 sq.mm + 1 x 1.5 sqm |
| 6 | Supplying and drawing FR PVC insulated & unsheathed flexible copper conductor ISI marked (IS:694) of 1.1 kV grade and approved make in existing surface or recessed conduit/casing capping including making connections etc. as required.Group-I(b) 2 x 4.0 sq.mm + 1 x 1.5 sqm |
| 7 | S/F of Power Plug Point accessories on 18 SQG or in recessed with suitable size phenolic laminated sheet cover including cost of 6 pin 16 Amp switch and socket outlet making connections testing etc as required (Group 1) |
| 8 | P & F surface/m recessed type 10mm thick teak wood board duly anitiermite treated, varnished and fixed by using gutties/ PVC fasteners of following size as required. 250 mm x 300 mm. Gr-I |
| 9 | P & F 240 V metal clad rewire clad rewire able porcelain switch fuse unit conforming to IS: 13947 P-I & III including making connections with lugs, testing etc as required, Single pole & neutral 32A /240 V Group I |
| 10 | P & F 240 /415 V proclain kitkat use (/HBC type) conforming to IS :2086, 1983 on existing board/ sheet including making connections with lugs, testing etc as required, 16 A, 240 V Group |
| 11 | Pipe Earthing as per IS:3043 with perforated 3.0 Mtr. Long, 40 mm dia. ' B ' class G.I. Pipe including all accessories like nut, bolts, reducer, nipple, wire meshed funnel, and C.C. finished chamber covered with hinged type with locking arrangement C.I. Cover, C.I. Frame of size 300mm x 300 mm and embodying the pipe complete with alternate layers salt and coke/ charcoal, testing of earth resistance as required.(Group 1) |
| 12 | S & Laying following size earth wire / strip in horizontal or vertical run in ground/ surface / recess including riveting, soldering, saddles, makingn connection etc as required etc. as required . 8 SWG GI (Hot dipped) Wire (Group-I) |
| 13 | P & F IP -43 protected street light luminaire on existing bracket suitable for CFL, made out from CRCA sheet steel finished/ Aluminium coating with stove enameled paint, having deep drawn aluminium alloy camopy reflector cum control gear tray, clear ribbed acrylic diffuser held with synthetic gasket, with all necessary accessoories copper wound ballast, starter, holder prewired with PVC insulated copper conductor including making connection testing etc as required. (without tube) 1 x 36 watt (Group-I) |

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| 14 | SITC of ISI mark(IS:8472) self priming monoblock pump set of approved make, TEFC, permanent split capacitor type (PSC), fitted with thermal overload protection, mechanical seal, 1440/1500 RPM, single phase(180 to 240 V). Including cost of hardware etc on existing platform complete. Pump shall have following HP Rating, phase, Head, minimum Discharge respectively. 0.5 HP, 1-Ø, (6-28)Mtr, (52-12) LPM |
| 15 | P & F strip type flourscent tube fitting fabricated from (CRCA and finished with powder coating / stove enamelled paint)/ (extruded non corrosive UV resist EP channel) .1 x 28 watts with EB complete with accessories (Low loss Copper Choke, starter, starter seat)/ Electronic Choke with terminal block duly prewired with copper conductor including making connection, testing etc. as required (without tube). 1 x 28 watts with EB . Group-.2 |
| 16 | P & F Fluorscent tube rod in existing fixtures as required .T5 lamps 28 watts. Group- 2 |
| 17 | P & F 18 swg M.S. Recessed fan box, hexagonal/ round of size 130 mm dia, depth 75mm, 12 mm dia rod fan hook with 100 mm length extended on each side. (Group-I) |
| 18 | Providing of synthetic rope for submersible pump ISI marked (IS:5175) of following sizes. 16mm (suitable above 50mm & up to 75mm OD pipe)(Gr.-I) |
| 19 | Providing of HDPE pipe ISI mark (IS:4984/95) for water supply (suitable for submersible & jet pump) with required fittings 40 mm OD 6 kg / cm ² (Gr.-I) |
| 20 | Supplying and installation of submersible motor pump sets ISI marked (IS:8034-1989) of approved make with required accessories including making connection suitable for T.W./ D.C.B./ Open well. The job includes lowering of riser pipe, G.I./ H.D.P.E. pipe with rope, cables, installation of complete fitting and accessories, jointing of electrical cables up to switch board. All labour for testing of submersible pumps set and supply of water to water mains, complete in all respect. 100 mm diameter Submersible pump shall have following HP Rating, phase, Head, minimum Discharge respectively. 3.0 HP, 3-Ø, (69-125)Mtr, (110-33)LPM (Gr.-I) |
| 21 | P/Laying ISI marked P.V.C. insulated submersible cable confirming to IS:694 with flexible copper conductor including making connection etc. as required 4.0 Sq. mm 3 core flat / Round (Gr.-I) |
| 22 | P & F TP&N 415 V side handle operated double break fuse switch unit in sheet steel enclosure conforming to IS 13947 P-III and IS:4064 (W/O HBC fuses) including making connections with suitable lugs, testing etc as required 200 A rating (Gr-I) |
| D | Part "D" Boundary Wall & Dev. Work |
| 1 | Earth work in excavation in foudation trenches or drains including dressing of sides and ramming of bottoms, lift up to 1.5 Mtr. Includijng taking out the excavated soil and depositing and refilling of jhiri with watering & ramming and disposal of surplus excavated soil as directed with in a lead of 50 meter. All kind of soil |
| 2 | P & Laying in postion cement concrete including curing, compaction etc. complete in specified grade excluding the cost of centering and shuttering-all work up to plinth level. 1:4:8(1 cement: 4 coarse sand: 8 graded stone aggregate 40 mm nominal size). |
| 3 | P & Laying in postion cement concrete including curing, compaction etc. complete in specified grade excluding the cost of centering and shuttering-all work up to plinth level. M10 grade Nominal Mix (with graded stone aggregate 20mm nominal size). |
| 4 | P & Laying in postion cement concrete including curing, compaction etc. complete in specified grade excluding the cost of centering and shuttering-all work up to plinth level. M20 grade Nominal Mix (with graded stone aggregate 20mm nominal size). |
| 5 | Random Rubble stone masonry for foundation and plinth in Cement sand mortar above 30cm thick wall in :Cement Mortar 1:6 (1-cement:6 sand) |
| 6 | Add extra Wall upto 30cm. And less thickness. |
| 7 | Random Rubble stone masonry for superstructure above plinth level one storey height above 30cm. Thick walls in :Cement Mortar 1:6 (1-cement:6 sand) |
| 8 | Pointing on stone masonry in cement sand mortar 1:3 (1-cement: 3-sand): Flush or ruled pointing |
| 9 | Pointing on stone masonry in cement sand mortar 1:3 (1-cement: 3-sand): Raised and cut pointing |
| 10 | P & F precast cement concrete coping 1:2:4 mix 50mm thick complete as per specification:50 mm |
| 11 | Plaster on new surface on wall in cement sand mortar 1:6 including raking of joints etc. complete fine finish 20mm thick. |
| 12 | Plaster on new surface on wall in cement sand mortar 1:4 including raking of joints etc. complete fine finish :20mm thick. |
| 13 | Structural steel work in single section fixed without connecting plate including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete above plinth level upto 4.5 mtr. height. In flats, tees, angles and channels. |

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| 14 | P & F steel gate, grating and grills made of angles, tees, square bars, flats, or black pipe with holdfast and fittings complete as per design and drawing including cutting welding and fabrication with priming coat of red oxide. |
| 15 | Providing stone slab covering over drains including filling of joints in cement sand mortar 1:3 with 35mm thick cement concrete flooring 1:2:4 mix complete with good finished with; Stone slab 60 to 75mm thick average |
| 16 | Cement concrete flooring grade 1:2:4 (1-cement : 2-coarse sand : 4-graded stone aggregate) rounding off edges etc. but excluding the cost of nosing of steps etc. complete: 75mm thick with 20mm thick nominal size aggregate. |
| 17 | S & F of chain link fencing with angle iron posts 50x50x6mm placed at every 3 Mtr. apart 30cm in ground embedded in cement concrete 1:3:6 (30x30x45cm) corner and every tenth post to be strutted with (50x50x6cm) angle iron provided and fixed and fitted with posts including earthwork in excavation etc. complete with chain link size. |
| 18 | Finishing wall with water proofing cement paint of approved brand and manufacture and or required shade to give an even shade including all scaffolding:New Work (three or more coats) |
| 19 | Painting with enamel paint of approved brand and manufacture to give an even shade:Two or more coats on new work |
| 20 | P & F M.S. sheet single leaf door shutter in angle iron frame 35x35x5mm suitably diagonally braced with 25x3mm flat iron above and below lock rail of size 50x5mm beading extra including all fittings, as per direction of Engg. incharge but excluding cost of chowkhats: including two coats of anti-corrosive red oxide primer paint.M.S. sheet 20 S.W.G. |
| 21 | S & F dressed sand or other approved stone shelves, tands in cement mortar 1:3 with fine dressed edges :25 mm thick |
| 22 | Surface dressing of ther groud including removing vegetation and inequalities not exceeding 15c deep and disposal of rubbish lead up to 50mtr. And lift up to Mtr.:All kinds of soil |
| E | Part-E (Item Rate) |
| 1 | Collection & Spreading of graded broken hard stone agg. Free from katcha stuff, and organic material including stacking as per the standard specification of size: 40 mm nominal sizde crusher broken with all lead and lift. |

R. Specific Conditions for Operation & Maintenance

1. Supervision

- 1.1. The work shall be carried out under the supervision & control of the contractor and supervision & control of the work /job will be contractor's responsibility. Contractor will dictate about the work to his persons without any interference / instructions from Ajmer Discom in day working. Supervision, control and regulation of condition of the workmen engaged by contractor shall be his responsibility. The contractor shall ensure that the persons deployed by him are fully trained for the job. The persons engaged by him shall be treated his employees for all purposes. He will be responsible for payment of remuneration to such staff as may be provided by any law, rule and regulations of the time being in force and that the
- 1.2. Ajmer Vidyut Vitran Nigam Limited shall not be responsible in any of the matters connected with the employees of the authorized contractor.
- 1.3. However to ascertain and maintain the quality of work and other conditions specified for supply of electricity, any Officer of Ajmer Discom not below the rank of Junior Engineer may suddenly check the sub-station at any time. Any short coming / deficiency in the work observed during checking shall be rectified/ attended free of cost immediately otherwise Ajmer Discom will be free to get the deficiencies rectified

/ attended at the cost and risk of the contractor besides withholding his payment/ terminating the contract.

2. Function & Duties To Be Performed By Contractor/ Contractor Workers:

2.1. Operational function & duties to be performed: -

- 2.1.1. Workmen of contractor shall strictly provide three phase & single phase supply on each 11 KV outgoing feeder 33/11 KV Sub-station as per schedule / block hours and timings as intimated by officers of AVVNL from time to time.
- 2.1.2. For making supply off and on, workmen shall operate main 11 KV and outgoing feeders VCB/OCB/KIOS (if available on 11 KV feeders) along with operating GO's and fuses of 11 KV feeders.
- 2.1.3. For providing single-phase supply by removing 33 KV sides and 11 KV side fuses or by other single phasing mechanism as per methodology and system instructed/ directed by officers of AVVNL.
- 2.1.4. All operation for providing three phase /single-phase supply on 11 KV feeders should be done carefully with all safety measure as well as guidelines prescribed for operations.
- 2.1.5. The contractor will be solely responsible for any damage of equipment or accident of any workman.
- 2.1.6. In case contractor needs shut down at 33 KV/11 KV sub-station to carry out any repair or maintenance work prior permission of shut down shall be obtained from the concerning Assistant Engineer/ Junior Engineer. The material required for such maintenance (excluding T&P) shall be provided by the Assistant Engineer In-charge of the sub-station. Any shut down on any of the 33/11 KV lines at the sub-station required by Ajmer Discom's authorized employee(s) shall be given by the contractor or his authorized representative on the requisition of PTW form (Format N9A).
- 2.1.7. On failure of 33/11 KV line the contractor or his authorized person shall intimate to the concerned Assistant Engineer / Junior Engineer promptly.
- 2.1.8. In case of tripping of supply or blowing of fuse of any feeder the same will be replaced immediately according to capacity by the contractor or his authorized person. The capacity of fuses for each feeder shall be prescribed by Assistant Engineer concerned.

2.2. Maintenance duties to be performed: -

- 2.2.1. The contractor shall check oil level of power Transformers leakage, if any in the power transformer checking air passage are free and also check the colour of the silica-gel. The contractor shall observe earthing of the transformer and he will inspect any crack ness of flat of earthing of the dryness. He will intimate the position to JEN/AEN.

- 2.2.2. The contractor shall carry out inspection & maintenance of circuit breaker as under: - The contractor shall inspect switchgear premises & circuit breaker. He will clean the circuit breaker. He will inspect oil position of the circuit breaker and if any leakage is found he will intimate to JEN/AEN. Any unusual smell /noise observed in the OCB shall be intimated to JEN/AEN. He will also observe position of auxiliary fuses whether intact or not. The position shall be intimated to JEN/AEN. The contractor shall observe working order of indicating & measuring instrument whether they are in working order or not. The position / condition will be intimated to JEN/AEN. He will also examine position of dirt, top fitting and oxide film on lighting arrester. He will clean with dry cloth and tight bolt if found any looseness. The position will be intimated to JEN/AEN. The contractor shall observe water level of battery if the water level is low he will fill water and position will be intimated to JEN/AEN.
- 2.2.3. The 33/11 KV sub-station area will be maintained clean by cutting grass and shrubs and toilet cleaning etc. by the contractor at his own cost and material required for this work will be arranged by the contractor himself.
- 2.2.4. The contractor shall be full responsible for watch and ward of the Sub-Station area and equipments.
- 2.2.5. The contractor shall maintain the Ajmer Discom property and equipment safely and any damage caused solely due to lack of contractor or his employee then losses will be recovered form his due payment. If amount of damage/losses are more than due payment then he will be liable to deposit the balance amount otherwise this will be recoverable as per law.
- 2.2.6. The contractor shall replace 33 KV and 11 KV GO Blades/Rods. The requisite material shall be provided by Ajmer Discom.
- 2.2.7. Initially the Nigam shall hand over the sub-station to the contractor with proper lighting arrangements including providing of fixture and bulbs, tube light etc. subsequently; the contractor shall maintain the lighting arrangements at the sub-station.
- 2.2.8. The contractor or his authorized persons shall pour sufficient quantity of water in earthing pits in 33/11 KV Sub-station premises from time to time.

2.3. AVAILABILITY OF POWER:

- 2.4. Power availability means the supply available on 33 KV mains/ 11 KV Bus Bar. If any month availability of power is less than 95 % in aggregate due to the reasons solely attribute to the contractor, then a penalty of 2% of monthly contract value (for the concerned sub-station) for every fall of 1% below availability of 95% shall be recovered from the contractor. If power availability falls below 90% in any month then besides deduction of above penalty contract may be terminated without any further notice.**

2.5. In case of block hours supply specified on each 11 KV feeder if any distributed /shortage/ excess in supply occurs due to deficiency /negligence of the contractor, the sum of duration of individual feeder for the time supply remained disturbed /contrary to block hours will be deducted time of availability of supply. The concerned Unit Officer shall record a certificate on each bill regarding availability of power. Further, in case of excess supply of power on any feeder beyond block hours by the contractor due to the reasons not beyond his control, the contract shall be liable to be terminated without further notice besides above deduction of penalty.

3. Other Conditions

3.1. For carrying out round the clock operation & maintenance of the 33/11 KV Sub-Station, the contractor shall employ his own, 3 (three) persons per day per GSS who possess a minimum qualification of ITI from a recognized/ Govt. Institution in each shift i.e one Skilled (ITI) in each shift is to be deployed. The contractor shall ensure that the persons engaged by him should not continue the shift for more than 8 hours in a day. The contractor shall provide following details of each worker engaged by him on each sub-station at his own cost: -

3.1.1. Appointment letter with photo affixed duly counter signed by the Assistant Engineer (O&M) containing details such as name, father's name date of birth, age, home address. Per month wages including confirmation from such persons about having been engaged by the contractor along with wages at which employed and educational qualification, duly signed by the employee engaged and attested by the contractor. A copy of this appointment letter issued by the contractor to his worker shall be providing to the Assistant Engineer concerned and also pasted on the Notice Board of the Sub-Station. The copy of appointment letter of workers shall also be provided to the Sr. Accounts Officer (CPC), AVVNL, Ajmer along with the first bill.

3.1.2. Identity card of each employee engaged in enclosed Performa (Annexure-II) for counter signature of concerned Executive Engineer. The identity card after counter signature will be returned back to the contractor for keeping it with his employees. The identity card so issued will not be used for any legal purposes and will be treated as null and void for the same. Further the identity card so issued shall be used by the workers in 33/11 KV sub-station premises only.

3.1.3. If any engaged person(s) to be replaced/ shifted by the contractor, then a written prior permission from the concerned Executive Engineer will be obtained by the contractor.

3.1.4. Weekly duty chart (Monday to Sunday) shall be displayed by the contractor on the Notice Board of the Sub-Station.

4. Minimum Wage Criteria to be followed Strictly

4.1. In this regard details of minimum wage clause as mentioned in Section E Clause 2.4 shall be strictly followed by Contractor

5. All T&P and safety devices like hand gloves, safety belt, Ladder earth chain, insulated pliers, screw driver, spanner set etc. of standard quality for this work will be arranged by the contractor at his own cost.

6. The contractor has to provide proper safety to equipment/ items and workman/ labour deployed at sub-station and also issue protection tip/ instructions to them.
7. The contractor shall be required to get all workmen insured under Group Insurance Scheme against accident/miss-happening of the workmen during execution of work at his cost to cover the liability of workman as per workmen's compensation Act, which should be paid by the Insurance Company against the accident. The Ajmer Discom shall not be held responsible for any accident/ injury/ casualty during the execution of the contract, total responsibility will be of the contractor whatsoever and contractor/ Insurance Company will pay the compensation as per workmen compensation Act, 1923 and amendment thereto.
8. The contractor and his authorized person will not interfere in the working of Ajmer Discom. Any unlawful activities shall not be allowed. No person other than the contractor's duty person and officers/ officials of Ajmer Discom shall be allowed to enter into the premises of 33/11 KV sub-station.
9. Ajmer Discom shall not be responsible in any manner for any act or omission or commission of the workers engaged by the contractor. No claim in this regard shall lie against Ajmer Discom. If by virtue of any law in force, Ajmer Discom is made liable to pay any amount by way of penalty / damages/ fine etc. contractor shall be liable to indemnify/ reimburse to the extent of amount so paid along with other expenses incurred by Ajmer Discom to defend such cases.
10. The concerned officers of the Ajmer Discom shall have the authority to inspect the work site/ sub-station at any time during the period of contract.
11. All the consumable items such as TC fuse wire, bulbs, tube lights, distilled water etc. shall be arranged by the contractor at his own cost.
12. Engineer Incharge/Nodal Officer:-
 - 12.1. The engineer In-charge for verification and monitoring of supply position and other technical issues against this order shall be concerned Superintending Engineer (O&M), since concerned SE (O&M) is Engineer incharge/Nodal Officer of the package, hence he is allowed to change the name of GSS as per his convenience in his circle.
13. The following record shall be maintained at each sub-station by the contractor or his authorized representative and shall be produced on demand for which register shall be provided by Ajmer Discom: -
 - 13.1. PTW (Permit to Work) Register (Section N Format N9A)
 - 13.2. Identity Card (Section N Format N9B)
 - 13.3. Log Sheet (Section N Format N9C)
 - 13.4. Maintenance of power Transformer (Section N Format N9D)
 - 13.5. Maintenance of Circuit Breaker (Section N Format N9E)
 - 13.6. Transformer failure report (Section N Format N9F)
 - 13.7. Roznamcha containing the incidence of all nature like disturbance of supply on 11 KV, failure of 33 KV supply and damage of equipment of sub-station etc. (To be maintained in ordinary register).

- 13.8. Daily attendances register of workers.
- 13.9. Register of workmen employed by contractor (Form ix). Employment Card (Form x) and Register of wages (Form xii) prescribed under Rajasthan Contract Labour (R&A) Rules, 1971.
- 13.10. Certificate of principal employer (Section N Format N9G), Renewal with Licensing officer (N9H), Register of particulars of contractors (N9I), Progress of contract work(N9J), Annual return of principal employer to be sent to registering officer (N9M), N9K and N9L.
- 13.11. Ajmer Discom will provide Notice Board to the contractor having (a) Name of utility.
- 13.12. Name of 33/11 KV sub-station with district on which contractor person will write by chalk as under: -
- 13.12.1. Block of supply hours for agriculture sector giving feeder wise details.
 - 13.12.2. Name of employee on duty.
 - 13.12.3. Single-phase supply hours.

14. Other Penalty Provisions:

- 14.1. Workmen/person found performing duty more than One shift (8 Hours) at any substation i.e. He continues the duty in next shifts then penalty at rate of Rs.250/- Per shift per day shall be imposed.
- 14.2. If deficiency as mentioned above at point (i) remains/continues upto 7 days then the work order shall be cancelled / terminated and the Security deposit and safe custody bank guarantee against equipment shall be forfeited.
- 14.3. In case of non maintenance of any or all the records as set out in the specification or incomplete records at any Sub-Station assigned to the contractor is reported during checking by the Inspecting officer then an amount equivalent to 20% of the contract value for the month in respect of the Sub-Station assigned where deficiency noticed, shall be recovered from the contractor's bill.
- 14.4. In case, if such deficiencies (as mentioned in sub clause (iii) above) are reported more than once at any of the sub-station assigned to the contractor under the contract, then besides above deductions, the contract for that particular sub-station shall be terminated without further notice and the contractor shall be liable for black listing.
- 14.5. In case any sub-station is reported to be unmanned (without contractor's worker) by the Inspecting officer then work order shall stand terminated with immediate effect.
- 14.6. Single phase and three phase supply must be maintained as per instruction issued by Nigam Authority time to time and in case of non-compliance of instructions noticed at any sub-station the penalty for excess supply given shall be entirely charged on the basis of excess supply given on that feeder multiplied by average cost of power purchased on that feeder.

S. General Technical Instruction

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. 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.

1.2. 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:

- 1.1.1. 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
- 1.1.2. 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.

1.1.3. 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 be required to 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 the 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.

1.1.4. 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. |

1.3. Electrical System Data

| | <u>33 KV</u> | <u>11KV</u> |
|---|-------------------------------------|-------------|
| 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 50 Hz ac system under Dry condition (rms) | Not less than 27 kV, phase to earth | |
| Radio interference voltage at one MHz for 27 kV (dry condition) | Not exceeding 1000 micro-volts | |

1.4. 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.

1.5. 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.

1.6. 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.

1.7. 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.

1.8. 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.

1.9. 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) |

1.10. 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.

1.11. 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.

1.12. 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 smoothed.

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 / aerrail rollers. The pulley groove size shall be such that the joint along with protection can be passed over it smoothly.

1.13. 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.

1.14. 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.

1.15. 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.

1.16. 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.

1.17. 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.

1.18. 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.

1.19. 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 tying.

1.20. 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 Project Manager 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.

1.21. 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.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.

1.22. 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 wired 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.

1.23. Testing And Commissioning

When the line is ready for energisation, it should be thoroughly inspected in respect of the following:-

- a) Poles-Proper alignment, concerting and muffing.
- b) Cross-arms – Proper alignment.

- c) Finishing of fabricated steel items used.
- d) Insulators – Proper finish, cleanliness, insulation resistance.
- e) Binding, clamps and jumpers – To check whether these are in reach.
- f) Conductor and earth wire – Proper sag to check whether there are any cuts, etc.
- g) Guys: To check whether the Guy wire is tight and whether the Guy insulators are in tact.
- h) 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.

- a. 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.
- b. The line should be energized before the officer who has been authorized by the Project Manager in this regard.
- c. 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.
- d. 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.

1.24. 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 Project Manager. In case of river crossing with longer span, special designed structures are to be used for the purpose.

1.25. 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.

1.26. 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.

1.27. LT Lines and Service connection

- 1.1.5. 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.
- 1.1.6. 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.
- 1.1.7. All single phase service connections released under the DDUGJY 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.
- 1.1.8. 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.
- 1.1.9. The consumer meter shall be installed at the premises of consumers at suitable height and at place which is not in direct approach of sun-light and rain water. Meters should be installed under the covering shade

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Format M1: Bid Security

{To be executed on Non-judicial Stamp paper of worth 0.25% of Bank Guarantee Value
(maximum stamp duty of Rs25000/-)}

Bid Security

Bank Guarantee No.:

Date:

To
Superintending Engineer (TW)
Ajmer Vidyut Vitran Nigam Limited,
Vidyut Bhawan, Room No.216
Panchsheel Nagar, Makarwali Road,
Ajmer-305004, Rajasthan

WHEREAS M/s. (insert name of Bidder)..... having its Registered/Head Office at (insert address of the Bidder) (Hereinafter called "the Bidder") has submitted its Bid for the performance of the Contract for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.

KNOW ALL PERSONS by these present that WE (*Insert name & address of the issuing bank*) having its Registered/Head Office at (*Insert address of registered office of the bank*)..... (Hereinafter called "the Bank"), are bound unto Ajmer Vidyut Vitran Nigam Limited (hereinafter called "the Employer") in the sum of..... (*Insert amount of Bid Security in figures & words*)..... for which payment well and truly to be made to the said Employer, the Bank binds itself, its successors and assigns by these presents.

Sealed with the Common Seal of the said Bank this day of 20....

The "Conditions" of this obligation are:

1. If the Bidder withdraws its bid during the period of bid validity specified in the "Tender Document" issued vide NIT No: AJD/SE/TW/TN-378; or
2. In case the Bidder does not withdraw the deviations proposed by him, if any, at the cost of withdrawal stated by him in the bid and/or accept the withdrawals/rectifications pursuant to the declaration/confirmation made by him in Format – Declaration on Deviation in the Bid; or
3. If the Bidder does not accept the corrections to arithmetical errors identified during preliminary evaluation of his bid pursuant to Section H Clause 13.4 of Tender Document; or
4. In the case of a successful Bidder, if the Bidder fails within the specified time limit

- a. to sign the Contract Agreement, in accordance with Section I - Clause 5 of Tender Document; or
 - b. to furnish the required Performance Security, in accordance with Section – I Clause 4 of Tender Document; or
5. In any other case, specifically provided for in Tender Document.
6. All disputes arising under this said Guarantee between the Bank and the Employer or between the Contractor and the Employer pertaining to this said Guarantee shall be subject to the jurisdiction of Courts only at Ajmer, Rajasthan alone.

We undertake to pay to the Employer up to the above amount upon receipt of its first written demand, without the Employer having to substantiate its demand, provided that in its demand the Employer will note that the amount claimed by it is due to it, owing to the occurrence of any of the above-named Conditions or their combination, and specifying the occurred Condition or Conditions.

This guarantee will remain in full force up to and including (valid for 30 days beyond the Bid Validity i.e. 6 months + (plus) additional 30 days grace period)..... and any demand in respect thereof must reach the Bank not later than the above date.

For and on behalf of the Bank

[Signature of the authorised signatory(ies)]

Signature _____

Name _____

Designation _____

POA Number _____

Contact Number(s): Tel. _____ Mobile _____

Fax Number _____

email _____

Common Seal of the Bank _____

Witness:

Signature _____

Name _____

Address _____

Contact Number(s): Tel. _____ Mobile _____

email _____

Note:

1. **In case the bid is submitted by a Joint Venture, the Bid Security of a JV must be in the name of all the partners, lead or other partner in the joint venture submitting the bid.**
2. The Bank Guarantee shall be in accordance with the proforma as provided. However, in case the issuing bank insists for additional paragraph for limitation of liability, the following may be added at the end of the proforma of the Bank Guarantee [*i.e., end*]

paragraph of the Bank Guarantee preceding the signature(s) of the issuing authority(ies) of the Bank Guarantee]:

Quote

“Notwithstanding anything contained herein:

- 1. Our liability under this Bank Guarantee shall not exceed _____ (value in figures)_____ [_____ (value in words)_____].*
- 2. This Bank Guarantee shall be valid upto _____(validity date)_____.*
- 3. We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only & only if we receive a written claim or demand on or before _____ (validity date) _____.”*

Unquote

Format M2: Format of Affidavit for MSME Unit

{On Non-Judicial Stamp Paper of Rs. 100/- attested by Notary Public/ First Class Magistrate}

Affidavit for MSME Unit

IS/oAge Yrs. Residing at
 Proprietor/Partner/ Director of M/s (“Enterprise”)
 do hereby solemnly affirm and declare that:

- (a) My/Our above noted Enterprise M/s has been issued acknowledgement of Entrepreneurial Memorandum Part - II by the District Industries Centre The acknowledgement No. is dated and has been issued for manufacture of following items:

| S. No. | Name of Item | Production Capacity (Yearly) |
|--------|--------------|------------------------------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |

- (b) My/Our above noted acknowledgement of Entrepreneurial Memorandum Part - II has not been cancelled or withdrawn by the Industries Department and that the Enterprise is regularly manufacturing the above items.
 (c) My/Our Enterprise is having all the requisite plant and machinery and is fully equipped to manufacture the above noted items.
 (d) The present status of the firm is as per acknowledgment of Entrepreneurial Memorandum Part-II issued on the date of District Industries Centre.

Place

Signature of Proprietor/ Director/

Authorized Signatory with Stamp and Date

VERIFICATION

I, _____ S/o _____ Aged _____ Years
 residing at _____ Proprietor/ Partner/ Director of
 Enterprise M/s _____ verify and confirm that
 the contents at (a), (b), (c) & (d) above are true and correct to the best of my knowledge and
 nothing has been concealed therein. So, help me God.

DEPONENT

Format M3-A: Power of Attorney in favour of Authorized Signatory (In Case of Bidder is Single Entity)

{On Non-Judicial Stamp Paper of Rs. 500/- attested by Notary Public/ First Class Magistrate}

The Bidder is required to submit the Power of Attorney in the Format as per the applicable Law.

Format M3-B: Power of Attorney in favour of Authorized Signatory (In Case Bidder is Joint Venture)

{On Non-Judicial Stamp Paper of Rs. 500/- attested by Notary Public/ First Class Magistrate}

Power of Attorney in favour of Authorized Signatory

KNOW ALL MEN BY THESE PRESENTS THAT WE, the Partners whose details are given hereunder have formed a Joint Venture under the laws of and having our Registered Office(s)/Head Office(s) at (hereinafter called the 'Joint Venture' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators and assigns) acting through M/s being the Partner in-charge do hereby constitute, nominate and appoint M/s..... a Company incorporated under the laws of and having its Registered/Head Office at as our duly constituted lawful Attorney (hereinafter called "Attorney" or "Authorised Representative" or "Partner In-charge") to exercise all or any of the powers for and on behalf of the Joint Venture in regard to “Bid Specification” for work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378., the bids for which have been invited by Ajmer Vidyut Vitran Nigam Limited, Vidyut Bhawan, Ajmer, Vidyut Bhawan, Panchsheel Nagar, Makarwali Road, Ajmer-305004, Rajasthan (hereinafter called the 'AVVNL/ ‘ Discom’) undertake the following acts:

- i. To submit proposal and participate in the aforesaid Bid Specification of AVVNL on behalf of the "Joint Venture".
- ii. To negotiate with Discom the terms and conditions for award of the Contract pursuant to the aforesaid Bid and to sign the Contract with the Discom for and on behalf of the "Joint Venture".
- iii. To do any other act or submit any document related to the above.
- iv. To receive, accept and execute the Contract for and on behalf of the "Joint Venture".

It is clearly understood that the Partner In-charge (Lead Partner) shall ensure performance of the Contract(s) and if one or more Partner fail to perform their respective portions of the Contract(s), the same shall be deemed to be a default by all the Partners.

It is expressly understood that this Power of Attorney shall remain valid binding and irrevocable till completion of the period to complete all the Scope of Work awarded under the terms of Bid Specification/ Contract.

The Joint Venture hereby agrees and undertakes to ratify and confirm all the whatsoever the said Attorney/Authorised Representatives/Partner in-charge quotes in the bid and

negotiates with AVVNL and signs the Contract with Discom and/or proposes to act on behalf of the Joint Venture by virtue of this Power of Attorney and the same shall bind the Joint Venture as if done by itself.

IN WITNESS THEREOF the Partners Constituting the Joint Venture as aforesaid have executed these presents on this day of under the Common Seal(s) of their Companies.

For and on behalf of the
Partners of Joint Venture
.....
.....
.....

The Common Seal of the above Partners of the Joint Venture:

The Common Seal has been affixed there unto in the presence of:

WITNESS

- 1. Signature.....
 Name
 Designation
 Occupation

- 2. Signature.....
 Name
 Designation
 Occupation

Note:

- 1. For the purpose of executing the Agreement, the non-judicial stamp papers of appropriate value shall be purchased in the name of Joint Venture.

- 2. The Agreement shall be signed on all the pages by the authorised representatives of each of the partners and shall invariably be witnessed.

Format M4: Undertaking by the Joint Venture Partners (In Case Bidder is Joint Venture)

{On Non-Judicial Stamp Paper of Rs. 500/- attested by Notary Public/ First Class Magistrate}

Undertaking by Joint Venture

THIS JOINT DEED OF UNDERTAKING executed on this..... day of..... Two Thousand and..... by a company incorporated under the laws of and having its Registered Office at(hereinafter called the "Party No.1" which expression shall include its successors, executors and permitted assigns) and M/s. a Company incorporated under the laws of and having its Registered Office at (hereinafter called the "Party No.2" which expression shall include its successors, executors and permitted assigns) for the purpose of making a bid and entering into a contract [hereinafter called the "Contract" {in case of award}] against the "Bid Specification" for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378., the bids for which have been invited by Ajmer Vidyut Vitran Nigam Limited, Vidyut Bhawan, Ajmer, Vidyut Bhawan, Panchsheel Nagar, Makarwali Road, Ajmer-305004, Rajasthan (hereinafter called the 'AVVNL' / 'Discom').

WHEREAS the Party No.1 and Party No.2 have entered into an Agreement dated.....

AND WHEREAS AVVNL has invited bids as per the above mentioned Bid Specification for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378., details stipulated in the Tender Document issued vide: NIT No: AJD/SE/TW/TN-378.

AND WHEREAS Section F Clause 1.1 forming part of the Tender Document, inter-alia stipulates that an Undertaking of two or more qualified entities as partners in a Joint Venture, meeting the requirements of Eligibility & Qualification Criteria Section F, as applicable may bid, provided, the Joint Venture fulfills all other requirements under Section F and in such a case, the Bid Formats shall be signed wherever applicable and as required by Tender Document either by the Authorized Signatory (appointed by a Power of Attorney executed by all partners of Joint Venture) and/or all the partners so as to legally bind all the Partners of the Joint Venture, who will be jointly and severally liable to perform the Contract and all obligations hereunder.

The above clause further states that this Undertaking shall be attached to the bid and the Performance Security will be as per the format enclosed with the Tender Document without any restrictions or liability for either party.

AND WHEREAS the bid is being submitted to AVVNL vide Bid No.....(Reference No: of Bid submitted by Bidder) dated by Party No.1

based on this Undertaking between all the parties; under these presents and the bid in accordance with the requirements of Tender Document, has been signed by all the parties.

NOW THIS UNDERTAKING WITNESSETH AS UNDER:

In consideration of the above premises and agreements all the parties of this Deed of Undertaking do hereby declare and undertake:

1. In requirement of the award of the Contract by AVVNL to the Joint Venture Partners, we, the Parties do hereby undertake that M/s..... the **Party No.1**, shall act as Lead Partner and further declare and confirm that we the parties to the Joint Venture shall jointly and severally be bound unto Discom for the successful performance of the Contract and shall be fully responsible for successful completion and performance of Scope of Work as provided in Contract in accordance with the terms and conditions specified in the Contract.
2. In case of any breach or default of the said Contract by any of the parties to the Joint Venture, the party(s) do hereby undertake to be fully responsible for the successful performance of the Contract and to carry out all the obligations and responsibilities under the Contract in accordance with the requirements of the Contract.
3. Further, if the Discom suffers any loss or damage on account of any breach in the Contract or any shortfall in the performance of the equipment in meeting the performances guaranteed as per the specification in terms of the Contract, the Party(s) of these presents undertake to promptly make good such loss or damages caused to the Discom, on its demand without any demur. It shall not be necessary or obligatory for the Discom to proceed against Lead Partner to these presents before proceeding against or dealing with the other Party(s), the Discom can proceed against any of the parties who shall be jointly and severally liable for the performance and all other liabilities/obligations under the Contract to the Discom.
4. The financial liability of the Parties of this Deed of Undertaking to the AVVNL/ Discom, as applicable, with respect to any of the claims arising out of the performance or non-performance of the obligations set forth in this Deed of Undertaking, read in conjunction with the relevant conditions of the Contract shall, however not be limited in any way so as to restrict or limit the liabilities or obligations of any of the Parties of this Deed of Undertaking.
5. It is expressly understood and agreed between the Parties to this Undertaking that the responsibilities and obligations of each of the Parties shall be as delineated in Appendix – *(to be suitably appended by the JV Partners alongwith this Undertaking in its bid)* to this Deed of Undertaking. It is further undertaken by the parties that the above sharing of responsibilities and obligations shall not in any way be a limitation of joint and several responsibilities of the Parties under the Contract.
6. It is also understood that this Undertaking is provided for the purposes of undertaking joint and several liabilities of the partners to the Joint Venture for submission of the bid and performance of the Contract and that this Undertaking shall not be deemed to give rise to any additional liabilities or obligations, in any

manner or any law, on any of the Parties to this Undertaking or on the Joint Venture, other than the express provisions of the Contract.

7. This Undertaking shall be construed and interpreted in accordance with the provisions of the Contract.
8. In case of an award of a Contract, we the parties to this Deed of Undertaking do hereby agree that we shall be jointly and severally responsible for furnishing a Contract Performance Security from a bank in favour of Discom in the currency/currencies of the Contract.
9. It is further agreed that this Deed of Undertaking shall be irrevocable and shall form an integral part of the bid and shall continue to be enforceable till the Discom discharges the same or upon the completion of the Contract in accordance with its provisions, whichever is earlier. It shall be effective from the date first mentioned above for all purposes and intents.

IN WITNESS WHEREOF, the Parties to this Deed of Undertaking have through their authorised representatives executed these presents and affixed Common Seals of their companies, on the day, month and year first mentioned above.

Common Seal of
has been affixed in my/ our
presence pursuant to Board of
Director's Resolution dated

For Lead Partner (Party No.-1)
For and on behalf of M/s
.....

Name
Designation

Signature

(Signature of the authorized
representative)

WITNESS :

I.
II.

Common Seal of
has been affixed in my/ our
presence pursuant to Board of
Director's Resolution dated

For Party No.-2
For and on behalf of
M/s.....

Name

(Signature of the authorized
representative)

Designation

Signature

WITNESS :

I.

II.

Note:

1. For the purpose of executing the Joint Deed of Undertaking, the non-judicial stamp papers of appropriate value shall be purchased in the name of Joint Venture.
2. The Undertaking shall be signed on all the pages by the authorised representatives of each of the partners and shall invariably be witnessed.
3. **Attach the Appendix.....as mentioned in the Clause 5 of this Deed of Undertaking.**

Format M5: Bid Submission Letter/Undertaking

(On Letterhead of Bidder/ Lead Member of JV)

Bid Submission Letter

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

From:- (Full name of Bidder / Lead Member of JV)
 Address of the Organisation.....
 Name of Authorized Signatory:.....
 Designation:.....
 Email ID:.....
 PHONE /MOBILE NO.:.....

To
Superintending Engineer (TW)
Ajmer Vidyut Vitran Nigam Limited,
 Vidyut Bhawan, Room No.216
 Panchsheel Nagar, Makarwali Road,
 Ajmer-305004, Rajasthan

Sub: Bid for Tender for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.

Ref: NIT NO: AJD/SE/TW/TN-378 dated; 21.09.2019

Dear Sir,

In connection with the above subject, I / We confirm the following:

1. I/We, the undersigned.....[insert name of the 'Bidder'] having read, examined and understood in detail the Tender document issued vide above referenced NIT, hereby submit our "Bid" in full compliance with terms & conditions of Tender Document. A copy of the Tender Document, duly signed on each page is also submitted as a proof of our acceptance of all specifications as well as terms/ Conditions. I/ We have submitted the Bid in electronic form on ON-LINE mode at the Bidding Portal mentioned in the Tender Document.
2. (Insert this clause in case JV) I/We are submitted our Bid in form of Joint Venture, whereby M/s..... is the Lead Member and Partner,

M/s..... & M/s.....is/ are the other JV Partner/ Partners. We have enclosed the Joint Deed of Undertaking executed by us in our Bid as per the requirement mentioned in the Tender Document. We, the partners of Joint Venture submitting this bid, do agree and confirm that in case of Award of Contract on the Joint Venture, we shall be jointly and severally liable and responsible for the execution of the Contract in accordance with Contract terms and conditions.

3. I/We have selected Mr....., as our Authorized Signatory in our Bid. We have enclosed the Power of Attorney (POA) executed in favour of Authorized Signatory in our Bid as per the requirement mentioned in the Tender Document.
4. I/We have paid the requisite amount of EMD. I/we understand that without payment of the EMD by us, our offer shall outrightly be rejected.
5. If, I/we are selected and shortlisted for as successful Bidder, we agree pay the required Performance Security as per the terms & conditions mentioned in the Tender Document. I/We understand that I/we shall not be awarded the Contract if we fail to pay the Performance Security in stipulated time.
6. I/We agree to treat the Tender document and other records connected with the Scope of Work as secret and confidential documents and shall not communicate information described therein to any person other than the person authorized by you or use the information in any manner prejudicial to the safety requirement.
7. I/We understand that you are not bound to accept the lowest or any bid you may receive.
8. I/ We are participating, as Bidders, in not more than one Bid in this Bidding process.
9. I / We declare that our Bid is strictly in line with Tender Document Specification and there is no deviation. Further, I/We also agree that additional conditions / deviations, if any, found in our Bid, the Bid shall be outrightly rejected without assigning any reason thereof. We shall ensure that we execute such Bid documents as per the provisions of the NIT and provisions of such Tender Document shall be binding on us. I/We confirm that we have not taken any deviation so as to be deemed non-responsive.
10. I/We hereby unconditionally and irrevocably agree and accept that the decision made by AVVNL in respect of any matter regarding or arising out of the Bid submitted by us/ Tender Document issued by AVVNL shall be binding on us. We hereby expressly waive any and all claims in respect of Bid process.
11. I/ We confirm that there are no litigations or disputes against us, which materially affect our ability to fulfil our obligations with regard to execution of Project mentioned in the Tender Document.
12. I / We hereby submit our Bid (Technical & Price) and undertake to keep our Bid valid for a period of 6 months from the date of opening of Technical Bid. I / We hereby

further undertake that during the said period, I / We shall not vary/alter or revoke my/our Bid.

13. We confirm that except as otherwise specifically provided our Bid Prices quoted and uploaded in e-procurement web portal include all taxes, duties, levies and charges as may be assessed on us, our Sub-Contractor/Sub-Vendor or their employees by all municipal, state or national government authorities in connection with the Facilities, in and outside of India.
14. We undertake, if our bid is accepted, to commence the work immediately upon issue of Letter of Intent to us, and to achieve the delivery of goods and related services within the time stated in the Bidding Documents. Until a formal Contract is prepared and executed between us, this bid, together with your written acceptance thereof in the form of your Letter of Intent shall constitute a binding contract between us.
15. We, hereby, declare that only the persons or firms interested in this proposal as principals are named here and that no other persons or firms other than those mentioned herein have any interest in this proposal or in the Contract to be entered into, if the award is made on us, that this proposal is made without any connection with any other person, firm or party likewise submitting a proposal is in all respects for and in good faith, without collusion or fraud.
16. I/We also agree to abide by and fulfill all the terms, conditions and provisions of the above mentioned Tender documents.

Enclosed:

1. Summary Details of Bidder/ JV Partners

(Signature & Seal of Authorized Signatory for which POA attached)

Name of Authorized Signatory:

Designation:

Date:

Place:

Format M5-A: Summary Details of Bidder

(On Letterhead of Bidder for which the said details are provided. In Case of JV the following format is to be provided by Each Member of the Joint Venture)

Summary Detail of Bidder

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

| S.No. | INFORMATION : | DETAILS : |
|-------|--|--|
| 1. | Name of Sole Bidder / Lead Member/ JV Partner: | |
| 2. | Bidding Status | (JV / Sole Bidder) |
| 3. | Status in JV: (Not applicable for Sole Bidder) | (Lead Member/ Other Partner) |
| 4. | Registration status : | (Company/ LLP/ Partnership/ Sole Proprietor) |
| 5. | Registration Number : | |
| 6. | GST Registration Number: | |
| 7. | PAN No: | |
| 8. | Name of Key Contact Person: Email ID & Mobile No: | |
| 9. | Registered office address of the Firm & Phone Number and E mail Ids : | |
| 10. | Other Branch offices in India : | |
| 11. | (i) | |
| 12. | (ii) | |
| 13. | (iii) | |
| 14. | (iv) | |
| 15. | Name of Directors of the Firm with Mobile Number and mail Ids : | |
| | Name : | Designation, Address, Mobile Number and Email ID : |
| | (i) | Designation, Address, Mobile Number and Email ID : |
| | (ii) | Designation, Address, Mobile Number and Email ID : |
| | (iii) | Designation, Address, Mobile Number and Email ID : |
| | (iv) | Designation, Address, Mobile Number and Email ID : |
| 16. | Details of JV/Joint Venture Partner with Declaration of Lead Member | |
| 17. | If Manufacturer of any item, the Name of products being manufactured : | |

| S.No. | INFORMATION : | DETAILS : |
|--------------|--|------------------|
| 18. | Address of Manufacturing unit : | |
| 19. | Brief details of firm's work experiences : | |

(Signature & Seal of Authorized Signatory for which POA attached)

Name of Authorized Signatory:

Designation:

Date:

Place:

Format M6: Details of Bidder's Eligibility Requirements

(On Letterhead of Bidder/ Lead Member of JV)

Bidder's Eligibility

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

To
Superintending Engineer (TW)
Ajmer Vidyut Vitran Nigam Limited,
 Vidyut Bhawan, Room No.216
 Panchsheel Nagar, Makarwali Road,
 Ajmer-305004, Rajasthan

Sub: Bid for Tender for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.

Ref: NIT NO: AJD/SE/TW/TN-378 dated; 21.09.2019

We hereby declare that we are eligible for bidding in reference to "Eligibility Requirements" of the Tender Document vide above referenced NIT No. and submit the following certificate(s) /documents in support:

| S. No. | Criteria | Documents Required | Status & Supporting Documents Attached |
|--------|---|---|---|
| 1.1 | Bidder Status – Bidder can be sole/ single bidder OR JV of up to 2 (two) members, with one of the members as a Lead Member | In case of JV, Deed of Undertaking | Status: Documents Attached: Yes/No (Attached at Annexure...to this letter) |
| 1.2 | The Bidder shall have any of the following legal status: a) Body incorporated in India under the Companies Act, 2013 including any amendment thereto; OR | a) In case of Company – Copy of Registration/ Incorporation Certificate | Status: Documents Attached: Yes/No |

| S. No. | Criteria | Documents Required | Status & Supporting Documents Attached |
|--------|--|--|---|
| | <p>b) Body incorporated in India under the Limited Liability Partnership (LLP) Act, 2008 including any amendment thereto; OR</p> <p>c) Firm registered under Partnership Act, 1932 in India; OR</p> <p>d) Sole Proprietor</p> <p>In case of JV, all the members must fulfill this requirement and submit the documents as per the Tender Document.</p> | <p>b) In case of LLP – Copy of Deed of Partnership</p> <p>c) In case of Partnership – Copy of Deed of Partnership</p> <p>d) In case of Sole Proprietor – Duly notarized Undertaking from Sole proprietor</p> | <p>(Attached at Annexure...to this letter)</p> |
| 1.3 | <p>The Bidder must have the required GST Registration</p> <p>In case of JV, all the members must fulfill this requirement.</p> | <p>Copy of GST registration certificate with legible GSTIN.</p> | <p>Status:</p> <p>Documents Attached: Yes/No</p> <p>(Attached at Annexure...to this letter)</p> |
| 1.4 | <p>The Bidder must have valid PAN Number</p> <p>In case of JV, all the members must fulfill this requirement.</p> | <p>Copy of Pan Card</p> | <p>Status:</p> <p>Documents Attached: Yes/No</p> <p>(Attached at Annexure...to this letter)</p> |
| 1.5 | <p>The bidder should possess "A" Class license issued by the Electrical inspectorate of Govt of Rajasthan/Central Inspectorial organization of Govt. of India/ other State Govt.</p> <p>In case Bidder is a distribution Licensee under Electricity Act 2003, contractor License is not required.</p> | <p>Copy of Registration Certificate issued by Competent Authority of respective Central / State Government Department.</p> | <p>Status:</p> <p>Documents Attached: Yes/No</p> <p>(Attached at Annexure...to this letter)</p> |

| S. No. | Criteria | Documents Required | Status & Supporting Documents Attached |
|--------|---|--|--|
| | <p>In case bidder is a Distribution Franchisee under Electricity Act 2003 it should possess “A” Class license issued by Electrical inspectorate of Govt of Rajasthan/Central Inspectorial organization of Govt. of India/ other state Govt or avail it within a month from the date of award of contract.</p> <p>In case of JV, any one of the members must fulfill this requirement and submit the documents as per the Tender Document.</p> | | |
| 1.6 | <p>The Bidder shall be engaged in the business of Electrical works.</p> <p>In case of JV, all the members must fulfill this requirement and submit the documents as per the Tender Document.</p> | <p>Statutory Documents substantiating this requirement along with Documents submitted in Clause 1.2 of this Section above.</p> | <p>Status: Documents Attached: Yes/No (Attached at Annexure...to this letter)</p> |
| 1.7 | <p>The bidder shall be having unblemished record and must not be blacklisted/ declared ineligible/ debarred / under business relation severed for corrupt & fraudulent practices by “any State/ Central Government” / “any State / Central Government Department/ Company / Entity/ PSU/ Power Utility”</p> <p>In case of JV, all the members must fulfill this requirement.</p> | <p>The bidder shall provide an undertaking as per the format provided in Section M Format M13.</p> <p>In case of JV, all the members must submit the undertaking as per the format provided in Section M Format M13.</p> | <p>Status: Documents Attached: Yes/No Status: Documents Attached: Yes/No (Attached at Annexure...to this letter)</p> |
| 1.8 | <p>The bidder must submit a Power of Attorney (POA) authorizing a person to sign the documents on behalf of the Bidder, submit technical, commercial information and attend meetings on behalf of the Bidder.</p> | <p>Sole Bidder to provide POA as per the applicable Law as provided in Section M Format M3-A</p> <p>In case of JV, Undertaking by JV as</p> | <p>Status: Documents Attached: Yes/No</p> |

| S. No. | Criteria | Documents Required | Status & Supporting Documents Attached |
|--------|--|--|---|
| | | per the format provided in Section M Format M4 and POA as per the format provided in Section M Format M3-B | (Attached at Annexure...to this letter) |
| 1.9 | The bidder shall have “No Conflict of Interest” In case of JV, all the members must fulfill this requirement. | The bidder shall provide an undertaking as per the format provided in as per the format provided in Section M Format M8-A In case of JV, all the members shall submit the undertaking as per the format provided in Section M Format M8-A | Status: Documents Attached: Yes/No (Attached at Annexure...to this letter) |
| 1.10 | a) The Bidder should be registered with PF and ESI Department in case of notified area. b) The Bidder should possess the valid license as provided under section 12 of the contract labour (R&A) Act 1970. Note: In case of JV, any one of the members must fulfill this requirement (both (a) & (b)) and submit the documents as per the Tender Document. | Notarized copies of required Certificates issued by relevant Govt. Department shall be provided. | Status: Documents Attached: Yes/No (Attached at Annexure...to this letter) |

Supporting Documents enclosed.

(Supporting Documents, wherever required & applicable are to be attached at Annexure to this letter.....)

(Signature & Seal of Authorized Signatory for which POA attached)

Name of Authorized Signatory:

Designation:

Date:

Place:

Format M7: Details of Bidder's Qualification Requirements

(On Letterhead of Bidder/ Lead Member of JV)

Bidder's Qualification

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

To
Superintending Engineer (TW)
Ajmer Vidyut Vitran Nigam Limited,
 Vidyut Bhawan, Room No.216
 Panchsheel Nagar, Makarwali Road,
 Ajmer-305004, Rajasthan

Sub: Bid for Tender for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.

Ref: NIT NO: AJD/SE/TW/TN-378 dated; 21.09.2019

We hereby declare that we are eligible for bidding in reference to "Qualification Requirements" of the Tender Document vide above referenced NIT No. and submit the following certificate(s) /documents in support:

| S. No. | Criteria | Documents Attached Details |
|------------|--|---|
| 2.1 | Technical Criteria | |
| 2.1.1 | (a) "The bidder must have satisfactorily erected and commissioned works of 33/11 kV (or higher) sub-stations of value at least 25% of "Estimated Project Cost" in last 5 (five) financial years (up to 31.03.2019)." For the purpose of meeting this requirement, only those contracts shall be considered which has contract value of not less than Rs.50 lakhs individually and order is placed on or after 01.04.2010. The orders executed of only Supply of material shall not be considered. AND (b) The bidder should have at least 1.5 Years/18 Months (Gross), successful experience with minimum 12 month continuous experience | Meeting Qualification: (Yes/No) Documents along with Format..... attached in Annexure....to this letter |

| S. No. | Criteria | Documents Attached Details |
|------------|--|--------------------------------------|
| | <p>for operation & maintenance of 33/11 KV Sub-Stations in last Five preceding Financial years and bidder having similar exposures in higher voltage class than 33 KV i.e. 66 KV, 132 KV & 220 KV etc. shall also be considered, during last Five Financial years from date of opening of Bid i.e. from Financial Year 2014 -15 to Financial Year 2018-19. The Bidders experience of operation & maintenance of 33/11 KV GSS shall be counted cumulative (Sum of best three years) of last five preceding financial years and should not be less than 5 Nos. of GSS (required to be constructed in this Tender Document) as mentioned in this Tender document.</p> <p>Notes:</p> <p>In case of JV, the above qualification shall be met as follows:</p> <p>3) For Requirement (a) above</p> <p>ii. the Lead partner shall meet not less than 60% of the work experience</p> <p>AND</p> <p>the other partner(s) shall meet the balance of the work experience and collectively the requirement of total work experience i.e. 100% of Work experience requirement.</p> <p>4) For Requirement (b) above, either of the Lead Member or other member or both cumulatively shall meet the complete 100% requirement.</p> <p>It may be noted that a proposal /bid from any JV member which has not carried out works related to installation of electrical systems as noted above shall not be considered a responsive offer.</p> | |
| 2.2 | Financial Criteria | |
| 2.2.1 | The Bidder shall have Net Worth for the each of the last three Financial Years (FY16-17, FY17-18, and FY18-19) shall be positive. | Meeting (Yes/No) Qualification: |

| S. No. | Criteria | Documents Attached Details |
|--------|---|---|
| | <p>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.</p> <p>In case of JV, all the partners of JV shall meet individually this qualification.</p> | <p>Documents along with Format..... attached in Annexure....to this letter</p> |
| 2.2.2 | <p>Minimum Annual Turnover (MAT) in any one/single year out of the last five financial years (FY14-15, FY15-16, FY16-17, FY17-18, and FY18-19) of the bidder shall be more than 50% of “Estimated Project Cost”</p> <p>In case of JV, all the partners of the JV shall meet, collectively the qualification requirement. The figures for each of the partner of the joint venture shall be added together to determine the bidder’s compliance with this qualifying criteria; however in order for a joint venture to qualify, the partner(s) of joint venture must meet the following minimum criteria:</p> <p>“The Lead partner shall meet not less than 60% AND of the other partner shall meet not less than 40% of MAT requirement. Collectively, JV shall meet the 100% requirement as in this MAT qualification”</p> | |
| 2.2.3 | <p>Certificate from Bank</p> <p>Bidder shall have liquid assets (LA) and/ or evidence of access to or availability of fund based credit facilities of not less than 10% of the “Estimated Total Project Cost” and the Banker should confirm that the Credit facility is earmarked for the Work specified under Bid on receipt of the Bid. Liquid assets would include cash (and equivalents), bank deposits, securities that can be freely traded and receivables which has general certainty of getting received.</p> <p>In case of JV, all the partners of the JV shall meet, collectively the qualification requirement. The figures for each of the partner of the joint venture shall be added together to determine the</p> | <p>Meeting Qualification: (Yes/No)</p> <p>Documents along with Format..... attached in Annexure....to this letter</p> |

| S. No. | Criteria | Documents Attached Details |
|--------|--|---|
| | <p>bidder's compliance with this qualifying criteria; however in order for a joint venture to qualify, the partner(s) of joint venture must meet the following minimum criteria:</p> <p>“The Lead partner shall meet not less than 60% AND of the other partner shall meet not less than 40% of this requirement. Collectively, JV shall meet the 100% requirement as in this qualification”</p> | |
| 2.4 | Certificate from Banker | <p>Meeting Qualification: (Yes/No)</p> <p>Documents along with Format..... attached in Annexure....to this letter</p> |

Supporting Documents enclosed.

(Supporting Documents, wherever required & applicable are to be attached at Annexure to this letter.....)

(Signature & Seal of Authorized Signatory for which POA attached)

Name of Authorized Signatory:

Designation:

Date:

Place:

Format M7-A: Work Experience Certificate for Technical Qualification
(On Letterhead of Bidder/ Lead Member of JV)

Work Experience Certificate

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

Experience related to Construction Works

| S. No. | Name of Bidder (In case of JV, name of Lead Member or Partner having experience) | Client Name | Description of Work | Work order | | Stipulated completion Period | Date of commencement | Date of actual completion | Value of work actually executed (as per completion certificate) during under-mentioned years (Amt.in Rs. Lacs) | | | | | | Remarks |
|--------|---|-------------|---------------------|------------|----------------------|------------------------------|----------------------|---------------------------|--|------------|------------|------------|------------|-------|---------|
| | | | | No.& Date | Amount (Rs.in Lakhs) | | | | FY 2014-15 | FY 2015-16 | FY 2016-17 | FY 2017-18 | FY 2018-19 | Total | |
| 1 | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | |
| | | | TOTAL: | | | | | | | | | | | | |

(Signature & Seal of Authorized Signatory for which POA attached)

Name of Authorized Signatory:

Designation:

Date:

Place:

(Signature & Seal of Practicing Chartered Account)

Certifying Chartered Accountant:

Name of Firm:

UDIN No:

Date:

Place:

Experience related to O&M Works

| S. No. | Name of Bidder (In case of JV, name of Lead Member or Partner having experience) | Client Name | Description of Work | Work order | | Stipulated completion Period | Date of commencement | Date of actual completion | A. Value of work actually executed (as per completion certificate) during under-mentioned years (Amt.in Rs. Lacs) | | | | | | Remarks |
|--------|---|-------------|---------------------|------------|----------------------|------------------------------|----------------------|---------------------------|---|------------|--------------------------------|------------|-------------------------------|-------|---------|
| | | | | No.& Date | Amount (Rs.in Lakhs) | | | | B. Nos. of GSS Operated & Maintained | | C. Continuous Month Experience | | D. Total Experience in Months | | |
| | | | | | | | | | FY 2014-15 | FY 2015-16 | FY 2016-17 | FY 2017-18 | FY 2018-19 | Total | |
| 1 | | | | | | | | | A. | A. | A. | A. | A. | A. | |
| 2 | | | | | | | | | B. | B. | B. | B. | B. | B. | |
| 3 | | | | | | | | | C. | C. | C. | C. | C. | C. | |
| 4 | | | | | | | | | D. | D. | D. | D. | D. | D. | |
| | | | TOTAL: | | | | | | | | | | | | |

(Signature & Seal of Authorized Signatory for which POA attached)

Name of Authorized Signatory:

Designation:

Date:

Place:

Note:

(Signature & Seal of Practicing Chartered Account)

Certifying Chartered Accountant:

Name of Firm:

UDIN No:

Date:

Place:

1. Notarized Copy of work orders and a satisfactory work completion certificate for 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./Electricity Power Utility/ Power Deptt. in India only. In absence of any one, it will not be considered for qualifying in technical bid. In case of distribution licensee / Distribution Franchisee, the bidder shall provide the self-certification and CA audited annual accounts and reports of meeting the criteria.
2. Work experience Certificate having value of completed work in the name of Bidder duly certified by Practicing Chartered Accountant as per the format provided in Section M Format...mentioning UDIN
3. In case of JV, the above qualification shall be met as follows:
the Lead partner shall meet not less than 60% of the work experience
AND
the other partner(s) shall meet the balance of the work experience and collectively the requirement of total work experience i.e. 100% of Work experience requirement.
4. It may be noted that a proposal /bid from any JV member which has not carried out electrical works as noted above shall not be considered a responsive offer.
5. The above details shall also be certified by the Chartered Accountant with their membership (UDIN) No. by sign and seal on each page of this format.

Format M7-B: Certificate of Bidder's Financial Qualification

(On Letterhead of the respective entity (Bidder/ Lead Member/ Other Member) for which the below details are provided. In Case of JV the following format is to be provided by Each Member of the Joint Venture separately on their respective letterhead)

Financial Qualification Certificate

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

(Rupees in Lakhs)

| S. No. | Financial parameters | FY 2014-15 | FY 2015-16 | FY 2016-17 | FY 2017-18 | FY 2018-19 |
|--------|---|------------|------------|------------|------------|------------|
| 1. | Net Worth (only last three years) | | | | | |
| 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 Assets*** | | | | | |

* Free Reserve and Surplus shall 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.

*** Liquid assets would include cash (and equivalents), bank deposits, securities that can be freely traded and receivables which has general certainty of getting received.

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

(Signature & Seal of Authorized Signatory for which POA attached)
Name of Authorized Signatory:
Designation:
Date:
Place:

(Signature & Seal of Practicing Chartered Accountant)
Certifying Chartered Accountant:
Name of Firm:
UDIN No:
Date:
Place:

Note:

1. In addition to above certificate from Chartered Accountant, Bidder is required to submit Firm's Annual Audit Report, Balance sheet, Profit & Loss and Income Tax Returns / CA certificate for last Five years i.e F.Y: 2014-15, 2015-16, 2016-17, 2017-18 & 2018-19.
2. In case of JV, The form shall also be signed by respective entity's authorized signatory along with Authorized Signatory for which POA is attached.

Format M7-C: Certificate from Banker for Evidence of Access to or Availability of Credit/Facilities

(On Letterhead of Bank Issuing Certificate)

(In case of JV, this format is to be provided for each member including Lead Member)

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

BANK CERTIFICATE

Date

This is to certify that M/s. _____ (*insert Name & Address of the Contractor*) _____ who have submitted their bid to Ajmer Vidyut Vitran Nigam Limited (AVVNL) for “for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.”, is our customer for the past years.

Their financial transaction 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

Format M8-A: Declaration for Compliance with the Code of integrity and No Conflict of Interest

(On Letterhead of Bidder giving said declaration. In Case of JV the following format is to be provided by Each Member of the Joint Venture on their respective letterhead, signed by respective authorized Signatory along with Authorized Signatory for which POA is attached with Bid)

Declaration for Compliance with the Code of integrity and No Conflict of interest
(In Compliance to RTPP Act 2012 & RTPP Rules 2013)

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

To
Superintending Engineer (TW)
Ajmer Vidyut Vitran Nigam Limited,
 Vidyut Bhawan, Room No.216
 Panchsheel Nagar, Makarwali Road,
 Ajmer-305004, Rajasthan

Sub: Bid for Tender for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.

Ref: NIT NO: AJD/SE/TW/TN-378 dated; 21.09.2019

We hereby declare that, we are in complete compliance of with the Code of integrity and No Conflict of interest as per Rajasthan Transparency in Public Procurement Act 2012 (RTPP Act 2012) & Rajasthan Transparency in Public Procurement Rules 2013 (RTPP Rules 2013), including any amendments issued thereafter.

“

A. Rule 80. Code of integrity.-

- (1) All the officers or employees of the procuring entity shall,-
- (a) Maintain an unimpeachable standard of integrity both inside and outside their office;
 - (b) act in accordance with the provisions of the Act, these rules, guidelines issued under the Act and instructions;
 - (c) Not allow any bidders to have access to information on a particular procurement, before such information is available to the public at large;
 - (d) Not intentionally use unnecessarily restrictive or “tailored” specifications, terms of reference or statements of work that can discourage competition;
 - (e) not solicit or accept any bribe, reward or gift or any material benefit of any directly or indirectly promise of future employment from anyone, who has sought or is seeking procurement from the procuring entity;

- (f) not have a financial interest in any bidder(s) responding to a procuring entity's bidding process and any person having financial interest in any bidder shall not participate in that procurement process;
 - (g) Not disclose proprietary and source selection information, directly or indirectly, to any person other than a person authorized to receive such information;
 - (h) Treat all bidders in a fair and equitable manner in line with the principle of fairness, integrity and transparency in the procurement process;
 - (i) provide all bidders identical information at the same time, during the bidding process;
 - (j) apply the same criteria of evaluation as specified in the bidding documents, bidder registration documents or pre-qualification documents and under no circumstances new evaluation criteria shall be introduced during the evaluation process;
 - (k) Not entertain any favour, recreation, presents, services, etc. from the bidders or prospective bidders;
 - (l) Protect the interests of the procuring entity under all circumstances while dealing with information and information sources;
 - (m) Maintain confidentiality of all bids;
 - (n) Ensure that the selection of bidder is as per the bidding documents and is not influenced by personal reasons attributable to concerned officials in any manner; and
 - (o) Disclose conflict of interest, if any.
- (2) Any person participating in procurement process shall,
- (a) not offer any bribe, reward or gift or any material benefit either directly or in directly in exchange for an unfair advantage in procurement process or to otherwise influence the procurement process;
 - (b) not misrepresent or omit information that misleads or attempts to mislead so as to obtain a financial or other benefit or avoid an obligation;
 - (c) not indulge in any collusion, bid rigging or anticompetitive behavior to impair the transparency, fairness and progress of the procurement process;
 - (d) not misuse any information shared between the procuring entity and the bidders with an intent to gain unfair advantage in the procurement process;
 - (e) not indulge in any coercion including impairing or harming or threatening to do the same, directly or indirectly, to any party or to its property to influence the procurement process;
 - (f) not obstruct any investigation or audit of a procurement process;
 - (g) disclose conflict of interest, if any; and
 - (h) disclose any previous transgressions with any entity in India or any other country during the last three years or any debarment by any other procuring entity.

B. Rule 81. Conflict of interest.-

- (i) A conflict of interest for procuring entity or its personnel and bidders is considered to be a situation in which a party has interests that could improperly influence that party's performance of official duties or responsibilities, contractual obligations, or compliance with applicable laws and regulations.
- (j) The situations in which a procuring entity or its personnel may be considered to be in conflict of interest includes, but not limited to, following:-
- (k) A conflict of interest occurs when procuring entity's personnel's private interests, such as outside professional or other relationships or personal financial assets,

interfere or appear to interfere with the proper performance of its professional functions or obligations as a procurement official.

- (l) Within the procurement environment, a conflict of interest may arise in connection with such private interests as personal investments and assets, political or other outside activities and affiliations while in the service of the procuring entity, employment after retirement from the procuring entity's service or the receipt of a gift that may place the procuring entity's personnel in a position of obligation.
- (m) A conflict of interest also includes the use of procuring entity's assets, including human, financial and material assets, or the use of procuring entity's office or knowledge gained from official functions for private gain or to prejudice the position of someone procuring entity's personnel does not favour.
- (n) A conflict of interest may also arise in situations where procuring entity's personnel is seen to benefit, directly or indirectly, or allow a third party, including family, friends or someone they favour, to benefit from procuring entity's personnel's actions or decisions.
- (o) A Bidder may be considered to be in conflict of interest with one or more parties in a bidding process if, including but not limited to:-
 - (p) they have controlling partners in common;
 - (q) they receive or have received any direct or indirect subsidy from any of them;
 - (r) they have the same legal representative for purposes of the bid;
 - (s) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another;
 - (t) A bidder participates in more than one bid in the same bidding process.; or
 - (u) A bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the subject matter of procurement of the bidding process. All bidders shall provide in Qualification Criteria and Bidding Forms, a statement that the bidder is neither associated nor has been associated directly or indirectly, with the consultant or any other entity that has prepared the design, specifications and other documents for the subject matter of procurement or being proposed as Project Manager for the contract.

C. Rule 82. Breach of code of integrity by the bidder.-Without prejudice to the provisions of Chapter IV of the Act, in case of breach of any provision of the code of integrity by a bidder or prospective bidder, as the case may be, the procuring entity may take appropriate action in accordance with the provisions of subsection (3) of section 11 and section 46.

(Signature & Seal of Authorized Signatory for which POA attached)

Name of Authorized Signatory:

Designation:

Date:

Place:

Format M8-B: Declaration by the Bidder regarding Qualification

(On Letterhead of Bidder giving said declaration. In Case of JV the following format is to be provided by Each Member of the Joint Venture on their respective letterhead, signed by respective authorized Signatory along with Authorized Signatory for which POA is attached with Bid)

Declaration by the Bidder regarding Qualification RTPP Act 2012 & RTPP Rules 2013
(In Compliance to RTPP Act 2012 & RTPP Rules 2013)

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

To

Superintending Engineer (TW)
Ajmer Vidyut Vitran Nigam Limited,
 Vidyut Bhawan, Room No.216
 Panchsheel Nagar, Makarwali Road,
 Ajmer-305004, Rajasthan

Sub: Bid for Tender for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.

Ref: NIT NO: AJD/SE/TW/TN-378 dated; 21.09.2019

In relation to my/our Bid submitted to Ajmer Vidyut Vitran Nigam Limited, Ajmer (AVVNL) for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378. Dated I/we hereby declare under Section 7 of Rajasthan Transparency in Public Procurement Act, 2012, that:

1. I/we possess the necessary professional, technical, financial and managerial resources and competence required by the Tender Document issued by AVVNL;
2. I/we have fulfilled my/our obligation to pay such of the taxes payable to the Union and the State Government or any local authority as specified in the Tender Document;
3. I/we are not insolvent, in receivership, bankrupt or being wound up, not have my/our affairs administered by a court or a judicial officer, not have my/our business activities suspended and not the subject of legal proceedings for any of the foregoing reasons;
4. I/we do not have, and our directors and officers not have, been convicted of any criminal offence related to my/our professional conduct or the making of false statements or misrepresentations as to my/our qualifications to enter into a procurement contract within a period of three years preceding the commencement of this procurement process, or not have been otherwise disqualified pursuant to debarment proceedings;

5. I/we do not have a conflict of interest as specified in the Act, Rules and the Bidding Document, which materially affects fair competition;

(Signature & Seal of Authorized Signatory for which POA attached)

Name of Authorized Signatory:

Designation:

Date:

Place:

Format M8-C: Declaration by the Bidder regarding Grievance Redressal during Procurement Process

(On Letterhead of Bidder giving said declaration. In Case of JV the following format is to be provided by Each Member of the Joint Venture on their respective letterhead, signed by respective authorized Signatory along with Authorized Signatory for which POA is attached with Bid)

Declaration by the Bidder regarding Grievance Redressal during Procurement Process (In Compliance to RTPP Act 2012 & RTPP Rules 2013)

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

To
Superintending Engineer (TW)
Ajmer Vidyut Vitran Nigam Limited,
 Vidyut Bhawan, Room No.216
 Panchsheel Nagar, Makarwali Road,
 Ajmer-305004, Rajasthan

Sub: Bid for Tender for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.

Ref: NIT NO: AJD/SE/TW/TN-378 dated; 21.09.2019

We hereby declare that, we are in complete agreement with the Grievance Redressal during Procurement process and will follow the same in all respects as per Rajasthan Transparency in Public Procurement Act 2012 (RTPP Act 2012) & Rajasthan Transparency in Public Procurement Rules 2013 (RTPP Rules 2013), including any amendments issued thereafter.

The designation of the First Appellate Authority is Managing Director, Ajmer Vidyut Vitran Nigam Limited (“AVVNL”/ “Ajmer Discom”) and the address is the Corporate Office at Ajmer, Rajasthan. The designation of the Second Appellate Authority is Chairman, Rajasthan Discoms, Jaipur address, Vidyut Bhawan, Near Vidhan Sabha, Jaipur.

“

Appeals

A. RTPP Rule 83. Form of Appeal.-

1. An appeal under sub-section (1) or (4) of section 38 shall be in Form along with as many copies as there are respondents in the appeal.
2. Every appeal shall be accompanied by an order appealed against, if any, affidavit verifying the facts stated in the appeal and proof of payment of fee.
3. Every appeal may be presented to First Appellate Authority or Second Appellate Authority, as the case may be, in person or through registered post or authorized representative.

B. Rule 84. Fee for filing appeal.-

1. Fee for first appeal shall be rupees two thousand five hundred and for second appeal shall be rupees ten thousand, which shall be nonrefundable.

2. The fee shall be paid in the form of bank demand draft or banker's cheque of a Scheduled Bank payable in the name of Appellate Authority concerned.

C. Rule 85. Procedure for disposal of appeal.-

1. The First Appellate Authority or Second Appellate Authority, as the case may be, upon filing of appeal, shall issue notice accompanied by copy of appeal, affidavit and documents, if any, to the respondents and fix date of hearing.
2. On the date fixed for hearing, the First Appellate Authority or Second Appellate Authority, as the case may be, shall,-
 - i. hear all the parties to appeal present before him; and
 - ii. peruse or inspect documents, relevant records or copies thereof relating to the matter.
 - iii. After hearing the parties, perusal or inspection of documents and relevant records or copies thereof relating to the matter, the Appellate Authority concerned shall pass an order in writing and provide the copy of order to the parties to appeal free of cost.
 - iv. The order passed under sub-rule (3) shall also be placed on the State Public Procurement Portal.

- D. Rule 86. Repeal and savings.-**All rules, regulations, orders, notifications, departmental codes, manuals, by-laws, official memoranda or circulars relating to procurement of goods, services or works provided for in these rules, which are in force on the date of commencement of these rules, in relation to the matter covered by these rules are hereby repealed to the extent they are covered by these rules:

Provided that such repeal shall not affect the previous operation of rules, regulations, orders, notifications, departmental codes, manuals, by-laws, official memoranda or circulars, so repealed and the procurement process commenced before the commencement of these rules shall continue as per the provisions of rules, regulations, orders, notifications, departmental codes, manuals, by-laws, official memoranda or circulars, so repealed.

FORM No. 1
[See rule 83]

Memorandum of Appeal under the Rajasthan Transparency in Public Procurement Act, 2012

Appeal NoofBefore the(First / Second Appellate Authority)

1. Particulars of appellant:

- (i) Name of the appellant:
- (ii) Official address, if any:
- (iii) Residential address:

2. Name and address of the respondent(s):

- (i)
- (ii)
- (iii)

3. Number and date of the order appealed against and name and designation of the officer / authority who passed the order (enclose copy), or a statement of a decision, action or omission of the procuring entity in contravention to the provisions of the Act by which the appellant is aggrieved:

4. If the Appellant proposes to be represented by a representative, the name and postal address of the representative:

5. Number of affidavits and documents enclosed with the appeal:

6. Grounds of appeal:

.....
.....
.....
.....(Supported by an affidavit)

7. Prayer:

.....
.....
.....

Place

Date

Appellant's Signature

..."

(Signature & Seal of Authorized Signatory for which POA attached)

Name of Authorized Signatory:

Designation:

Date:

Place:

Format M8-D: Declaration by the Bidder regarding Additional Condition of Tender Document/ Contract

(On Letterhead of Bidder giving said declaration. In Case of JV the following format is to be provided by Each Member of the Joint Venture on their respective letterhead, signed by respective authorized Signatory along with Authorized Signatory for which POA is attached with Bid)

Declaration by the Bidder regarding Additional Condition of Tender Document/ Contract
(In Compliance to RTPP Act 2012 & RTPP Rules 2013)

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

To
Superintending Engineer (TW)
Ajmer Vidyut Vitran Nigam Limited,
 Vidyut Bhawan, Room No.216
 Panchsheel Nagar, Makarwali Road,
 Ajmer-305004, Rajasthan

Sub: Bid for Tender for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.

Ref: NIT NO: AJD/SE/TW/TN-378 dated; 21.09.2019

We hereby declare that, we are in complete agreement with the Additional Conditions of Tender Document/ Contract and will follow the same in all respects as per Rajasthan Transparency in Public Procurement Act 2012 (RTPP Act 2012) & Rajasthan Transparency in Public Procurement Rules 2013 (RTPP Rules 2013), including any amendments issued thereafter.

“.....

1. Correction of arithmetical errors

Provided that a Financial Bid is substantially responsive, Ajmer Vidyut Vitran Nigam Limited, (“AVVNL”) will correct arithmetical errors during evaluation of Financial Bids on the following basis:

- i. if there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of AVVNL there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected;
- ii. if there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

- iii. if there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (i) and (ii) above.

If the Bidder that submitted the lowest evaluated Bid does not accept the correction of errors, its Bid shall be disqualified and its Bid Security shall be forfeited or its Bid Securing Declaration shall be executed.

2. Discom's Right to Vary Quantities

Discom in this clause shall mean the respective Electricity Distribution Company of Rajasthan with whom the Contract shall be signed by Successful Bidder.

- i. At the time of award of contract, the quantity of Goods, works or services originally specified in the Bidding Document may be increased or decreased by a specified percentage, but such increase or decrease shall not exceed fifty percent, but may be decreased as per requirement of Discom, of the quantity specified in the Bidding Document. It shall be without any change in the unit prices or other terms and conditions of the Bid and the conditions of contract.
- ii. If the Discom does not procure any subject matter of procurement or procures less than the quantity specified in the Bidding Document due to change in circumstances, the Bidder/ Successful Bidder/ Contractor shall not be entitled for any claim or compensation except otherwise provided in the Conditions of Contract.
- iii. In case of procurement of Goods or services, additional quantity may be procured by placing a repeat order on the rates and conditions of the original order. However, the additional quantity can be upto 50% of the value of Goods of the original contract/work order and shall be within one month from the date of expiry of last supply. If the Contractor fails to do so, Discom shall be free to arrange for the balance supply by limited Bidding or otherwise and the extra cost incurred shall be recovered from the Contractor.
.....”

(Signature & Seal of Authorized Signatory for which POA attached)

Name of Authorized Signatory:

Designation:

Date:

Place:

Format M9: Declaration Regarding Alternative, Deviations and Exceptions to the Provisions

(On Letterhead of Bidder/ Lead Member of JV)

Declaration by the Bidder regarding Alternative, Deviations & Exceptions to Provisions

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

To

Superintending Engineer (TW)
Ajmer Vidyut Vitran Nigam Limited,
Vidyut Bhawan, Room No.216
Panchsheel Nagar, Makarwali Road,
Ajmer-305004, Rajasthan

Sub: Bid for Tender for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.

Ref: NIT NO: AJD/SE/TW/TN-378 dated; 21.09.2019

Dear Sir,

We hereby confirm that there is no Alternative, deviations & exceptions with respect to complete terms and conditions stipulated in the Tender Document and we are agreed to adhere all of the same strictly.

(Signature & Seal of Authorized Signatory for which POA attached)

Name of Authorized Signatory:

Designation:

Date:

Place:

Format M10: Declaration Regarding No Omissions or Inconsistencies or Reservations
(On Letterhead of Bidder/ Lead Member of JV)

Declaration by the Bidder regarding No Omissions or Inconsistencies or Reservations

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

To

Superintending Engineer (TW)
Ajmer Vidyut Vitran Nigam Limited,
Vidyut Bhawan, Room No.216
Panchsheel Nagar, Makarwali Road,
Ajmer-305004, Rajasthan

Sub: Bid for Tender for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.

Ref: NIT NO: AJD/SE/TW/TN-378 dated; 21.09.2019

Dear Sir,

We confirm that Bid submitted by us and have been filled up by us as per the provisions of the Tender Document issued vide above-referenced NIT. We have also uploaded price bid electronically as per the provisions of the Tender Document. Further, we have noted that the same shall be evaluated as per the provisions of the Tender Document.

Further, we hereby confirm that there is no Alternative, Deviations and Exceptions to the Provisions hereof of the Tender Document and/or the Covering Letter, forming part of our Bid Envelope and also confirm the following:

- (i) There are no discrepancies/inconsistencies and deviations/omissions/ reservations to the Tender Document, in the price bid;
- (ii) The description of items and the unit thereof in the price schedules are in conformity with those indicated in the price schedule of the Tender Document without any deviation to the specified scope of work.

We also confirm that in case any discrepancies/ inconsistencies and deviations/ omissions/ reservations, as referred to in para (i) and (ii) above, is observed in the online price bid, the same shall be deemed as withdrawn/rectified without any financial implication, whatsoever to AVVNL. However, in case of any arithmetical errors, the same shall be governed as per the provisions of Tender Document Section H 13.4.

(Signature & Seal of Authorized Signatory for which POA attached)

Name of Authorized Signatory:

Designation:

Date:

Place:

Format M11: Integrity Pact

(On Letterhead of Bidder giving said declaration. In Case of JV the following format is to be provided by Lead Member which shall be signed by all the partners of Joint Venture. The Bidder shall submit the Integrity Pact on a non-judicial stamp paper of Rs. 100/- duly notarised. The Integrity Pact is to be prepared in Two (2) Original Copies)

(INTEGRITY PACT)

General

This pre-bid pre-contract Agreement (hereinafter called the Integrity Pact) is made on day of the month of 2010, between, on one hand, theAjmer Vidyut Vitran Nigam Limited, Ajmer acting through Shri..... (Name and designation of Authorized Representative of Discom/ Employer) (Hereinafter called the "Discom", which expression shall mean and include, unless *the* context otherwise requires, his successors in office and assigns) of the First Part and M/s..... (Name of Bidder/ JV Member / Lead Member) represented by Shri....., Chief Executive Officer (hereinafter called the "Bidder / Contractor" which expression shall mean and include, unless the context otherwise requires, his successors and permitted assigns) of the Second Part.

WHEREAS the Discom proposes to hire eligible Bidder/ Contractor for executing the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378. (hereinafter referred to as "Scope of Work") and the Bidder / Contractor is willing to offer/has offered "proposal/ bid" for the said Tender.

WHEREAS the Bidder/ Contractor is a private company/ public company/ Government undertaking / limited liability partnership / partnership firm/ sole proprietorship entity, constituted in accordance with the relevant Law in the matter and the Discom is a Utility of Rajasthan State Government performing its functions on behalf of the Government of Rajasthan.

NOW, THEREFORE,

To avoid all forms of corruption by following a system that is fair, transparent and free from any influence/prejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to :-

Enabling the Discom to obtain the desired Scope of Work at a competitive price in conformity with the defined specifications by avoiding the high cost and the distortionary impact of corruption on public procurement, and

Enabling Bidder/ Contractor to abstain from bribing or indulging in any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and the Discom will commit to prevent corruption, in any form, by its officials by following transparent procedures.

The parties hereto hereby agree to enter into this Integrity Pact and agree as follows:

1. Commitments of the Discom

- 1.1. The Discom undertakes that no official of the Bidder/ Contractor, connected directly or indirectly with the contract, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the Bidder/ Contractor, either for themselves or for any person, organisation or third party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the contract.
- 1.2. The Discom will, during the pre-contract stage, treat all Bidder(s) alike and will provide to all Bidder(s) the same information and will not provide any such information to any particular Bidder which could afford an advantage to that particular Bidder in comparison to other Bidder(s).
- 1.3. All the officials of the Discom will report to the appropriate Government office any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.
- 1.4. In case any such preceding misconduct on the part of such official(s) is reported by the Bidder/ Contractor to the Discom with full and verifiable facts and the same is prima facie found to be correct by the Discom, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by the Discom and such a person shall be debarred from further dealings related to the contract process. In such a case while an enquiry is being conducted by the Discom the proceedings under the contract would not be stalled.

2. Commitments of Bidder(s)

- 2.1. The Bidder commits itself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its bid or during any pre-contract or post-contract stage in order to secure the contract or in furtherance to secure it and in particular commit itself to the following:-
- 2.2. The Bidder will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the Discom, connected directly or indirectly with the bidding process, or to any person, organisation or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the contract.
- 2.3. The Bidder further undertakes that it has not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the Discom or otherwise in procuring the Contract or forbearing to do or having done any act in relation to the obtaining or execution of the contract or any other contract with the Government for showing or for bearing to show favour or disfavour to any person in relation to the contract or any other contract with Government.

- 2.4. Bidder(s) shall disclose the name and address of agents and representatives and Indian Bidder(s) shall disclose their foreign principals or associates.
- 2.5. Bidder(s) shall disclose the payments to be made by them to agents/brokers or any other intermediary, in connection with this bid/contract.
- 2.6. The Bidder further confirms and declares to the Discom that the Bidder is the original manufacturer/integrator/authorised government sponsored export entity of the defence stores and has not engaged any individual or firm or company whether Indian or foreign to intercede, facilitate or in any way to recommend to the Discom or any of its functionaries, whether officially 'or unofficially to the award of the contract to the Bidder, nor has any amount been paid, promised or intended to be paid to any such individual, firm or company in respect of any such intercession, facilitation or recommendation.
- 2.7. The Bidder, either while presenting the bid or during pre-contract negotiations or before signing the contract, shall disclose any payments he has made, is committed to or intends to make to officials of the Discom or their family members, agents, brokers or any other intermediaries in connection with the contract and the details of services agreed upon for such payments.
- 2.8. The Bidder will not collude with other parties interested in the contract to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.
- 2.9. The Bidder will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.
- 2.10. The Bidder shall not use improperly, for purposes of competition or personal gain, or pass on to others, any information provided by the Discom as part of the business relationship, regarding plans, technical proposals and business details, including information contained in any electronic data carrier. The Bidder also undertakes to exercise due and adequate care lest any such information is divulged.
- 2.11. The Bidder commits to refrain from giving any complaint directly or through any other manner without supporting it with full and verifiable facts.
- 2.12. The Bidder shall not instigate or cause to instigate any third person to commit any of the actions mentioned above.
- 2.13. If the Bidder or any employee of the Bidder or any person acting on behalf of the Bidder, either directly or indirectly, is a relative of any of the officers of the Discom, or alternatively, if any relative of an officer of the Bidder has financial interest/stake in the Bidder's firm, the same shall be disclosed by the Bidder at the time of filing of bid in response to tender.
- 2.14. The term 'relative' for this purpose would be as defined in Section 6 of the Companies Act 1956.

- 2.15. The Bidder shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any employee of the Discom.

3. Previous Transgression

- 3.1. The Bidder declares that no previous transgression occurred in the last three years immediately before signing of this Integrity Pact, with any other company in any country in respect of any corrupt practices envisaged hereunder or with any Public Sector Enterprise in India or any Government Department in India that could justify Bidder's exclusion from the tender process.
- 3.2. The Bidder agrees that if it makes incorrect statement on this subject, Bidder can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

4. Bid Security

- 4.1. While submitting commercial bid, the Bidder shall deposit an amount of Rs. 6,70,860/- (specified in Tender Document/ NIT) as Bid Security, with the Discom through any of the following instruments:
- 4.1.1. Bank Draft or a Pay Order in favour of
- 4.1.2. A confirmed guarantee by from a reputed (i) Public Sector Bank located in India; or (ii) Scheduled Commercial Indian Private Bank as per the attached list only [List is placed at Section C Key Bid Data of Tender Document], promising payment of the guaranteed sum to the Discom on demand within three working days without any demur whatsoever and without seeking any reasons whatsoever. The demand for payment by the Discom shall be treated as conclusive proof of payment.
- 4.1.3. Any other mode or through any other instrument (as specified in Tender Document).
- 4.2. The Bid Security shall be valid upto a period of 6 months plus (+) 30 days of grace period "from the date of opening of Technical Bid" or the complete conclusion of the contractual obligations to the complete satisfaction of both the Bidder and the Discom, including warranty period, whichever is later.
- 4.3. In case of the successful Bidder, a clause would also be incorporated in the Article pertaining to Performance Security in the' Contract Agreement that the provisions of Sanctions for Violation shall be applicable for forfeiture of Performance Security in case of a decision by the Discom to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.
- 4.4. No interest shall be payable by the Discom to the Bidder on Bid Security for the period of its currency.

5. Sanctions for Violations

- 5.1. Any breach of the aforesaid provisions by the Bidder or anyone employed by it or acting on its behalf (whether with or without the knowledge of the Bidder) shall entitle the Discom to take all or any one of the following actions, wherever required:-
- 5.1.1. To immediately call off the pre contract negotiations without assigning any reason or giving any compensation to the Bidder. However, the proceedings with the other Bidder(s) would continue.
 - 5.1.2. The Bid Security (in pre-contract stage) and/or Performance Security (after the contract is signed) shall stand forfeited either fully or partially, as decided by the Discom and the Discom shall not be required to assign any reason therefore.
 - 5.1.3. To immediately cancel the contract, if already signed, without giving any compensation to the Bidder.
 - 5.1.4. To recover all sums already paid by the Discom, and in case of an Indian Bidder with interest thereon at 2% higher than the prevailing Prime Lending Rate of State Bank of India, while in case of a Bidder from a country other than India with interest thereon at 2% higher than the UBOR. If any outstanding payment is due to the Bidder from the Discom in connection with any other contract for any other stores, such outstanding payment could also be utilized to recover the aforesaid sum and interest.
 - 5.1.5. To encash the advance bank guarantee (if applicable) and Performance Security, if furnished by the Bidder, in order to recover the payments, already made by the Discom, along with interest.
 - 5.1.6. To cancel all or any other Contracts with the Bidder. The Bidder shall be liable to pay compensation for any loss or damage to the Discom resulting from such cancellation/rescission and the Discom shall be entitled to deduct the amount so payable from the money(s) due to the Bidder.
 - 5.1.7. To debar the Bidder from participating in future bidding processes of the Government of India for a minimum period of five years, which may be further extended at the discretion of the Discom.
 - 5.1.8. To recover all sums paid in violation of this Pact by Bidder(s) to any middleman or agent or broker with a view to securing the contract.
 - 5.1.9. In cases where irrevocable Letters of Credit have been received in respect of any contract signed by the Discom with the Bidder, the same shall not be opened.
 - 5.1.10. Forfeiture of Performance Security in case of a decision by the Discom to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.
- 5.2. The Discom will be entitled to take all or any of the actions mentioned at para 5.1.1 to 5.1.10 of this Pact also on the Commission by the Bidder or anyone employed by it or acting on its behalf (whether with or without the knowledge of the Bidder), of an offence as defined in Chapter IX of the Indian Penal code, 1860 or Prevention of Corruption Act, 1988 or any other statute enacted for prevention of corruption.
- 5.3. The decision of the Discom to the effect that a breach of the provisions of this Pact has been committed by the Bidder shall be final and conclusive on the Bidder. However, the Bidder can approach the Independent Monitor(s) appointed for the purposes of this Pact.

6. Fall Clause

- 6.1. The Bidder undertakes that it has not supplied/is not supplying similar product/systems or subsystems at a price lower than that offered in the present bid in respect of any other Ministry/Department of the Government of India or PSU and if it is found at any stage that similar product/systems or sub systems was supplied by the Bidder to any other Ministry/Department of the Government of India or a PSU at a lower price, then that very price, with due allowance for elapsed time, will be applicable to the present case and the difference in the cost would be refunded by the Bidder to the Discom, if the contract has already been concluded.

7. Independent Monitors

- 7.1. The Discom has appointed Independent Monitors (hereinafter referred to as Monitors) for this Pact in consultation with the Central Vigilance to as Monitors) for this Pact in consultation with the Central Vigilance Commission (Names and Addresses of the Monitors to be given).
- 7.2. The task of the Monitors shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this Pact.
- 7.3. The Monitors shall not be subject to instructions by the representatives of the parties and perform their functions neutrally and independently.
- 7.4. Both the parties accept that the Monitors have the right to access all the documents relating to the project/procurement, including minutes of meetings.
- 7.5. As soon as the Monitor notices, or has reason to believe, a violation of this Pact, he will so inform the Authority designated by the Discom.
- 7.6. The Bidder(s) accepts that the Monitor has the right to access without restriction to all Project documentation of the Discom including that provided by the Bidder. The Bidder will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The Monitor shall be under contractual obligation to treat the information and documents of the Bidder with confidentiality.
- 7.7. The Discom will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the parties. The parties will offer to the Monitor the option to participate in such meetings.
- 7.8. The Monitor will submit a written report to the designated Authority of Discom/Secretary in the Department/ within 8 to 10 weeks from the date of reference or intimation to him by the Discom/ Bidder and, shall the occasion arise, submit proposals for correcting problematic situations.

8. Facilitation of Investigation

- 8.1. In case of any allegation of violation of any provisions of this Pact or payment of commission, the Discom or its agencies shall be entitled to examine all the documents including the Books of Accounts of the Bidder and the Bidder shall provide necessary information and documents in English and shall extend all possible help for the purpose of such examination.

9. Law and Place of Jurisdiction

- 9.1. This Pact is subject to Indian Law. The place of performance and jurisdiction is the seat of the Discom.

10. Other Legal Actions

10.1. The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the extant law in force relating to any civil or criminal proceedings

11. Validity

11.1. The validity of this Integrity Pact shall be from date of its signing and extend upto 5 years or the complete execution of the contract to the satisfaction of both the Discom and the Bidder/ Contractor, including warranty period, whichever is later. In case Bidder is unsuccessful, this Integrity Pact shall expire after six months from the date of the signing of the contract.

11.2. Shall one or several provisions of this Pact turn out to be invalid; the remainder of this Pact shall remain valid. In this case, the parties will strive to come to an agreement to their original intentions.

The parties hereby sign this Integrity Pact aton.....

BUYER
Name of the Officer
Designation
Deptt./PSU

BIDDER
CHIEF EXECUTIVE OFFICER

Witness
1.....
2.....

Witness
2.....
3.....

* Provisions of these clauses would need to be amended/ deleted in line with the policy of the BUYER in regard to involvement of Indian agents of foreign suppliers

Format M12: Bank Guarantee Verification Check-list**Bank Guarantee Verification Check-List**
(On Letterhead of Bidder/ Lead Member of JV)

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

To
Superintending Engineer (TW)
Ajmer Vidyut Vitran Nigam Limited,
 Vidyut Bhawan, Room No.216
 Panchsheel Nagar, Makarwali Road,
 Ajmer-305004, Rajasthan

Sub: Bid for Tender for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.

Ref: NIT NO: AJD/SE/TW/TN-378 dated; 21.09.2019

| S. No. | Checklist | Yes | No |
|--------|--|-----|----|
| 1 | Does the bank guarantee compare verbatim with standard proforma for BG? | | |
| 2(a) | Has the executing Officer of BG indicated his name designation & Power of Attorney No. / Signing power Number etc. on BG? | | |
| 2(b) | Is each page of BG duly Signed/ initialed by the executants and last page is signed with full particulars as required in the standard proforma of BG and under the seal of the bank? | | |
| 2(c) | Does the last page of the BG carry the signatures of two witnesses alongside the signature of the executing Bank Manager? | | |
| 3(a) | Is the BG on non-judicial stamp paper of appropriate value? | | |
| 3(b) | Is the date of sale of non-judicial stamp paper shown on the BG and the stamp paper is issued not more than Six months prior to the date of execution of BG? | | |
| 4(a) | Are the factual details such as Bid specification No., LOA No. contract price, etc, correct? | | |
| 4(b) | Whether Overwriting /cutting, if any on the BG, authenticated under signature & seal of executants? | | |

| S. No. | Checklist | Yes | No |
|--------|---|-----|----|
| 5 | Is the amount and validity of BG is in line with contract provisions? | | |
| 6 | Whether the BG has been issued by a reputed (i) Public Sector Bank located in India; or (ii) Scheduled Commercial Indian Private Bank as per the attached list only [List is placed at BDS] (the applicability of the bank shall be in line with the provisions of bidding documents)? | | |

(Signature & Seal of Authorized Signatory for which POA attached)

Name of Authorized Signatory:

Designation:

Date:

Place:

Format M13: Undertaking for No Blacklisting & No Banning

(On Letterhead of Bidder giving said declaration. In Case of JV the following format is to be provided by Each Member of the Joint Venture on their respective letterhead, signed by respective authorized Signatory along with Authorized Signatory for which POA is attached with Bid)

(On Non-Judicial Stamp Paper of Rs. 100/- attested by Notary Public/ First Class Magistrate)

Undertaking for No Blacklisting & No Banning

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

To

Superintending Engineer (TW)
Ajmer Vidyut Vitran Nigam Limited,
Vidyut Bhawan, Room No.216
Panchsheel Nagar, Makarwali Road,
Ajmer-305004, Rajasthan

Sub: Bid for Tender for for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.

I / We hereby declare that presently our Company/Limited Liability Partnership/ Partnership Firm/ Sole Proprietorship is having unblemished record and is not declared ineligible and business relation not severed for corrupt/fraudulent practices by any State/Central Government/PSU on the date of Bid Submission.

I / We further declare that presently our Company/Limited Liability Partnership/ Partnership Firm/ Sole Proprietorship is not blacklisted/debarred and not declared ineligible and business relation not severed for reasons other than corrupt/fraudulent practices by any State/Central Government/PSU on the date of Bid Submission.

If this declaration is found to be incorrect then without prejudice to any other action that may be taken, our security may be forfeited in full and the tender if any to the extent accepted may be cancelled.

(Signature & Seal of Authorized Signatory for which POA attached)

Name of Authorized Signatory:

Designation:

Date:

Place:

Format M14: Price Bid (To be submitted in MS Excel File online)

(This format is just for reference and is not to be submitted in Technical Bid or hard copy. This is to be submitted only online in Cover – 3 in MS Excel File)

Bidder shall quote rates / costs in the format given below for in MS Excel File on Bidding Portal for for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378. (FOR Site Basis)

Excel File of BOQ attached in the Price Bid Section of Tender Document available online.

- Note:
- (i) The offer is valid for six months from date of opening of tender.
 - (ii) L-1 will be decided on the basis of sum of total quoted amount of all 4 BOQs.
 - (iv) **This format is for information only. All bidders are advised to submit their price offers online in MS Excel File cover-III only.**

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| N9-L | Format N9L – Employment Card | 307 |
| N9-M | Format N9M – Annual Return | 308 |
| N9-N | Format N9N – Muster Roll | 309 |

Format N1: Performance Security

(On Non judicial Stamp of Rajasthan State worth 0.25% of BG Value (maximum stamp duty of Rs. 25000/-)

Bank Guarantee No.

Date.....

Contract No.....

.....[Name of Contract].....

To

Concerned Discom Official
Concerned Discom & Address

Dear Ladies and/or Gentlemen,

We refer to the Letter of Intent ("LOI") <Insert LOI No:>, issued on <Insert Date of Issue of LOI by Discom.....> by Ajmer Vidyut Vitran Nigam Limited (hereinafter referred to as "AVVNL"), having its Registered Office at Vidyut Bhawan, Panchsheel Nagar, Makadwali Road, Ajmer-305004 (Rajasthan) (hereinafter referred to as "Discom") , to M/s (Name of Contractor), having its Principal place of business at(Address of Contractor) and Registered Office at(Registered address of Contractor) ("the Contractor") concerning **“work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378**, and the LOI having been accepted by the selected Contractor vide <.....Insert Letter No....>, resulting in Letter of Award to be issued and Contract Agreement to be entered into. [Applicable for Bank Guarantees issued by Contractor/Associate for those Contracts awarded to them]

Or

(Select Option accordingly as applicable)

We refer to the Letter of Intent ("LOI") <Insert LOI No:>, issued on <Insert Date of Issue of LOI by Discom.....> by Ajmer Vidyut Vitran Nigam Limited (hereinafter referred to as "AVVNL"), having its Registered Office at Vidyut Bhawan, Panchsheel Nagar, Makadwali Road, Ajmer-305004 (Rajasthan), having its Registered Office at.....(Insert Address) (hereinafter referred to as "Discom"), to M/s (Name of Contractor), having its Principal place of business at(Address of Contractor) and Registered Office at(Registered address of Contractor) ("the Contractor") and M/s (Name of Associate), having its Principal place of business at(Address of Associate) and Registered Office at(Registered address of Associate), the Associate of the Contractor, **“work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378”**, and the LOI having been accepted by the selected Contractor vide <.....Insert Letter No....>, resulting in Letter

of Award to be issued and Contract Agreement to be entered into. *[Applicable for Bank Guarantees to be issued by Contractor against those Contracts awarded to their Associate]*

By this letter we, the undersigned,(insert name & address of the issuing bank), a Bank (which expression shall include its successors, administrators, executors and assigns) organized under the laws of and having its Registered/Head Office at(insert address of registered office of the bank)..... do hereby irrevocably guarantee payment to the Discom up to i.e., Ten percent (10%) of the Contract Price until ninety (90) days beyond the 60 months from the date of successful installation of last system i.e., upto and inclusive of (dd/mm/yy).

We undertake to make payment under this Letter of Guarantee upon receipt by us of your first written demand signed by the Discom duly authorized officer or the authorized officer of **Discom** declaring the Contractor to be in default under the Contract and without civil or argument any sum or sums within the above named limits, without your need to prove or show grounds or reasons for your demand and without the right of the Contractor to dispute or question such demand.

Our liability under this Letter of Guarantee shall be to pay to the Discom whichever is the lesser of the sum so requested or the amount then guaranteed hereunder in respect of any demand duly made hereunder prior to expiry of the Letter of Guarantee, without being entitled to inquire whether or not this payment is lawfully demanded.

This letter of Guarantee shall remain in full force and shall be valid from the date of issue until ninety (90) days beyond the 60 months from the date of successful completion of contract i.e. upto and inclusive of (dd/mm/yy) and shall be extended from time to time for such period (not exceeding one year), as per the terms & conditions of Tender Document.

Except for the documents herein specified, no other documents or other action shall be required, notwithstanding any applicable law or regulation.

Our liability under this Letter of Guarantee shall become null and void immediately upon its expiry, whether it is returned or not, and no claim may be made hereunder after such expiry or after the aggregate of the sums paid by us to the Discom shall equal the sums guaranteed hereunder, whichever is the earlier.

All notices to be given under shall be given by registered (airmail) posts to the addressee at the address herein set out or as otherwise advised by and between the parties hereto.

All disputes arising under the said Guarantee between the Bank and the Discom or between the contractor and the Discom pertaining to the Guarantee shall be subject to the jurisdiction of courts only at Ajmer in Rajasthan alone.

We hereby agree that any part of the Contract may be amended, renewed, extended, modified, compromised, released or discharged by mutual agreement between you and the Contractor, and this security may be exchanged or surrendered without in any way impairing or affecting our liabilities hereunder without notices to us and without the necessity for any additional endorsement, consent or guarantee by us, provided, however, that the sum guaranteed shall not be increased or decreased.

No action, event or condition which by any applicable law shall operate to discharge us from liability hereunder shall have any effect and we hereby waive any right we may have to apply such law so that in all respects our liability hereunder shall be irrevocable and, except as stated herein, unconditional in all respects.

For and on behalf of the Bank

[*Signature of the authorised signatory(ies)*]

Signature_____

Name_____

Designation_____

POA Number_____

Contact Number(s): Tel._____Mobile_____

Fax Number_____

email _____

Common Seal of the Bank_____

Witness:

Signature_____

Name_____

Address_____

Contact Number(s): Tel._____Mobile_____

email _____

Note:

1. For the purpose of executing the Bank Guarantee, the non-judicial stamp papers of appropriate value shall be purchased in the name of Bank who issues the 'Bank Guarantee'.
2. The Bank Guarantee shall be signed on all the pages by the Bank Authorities indicating their POA nos. and shall invariably be witnessed.
3. The Bank Guarantee shall be in accordance with the proforma as provided. However, in case the issuing bank insists for additional paragraph for limitation of liability, the following may be added at the end of the proforma of the Bank Guarantee [*i.e., end paragraph of the Bank Guarantee preceding the signature(s) of the issuing authority(ies) of the Bank Guarantee*]:

Quote

“Notwithstanding anything contained herein:

1. Our liability under this Bank Guarantee shall not exceed _____ (*value in figures*)_____ [*value in words*]_____].
2. This Bank Guarantee shall be valid upto _____ (*validity date*)_____.
3. We are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only & only if we receive a written claim or demand on or before _____ (*validity date*) _____.”

Unquote

Format N2: Contract Completion Certificate by Discom

Certificate from Project Officer,Name of Discom

Following are certified in reference to (Name of Discom.....) Work Order No.....Date..... referred above for for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.:

1. A Supply & Erection Contract and Operation & Maintenance Contract as per the format at [Section N – Format N6](#) of Tender Document has been executed with the beneficiary.
2. The material has been supplied in good condition as per technical specification of tender document/work order.
3. The erection work has been completed within stipulated period / with a delay of ----- days.
4. All the relevant documents as desired by Discom has been provided to Discom.
5. The work as envisaged under the Contract to complete the Operation & Maintenance for the required period has been completed.
6. All the Operational Acceptances, Interim Taking Over, Final Taking Over Certificates for all the GSS under consideration have been issued by Discom.

Verified for payment of Rs. -----/- (Rs.-----
-----) as per terms and condition of said Tender Document and Work Order.

Signature for and on behalf of Discom

Name of Nodal Officer
Name of Discom
Seal of Discom
Date
Place

Format N3: Operational Acceptance Certificate

Date.....

Name of Contract.....

Contract No.....

To:

(Name and address of the Contractor)

Dear Ladies and/or Gentlemen,

Pursuant to GCC 20 (Completion of the Facilities) of the General Conditions of the Contract entered into between yourselves and the Employer dated relating to the..... (*insert brief description of the Facilities*)..... we hereby notify you that the we System tests and Acceptance tests of the following part(s) of the Facilities were satisfactorily completed on the date specified below :

- 1. Description of the Facilities or part thereof.....
- 2. Date of Operational Acceptance:.....

This letter does not relieve you of your obligation during the Defects Liability Period and Latent Defect warranty.

Very truly yours,

Title
(Project Manager)

Format N4 - A: Final Taking Over Certificate

Date.....
 Name of Contract.....
 Contract No.....

To:

(Name and address of the Contractor)

Dear Ladies and/or Gentlemen,

Pursuant to GCC 20, On Construction Completion, as per the General Conditions of the Contract entered into between yourselves and the Employer dated of/ relating to the..... (*Insert brief description of the Facilities*)..... we hereby notify you that the following part(s) of the Facilities was (were) complete on the date specified below, and that, in accordance with the terms of the Contract, the Employer hereby records the event regarding the said part(s) of the Facilities, and approves the starting of O&M period for said facility, thereof on the date mentioned below :

1. Description of the Facilities or part thereof.....
2. Date of Construction Completion:.....

However, you are required to complete the outstanding items listed in the attachment hereto as soon as practicable.

This letter does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defects Liability Period.

Very truly yours,

Title
 (Project Manager)

Format N4 - B: Final Taking Over Certificate

Date.....
 Name of Contract.....
 Contract No.....

To:

(Name and address of the Contractor)

Dear Ladies and/or Gentlemen,

Pursuant to GCC 52, On Construction Completion & O&M Completion as per the General Conditions of the Contract entered into between yourselves and the Employer dated of/ relating to the..... (*Insert brief description of the Facilities*)..... we hereby notify you that the following part(s) of the Facilities was (were) complete on the date specified below, and that, in accordance with the terms of the Contract, the Employer hereby takes over the said part(s) of the Facilities, together with the responsibility for care and custody and the risk of loss thereof on the date mentioned below :

1. Description of the Facilities or part thereof.....
2. Date of Construction Completion:.....
3. Date of O&M Completion:.....

However, you are required to complete the outstanding items listed in the attachment hereto as soon as practicable.

This letter does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defects Liability Period.

Very truly yours,

Title
 (Project Manager)

Format N5-A: Form of Indemnity bond to be executed by the Contractor for the equipment handed over in one lot by Discom for performance of its contract

INDEMNITY BOND

THIS INDEMNITY BOND is made this..... day of 20.... by a Company registered under the Companies Act, 1956/2013 (with amendment from time to time)/Partnership firm/ proprietary concern having its Registered Office at.....(hereinafter called as 'Contractor' or "Obligor" which expression shall include its successors and permitted assigns) in favour of Ajmer Vidyut Vitran Nigam Limited (*insert name of the Employer*)....., a Company incorporated under the Companies Act, 1956/2013 (with amendment from time to time) having its Registered Office at Vidyut Bhawan, Ajmer(*insert registered address of the Employer*) and its project at (hereinafter called " AVVNL (*abbreviated name of the Employer*)....." which expression shall include its successors and assigns):

WHEREAS AVVNL (*abbreviated name of the Employer*)..... has awarded to the Contractor a Contract for.....vide its Notification of Award/Contract No..... dated..... and its Amendment No. (applicable when amendments have been issued) (hereinafter called the "Contract") in terms of which(*abbreviated name of the Employer*)..... is required to hand over various Equipment to the Contractor for execution of the Contract.

And WHEREAS by virtue of Clause No.....of the said Contract, the Contractor is required to execute an Indemnity Bond in favour of AVVNL(*abbreviated name of the Employer*)..... for the Equipment handed over to it by(*abbreviated name of the Employer*)..... for the purpose of performance of the Contract/Erection portion of the contract (hereinafter called the "Equipment").

AND THEREFORE, This Indemnity Bond witnessed as follows:

1. That in consideration of various Equipment as mentioned in the Contract, valued at (amount in words.....) handed over to the Contractor for the purpose of performance of the Contract, the Contractor hereby undertakes to indemnify and shall keep(*abbreviated name of the Employer*)..... indemnified, for the full value of the Equipment. The Contractor hereby acknowledges receipt of the Equipment as per despatch title documents handed over to the Contractor duly endorsed in their favour and detailed in the Schedule appended hereto. It is expressly understood by the Contractor that handing over of the despatch title documents in respect of the said Equipments duly endorsed by(*abbreviated name of the Employer*)..... in favour of the Contractor shall be construed as handing over of the Equipment purported to be covered by such title documents and the Contractor shall hold such Equipment in trust as a Trustee for and on behalf of(*abbreviated name of the Employer*).....

2. That the Contractor is obliged and shall remain absolutely responsible for the safe transit/protection and custody of the Equipment at AVVNL (*abbreviated name of the Employer*)..... project Site against all risks whatsoever till the Equipment are duly used/erected in accordance with the terms of the Contract and the Plant/Package duly erected and commissioned in accordance with the terms of the Contract, is taken over by AVVNL(*abbreviated name of the Employer*)..... The Contractor undertakes to keep AVVNL(*abbreviated name of the Employer*)..... harmless against any loss or damage that may be caused to the Equipment.
3. The Contractor undertakes that the Equipment shall be used exclusively for the performance/execution of the Contract strictly in accordance with its terms and conditions and no part of the equipment shall be utilised for any other work of purpose whatsoever. it is clearly understood by the Contractor that non-observance of the obligations under this Indemnity Bond by the Contractor shall inter-alia constitute a criminal breach of trust on the part of the Contractor for all intents and purpose including legal/penal consequences.
4. That AVVNL(*abbreviated name of the Employer*)..... is and shall remain the exclusive Employer of the Equipment free from all encumbrances, charges or liens of any kind, whatsoever. The equipment shall at all times be open to inspection and checking by the Employee or Employer's Representative in this regard. Further, AVVNL(*abbreviated name of the Employer*)..... shall always be free at all times to take possession of the Equipment in whatever form the equipment may be, if in its opinion, the Equipment are likely to be endangered, misutilised or converted to uses other than those specified in the Contract, by any acts of omission or commission on the part of the Contractor or any other person or on account of any reason whatsoever and the Contractor binds himself and undertakes to comply with the directions of demand of AVVNL(*abbreviated name of the Employer*)..... to return the equipment without any demur or reservation.
5. That this indemnity Bond is irrevocable. If at any time any loss or damage occurs to the Equipment or the same or any part thereof is misutilised in any manner whatsoever, then the Contractor hereby agrees that the decision of the Employer's Representative as to assessment of loss or damage to the Equipment shall be final and binding on the Contractor. The Contractor binds itself and undertakes to replace the lost and/or damaged Equipment at his own cost and/or shall pay the amount of loss to AVVNL(*abbreviated name of the Employer*)..... without any demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to AVVNL(*abbreviated name of the Employer*)..... against the Contractor under the Contract and under this Indemnity Bond.
6. NOW THE CONDITION of this Bond is that if the Contractor shall duly and punctually comply with the terms and conditions of this Bond to the satisfaction of AVVNL(*abbreviated name of the Employer*)....., THEN, the above Bond shall be void, but otherwise, it shall remain in full force and virtue.

IN WITNESS WHEREOF, the Contractor has hereunto set its hand through its authorized representative under the common seal of the Company, the day, month and year first above mentioned.

SCHEDULE

| Particulars of the Equipment handed over | Quantity | Particulars of Dispatch title Documents | | Value of the Equipment | Signature of the Attorney in token of receipt |
|--|----------|---|---------|------------------------|---|
| | | RR/GR No. date of lading | Carrier | | |
| | | | | | |

For and on behalf of
M/s.....

WITNESS

1. Signature.....

Signature.....

Name.....

Name.....

Address.....

Address.....

2. Signature.....

Authorised
representative
(Common Seal)

Name.....

Address.....

(In case of Company)

Indemnity Bonds are to be executed by the authorised person and (i) in case of contracting Company under common seal of the Company or (ii) having the power of attorney issued under common seal of the company with authority to execute Indemnity Bonds, (iii) In case of (ii), the original Power of Attorney if it is specifically for this Contract or a Photostat copy of the Power of Attorney if it is General Power of Attorney and such documents should be attached to Indemnity Bond.

Format N5-B: Form of Indemnity bond to be executed by the Contractor for the equipment handed over in installment by Discom for performance of its contract

INDEMNITY BOND

THIS INDEMNITY BOND is made this day of 20..... by a Company registered under the Companies Act, 1956/2013 (with amendment from time to time)/Partnership firm/proprietary concern having its Registered Office at(hereinafter called as 'Contractor' or 'Obligor' which expression shall include its successors and permitted assigns) in favour of Ajmer Vidyut Vitran Nigam Limited (*insert name of the Employer*)....., a company incorporated under the Companies Act, 1956/2013 (with amendment from time to time) having its Registered Office at Vidyut Bhawan, Ajmer(*insert registered address of the Employer*)..... and its project at (hereinafter called "AVVNL(*abbreviated name of the Employer*)....." which expression shall include its successors and assigns):

WHEREAS AVVNL(*abbreviated name of the Employer*)..... has awarded to the Contractor a Contract forvide its Notification of Award/Contract No. datedand Amendment No. (applicable when amendments have been issued) (hereinafter called the "Contract") in terms of which AVVNL(*abbreviated name of the Employer*)..... is required to handover various Equipment to the Contractor for execution of the Contract.

AND WHEREAS by virtue of Clause No.....of the said Contract, the Contractor is required to execute an Indemnity Bond in favour of AVVNL(*abbreviated name of the Employer*)..... for the Equipment handed over to it by AVVNL(*abbreviated name of the Employer*)..... for the purpose of performance of the contract/Erection portion of the Contract (hereinafter called the "Equipment".)

NOW THEREFORE, This Indemnity Bond witnessed as follows:

1. That in consideration of various Equipments as mentioned in the Contract, valued at (amount in words _____) to be handed over to the Contractor in installments from time to time for the purpose of performance of the contract, the Contractor hereby undertakes to indemnify and shall keep(*abbreviated name of the Employer*)..... indemnified, for the full value of Equipment. The Contractor hereby acknowledges receipt of the initial installment of the equipment per details in the schedule appended hereto. Further, the Contractor agrees to acknowledge receipt of the subsequent installments of the Equipment as required by AVVNL(*abbreviated name of the Employer*)..... in the form of Schedules consecutively numbered which shall be attached to this Indemnity bond so as to form integral parts of this Bond. It is expressly understood by the Contractor that handing over the dispatch title documents in respect of the said Equipments duly endorsed by AVVNL(*abbreviated name of the Employer*)..... in favour of the Contractor shall be construed as handing over the Equipment purported to be covered by such title documents and the Contractor shall

hold such Equipments in trust as a Trustee for and on behalf of AVVNL(*abbreviated name of the Employer*).....

2. That the Contractor is obliged and shall remain absolutely responsible for the safe transit/protection and custody of the Equipment at AVVNL(*abbreviated name of the Employer*)..... project Site against all risks whatsoever till the Equipment are duly used/erected in accordance with the terms of the Contract and the Plant/Package duly erected and commissioned in accordance with the terms of the Contract, is taken over by AVVNL(*abbreviated name of the Employer*)..... The Contractor undertakes to keep AVVNL(*abbreviated name of the Employer*)..... harmless against any loss or damage that may be caused to the Equipment.
3. The Contractor undertakes that the Equipment shall be used exclusively for the performance/execution of the Contract strictly in accordance with its terms and conditions and no part of the equipment shall be utilised for any other work or purpose whatsoever. It is clearly understood by the Contractor that non-observance of the obligations under this Indemnity Bond by the Contractor shall inter-alia constitute a criminal breach of trust on the part of the Contractor for all intents and purpose including legal/penal consequences.
4. That AVVNL(*abbreviated name of the Employer*)..... is and shall remain the exclusive Employer of the Equipment free from all encumbrances, charges or liens of any kind, whatsoever. The equipment shall at all times be open to inspection and checking by the Employer or Employer's Representative in this regard. Further, AVVNL(*abbreviated name of the Employer*)..... shall always be free at all times to take possession of the Equipment in whatever form the Equipment may be, if in its opinion, the Equipment are likely to be endangered, misutilised or converted to uses other than those specified in the Contract, by any acts of omission or commission on the part of the Contractor or any other person or on account of any reason whatsoever and the Contractor binds himself and undertakes to comply with the directions of demand of AVVNL(*abbreviated name of the Employer*)..... to return the equipment without any demur or reservation.
5. That this indemnity Bond is irrevocable. If at any time any loss or damage occurs to the Equipment or the same or any part thereof is misutilised in any manner whatsoever, then the Contractor hereby agrees that the decision of the Employer's Representative as to assessment of loss or damage to the Equipment shall be final and binding on the Contractor. The Contractor binds itself and undertakes to replace the lost and/or damaged Equipment at its own cost and/or shall pay the amount of loss to AVVNL(*abbreviated name of the Employer*)..... without any demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to AVVNL(*abbreviated name of the Employer*)..... against the Contractor under the Contract and under this Indemnity Bond.

6. NOW THE CONDITION of this Bond is that if the Contractor shall duly and punctually comply with the terms and conditions of this Bond to the satisfaction of AVVNL(*abbreviated name of the Employer*)....., THEN, the above Bond shall be void, but otherwise, it shall remain in full force and virtue.

IN WITNESS WHEREOF, the Contractor has hereunto set its hand through its authorised representative under the common seal of the Company, the day, month and year first above mentioned.

SCHEDULE No. 1

| Particulars of the Equipment handed over | Quantity | Particulars of Despatch title Documents | | Value of the Equipment | Signature of the Attorney in token of receipt |
|--|----------|---|---------|------------------------|---|
| | | RR/GR No. date of lading | Carrier | | |
| | | | | | |

For and on behalf of

M/s.....

WITNESS

1. Signature.....

Signature.....

Name.....

Name.....

Address.....

Address.....

2. Signature.....

Authorised representative

Name.....

(Common Seal)

Address.....

(In case of Company)

Indemnity Bonds are to be executed by the authorised person and (i) in case of contracting Company under common seal of the Company or (ii) having the power of attorney issued under common seal of the company with authority to execute Indemnity Bonds, (iii) In case of (ii), the original Power of Attorney if it is specifically for this Contract or a Photostat copy of the Power of Attorney if it is General Power of Attorney and such documents should be attached to Indemnity Bond.

Format N6A: Contract Agreement for Supply & Erection

(To be signed single for complete Project)

SUPPLY CONTRACT AGREEMENT BETWEEN..... (*Ajmer Vidyut Vitran Nigam Limited*)..... AND M/s. (*Name of Contractor*)/JOINT VENTURE (JV) OF M/s. (*Name of Lead Partner*).... (THE LEAD PARTNER OF THE JV) AND M/s. (*Name of Other Partner*)..... (THE PARTNER OF THE JV) [*Use as applicable*]

THIS CONTRACT AGREEMENT No. (also referred to as 'Supply & Erection/the First Contract') is made on the day of 20.....

BETWEEN

(1) Ajmer Vidyut Vitran Nigam Limited, a company incorporated under the laws of Companies Act 1956/2013 (with amendment from time to time) and having its Registered Office at Vidyut Bhawan, Ajmer(*registered address of the Employer*) and its Corporate Office at Vidyut Bhawan, Ajmer(*address of the Employer*)..... (hereinafter called "the Employer" and also referred to as "AVVNL"(*insert abbreviated name of the Employer*))

and

(2) M/s..... (*Name of Contractor*), a company incorporated under the laws of Companies Act 1956/2013 (with amendment from time to time) and having its Principal place of business at(*Address of Contractor*) and Registered Office at(*Registered address of Contractor*) (hereinafter called "the Contractor" and also referred to as ".....(*insert abbreviated name of the Contractor*)")

or

Joint Venture (JV) of M/s..... (*Name of Lead Partner*)..... (the Lead Partner of JV), a company incorporated under the laws of Companies Act 1956 and having its Principal place of business at(*Address of Lead Partner*) and Registered Office at(*Registered address of Lead Partner*) and M/s (*Name of Other Partner*)..... (the Partner of JV), a company incorporated under the laws of Companies Act 1956/2013 (with amendment from time to time) and having its Principal place of business at(*Address of Other Partner*) and Registered Office at(*Registered address of Other Partner*) (hereinafter called "the Contractor" and also referred to as "Joint Venture"/the 'JV'")
(*Applicable only in case of Joint Venture*)

WHEREAS the Employer desires to engage the Contractor for the supply & erection of all equipment and materials including taxes and duties as applicable, Type Testing to be conducted inter-alia including (*Indicate brief scope of work*) for the complete execution of the (*insert name of Package alongwith name of the Project*)..... as detailed in the Contract Document ("the Facilities"), and the Contractor has agreed to such engagement upon and subject to the terms and conditions hereinafter appearing.

NOW IT IS HEREBY AGREED as follows:

Article 1. Contract Documents

1.1 Contract Documents (Reference GCC Clause 2.2)

The following documents shall constitute the Contract between the Employer and the Contractor, and each shall be read and construed as an integral part of the Contract:

VOLUME – A

1. This Contract Agreement and the Appendices thereto.
2. Invitation for bids (Reference No..... dated.....)
3. Pre-bid clarification (Reference No..... dated.....)
4. Letter of Intent (Reference No..... dated.....)

5. Mutually agreed contract execution plan/PERT chart (Reference No..... dated.....)
6. Contract Performance Securities (Reference No..... dated.....)
7. Work Order (Reference No..... dated.....)

VOLUME – B

1. Complete Tender Document

VOLUME – C

1. Bid Submitted by the Contractor.
(Only relevant extracts are attached herewith for easy reference. Should the circumstances warrant, the original Bid along with the enclosures thereof, shall be referred to.)
- 1.2 Order of Precedence (Reference GCC Clause 2)
In the event of any ambiguity or conflict between the Contract Documents listed above, the order of precedence shall be the order in which the Contract Documents are listed in Article 1.1 (Contract Documents) above.
- 1.3 Definitions (Reference GCC Clause 1/SCC Clause 1)
 - 1.3.1 Capitalized words and phrases used herein shall have the same meanings as are ascribed to them in the General Conditions of Contract/Special Conditions of Contract.

Article 2. Contract Price and Terms of Payment

- 2.1 Contract Price (Reference GCC Clause 7)
The Employer hereby agrees to pay to the Contractor the Contract Price in consideration of the performance by the Contractor of its obligations hereunder. The Contract Price shall be the aggregate of..... (*Amount in words*)..... (*Amount in figures*)), or such other sums as may be determined in accordance with the terms and conditions of the Contract. The break-up of the Contract price is as under:

.....

The detailed break-up of Contract Price is given in the relevant Appendices hereto.

- 2.2 Terms of Payment (Reference GCC Clause 8)
The terms and procedures of payment according to which the Employer will reimburse the Contractor are given in Appendix 1 (Terms and Procedures of Payment) hereto.

Article 3. Effective Date for Determining Time for Completion

- 2.3 Effective Date (Reference GCC Clause 4)
The Time of Completion of Facilities shall be determined from the date of the Issue of Letter of Intent i.e., from

Article 3. Appendices

The Appendices listed in the List of Appendices, as mentioned below, shall be deemed to form an integral part of this Contract Agreement.

Reference in the Contract to any Appendix shall mean the Appendices attached hereto, and the Contract shall be read and construed accordingly.

List of Appendices

Appendix 1 Terms and Procedures of Payment

Appendix 2 Deleted

Appendix 3 Insurance Requirements

Appendix 4 Time Schedule

Appendix 5 Deleted

Appendix 6 Scope of Works and Supply by the Employer

Appendix 7 List of Document for Approval or Review

Appendix 8 Guarantees, Liquidated Damages for Non-Performance

Article 4.

The Contract Agreement No. has also been made on the day of 20...., between the Employer and the Contractor for the O&M Contract (hereinafter referred to as the "Second Contract(s)") for the subject package which includes performance of all the O&M services interalia including (Indicate brief scope of work) for the complete execution of the (insert name of Package along with name of the Project).....

Notwithstanding the award of contract under two separate contracts in the aforesaid manner, the Contractor shall be overall responsible to ensure the execution of both the contracts to achieve successful completion and taking over of the facilities by the Employer as per the requirements stipulated in the Contract. It is expressly understood and agreed by the Contractor that any default or breach under the 'Second Contract(s)' shall automatically be deemed as a default or breach of this 'First Contract' also and vice-versa and any such breach or occurrence or default giving the Employer a right to terminate the 'Second Contract(s)' either in full or in part, and/or recover damages there under that Contract, shall give the Employer an absolute right to terminate this Contract at the Contractor's risk, cost and responsibility, either in full or in part and /or recover damages under this 'First Contract' as well. However, such breach or default or occurrence in the 'Second Contract(s)' shall not automatically relieve the Contractor of any of its responsibility/ obligations under this 'First Contract'. It is also expressly understood and agreed by the Contractor that the equipment /materials supplied by the Contractor under this 'First Contract' when installed and commissioned by the Contractor under the 'Second Contract(s)' shall give satisfactory performance in accordance with the provisions of the Contract.

IN WITNESS WHEREOF the Employer and the Contractor have caused this Agreement to be duly executed by their duly authorized representatives the day and year first above written.

Signed by for and
on behalf of the Employer
.....
Signature
.....
Title
in the presence of

Signed by for and
on behalf of the Contractor
.....
Signature
.....
Title
in the presence of

Format N6B: Contract Agreement for O&M

(To be signed separately for each GSS)

SUPPLY CONTRACT AGREEMENT BETWEEN..... (*Ajmer Vidyut Vitran Nigam Limited*)..... AND M/s. (*Name of Contractor*)/JOINT VENTURE (JV) OF M/s. (*Name of Lead Partner*)... (THE LEAD PARTNER OF THE JV) AND M/s. (*Name of Other Partner*)..... (THE PARTNER OF THE JV) [*Use as applicable*]

THIS CONTRACT AGREEMENT No. (also referred to as 'O&M Contract/the Second Contract') is made on the day of 20....

BETWEEN

(1) Ajmer Vidyut Vitran Nigam Limited, a company incorporated under the laws of Companies Act 1956/2013 (with amendment from time to time) and having its Registered Office at Vidhut Bhawan, Ajmer(*registered address of the Employer*) and its Corporate Office at Vidhut Bhawan, Ajmer(*address of the Employer*)..... (hereinafter called "the Employer" and also referred to as "AVVNL"(*insert abbreviated name of the Employer*))

and

(2) M/s..... (*Name of Contractor*), a company incorporated under the laws of Companies Act 1956/2013 (with amendment from time to time) and having its Principal place of business at(*Address of Contractor*) and Registered Office at(*Registered address of Contractor*) (hereinafter called "the Contractor" and also referred to as ".....(*insert abbreviated name of the Contractor*)")

or

Joint Venture (JV) of M/s..... (*Name of Lead Partner*)..... (the Lead Partner of JV), a company incorporated under the laws of Companies Act 1956 and having its Principal place of business at(*Address of Lead Partner*) and Registered Office at(*Registered address of Lead Partner*) and M/s (*Name of Other Partner*)..... (the Partner of JV), a company incorporated under the laws of Companies Act 1956/2013 (with amendment from time to time) and having its Principal place of business at(*Address of Other Partner*) and Registered Office at(*Registered address of Other Partner*) (hereinafter called "the Contractor" and also referred to as "Joint Venture"/the 'JV'")

(Applicable only in case of Joint Venture)

WHEREAS the Employer desires to engage the Contractor for the Operation & Maintenance of all equipment and materials including taxes and duties as applicable, Type Testing to be conducted inter-alia including (*Indicate brief scope of work*) for the complete execution of the (*insert name of Package alongwith name of the Project*)..... as detailed in the Contract Document ("the Facilities"), and the Contractor has agreed to such engagement upon and subject to the terms and conditions hereinafter appearing.

NOW IT IS HEREBY AGREED as follows:

Article 1. Contract Documents

1.2 Contract Documents (Reference GCC Clause 2.2)

The following documents shall constitute the Contract between the Employer and the Contractor, and each shall be read and construed as an integral part of the Contract:

VOLUME – A

1. This Contract Agreement and the Appendices thereto.
2. Invitation for bids (Reference No..... dated.....)
3. Pre-bid clarification (Reference No..... dated.....)
4. Letter of Intent (Reference No..... dated.....)

5. Mutually agreed contract execution plan/PERT chart (Reference No..... dated.....)
6. Contract Performance Securities (Reference No..... dated.....)
7. Work Order (Reference No..... dated.....)

VOLUME – B

1. Complete Tender Document

VOLUME – C

1. Bid Submitted by the Contractor.
(Only relevant extracts are attached herewith for easy reference. Should the circumstances warrant, the original Bid along with the enclosures thereof, shall be referred to.)
- 1.2 Order of Precedence (Reference GCC Clause 2)
In the event of any ambiguity or conflict between the Contract Documents listed above, the order of precedence shall be the order in which the Contract Documents are listed in Article 1.1 (Contract Documents) above.
- 1.3 Definitions (Reference GCC Clause 1/SCC Clause 1)
 - 1.3.1 Capitalized words and phrases used herein shall have the same meanings as are ascribed to them in the General Conditions of Contract/Special Conditions of Contract.

Article 2. Contract Price and Terms of Payment

2.1 Contract Price (Reference GCC Clause 7)

The Employer hereby agrees to pay to the Contractor the Contract Price in consideration of the performance by the Contractor of its obligations hereunder. The Contract Price shall be the aggregate of..... (*Amount in words*)..... (*Amount in figures*)), or such other sums as may be determined in accordance with the terms and conditions of the Contract. The break-up of the Contract price is as under:

.....

The detailed break-up of Contract Price is given in the relevant Appendices hereto.

2.2 Terms of Payment (Reference GCC Clause 8)

The terms and procedures of payment according to which the Employer will reimburse the Contractor are given in Appendix 1 (Terms and Procedures of Payment) hereto.

Article 3. Effective Date for Determining Time for Completion

2.3 Effective Date (Reference GCC Clause 4)

The Time of Completion of Facilities shall be determined from the date of the Construction Completion of Facilities i.e., from

Article 3. Appendices

The Appendices listed in the List of Appendices, as mentioned below, shall be deemed to form an integral part of this Contract Agreement.

Reference in the Contract to any Appendix shall mean the Appendices attached hereto, and the Contract shall be read and construed accordingly.

List of Appendices

Appendix 1 Terms and Procedures of Payment

Appendix 2 Deleted

Appendix 3 Insurance Requirements

Appendix 4 Time Schedule

Appendix 5 Deleted

Appendix 6 Scope of Works and Supply by the Employer

Appendix 7 List of Document for Approval or Review

Appendix 8 Guarantees, Liquidated Damages for Non-Performance

Article 4.

The Contract Agreement No. has also been made on the day of 20...., between the Employer and the Contractor for the Supply & Erection Contract (hereinafter referred to as the "First Contract") for the subject package which includes performance of all the O&M services interalia including (Indicate brief scope of work) for the complete execution of the (insert name of Package along with name of the Project).....

Notwithstanding the award of contract under two separate contracts in the aforesaid manner, the Contractor shall be overall responsible to ensure the execution of both the contracts to achieve successful completion and taking over of the facilities by the Employer as per the requirements stipulated in the Contract. It is expressly understood and agreed by the Contractor that any default or breach under the 'First Contract' shall automatically be deemed as a default or breach of this 'Second Contract(s)' also and vice-versa and any such breach or occurrence or default giving the Employer a right to terminate the 'First Contract' either in full or in part, and/or recover damages there under that Contract, shall give the Employer an absolute right to terminate this Contract at the Contractor's risk, cost and responsibility, either in full or in part and /or recover damages under this 'Second Contract(s)' as well. However, such breach or default or occurrence in the 'First Contract' shall not automatically relieve the Contractor of any of its responsibility/ obligations under this 'Second Contract(s)'. It is also expressly understood and agreed by the Contractor that the equipment /materials supplied by the Contractor under the 'First Contract' when installed and commissioned by the Contractor under this 'Second Contract(s)' shall give satisfactory performance in accordance with the provisions of the Contract.

IN WITNESS WHEREOF the Employer and the Contractor have caused this Agreement to be duly executed by their duly authorized representatives the day and year first above written.

Signed by for and on behalf of the Employer
.....
Signature
.....
Title
in the presence of

Signed by for and on behalf of the Contractor
.....
Signature
.....
Title
in the presence of

Appendix-1: TERMS AND PROCEDURES OF PAYMENT

(Pursuant to GCC Clause 8)

Appendix-2: Deleted

Appendix-3: INSURANCE REQUIREMENTS

A) Insurances to be taken out by the Contractor

In accordance with the provisions of GCC Clause 30, 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 Employer, 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 under the provisions of GCC Clause 30. However, in such a case the Contractor shall be required to furnish to the Employer documentary evidence from the insurer in support of the insurer's inability as aforesaid.

(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 applicable duties and taxes etc., if additionally payable. | Nil | Contractor & Employer | Mfrs ware-house | Project's ware-house store at final destination |

(II) If during the execution of Contract, the Employer 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 Employer and the Contractor. The policy shall indicate the Employer 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 Employer 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 GST, applicable duties & taxes, etc., if additionally payable. and 100% of erection price component | Nil | Contractor & Employer | 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 Employer and the Contractor. All these policies shall indicate Employer 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 Employer.

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 Employer. In case no refund is payable by the insurance company then the certificate to that effect shall be submitted to Employer 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 Employer's personnel) and loss of or damage to property (including the Employer's property and any parts of the Facilities which have been accepted by the Employer) occurring in connection with supply and installation of the Facilities.

| Amount | Deductible limits | Parties insured | From | To |
|---|-------------------|----------------------------|-----------------|-------------------------------|
| • 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. | Nil | Contractor/ Sub-contractor | Receipt at site | Upto Defect Liability Period. |

| | | | | |
|---|--|--|--|--|
| <ul style="list-style-type: none"> • 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. | | | | |
|---|--|--|--|--|

- (V) As per GCC Clause 30.8, 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 Employer and Employer 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 Employer 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 Employer 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 Employer (including without limitation any consultant, servant, agent or employee of the Employer) 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 Employer shall be named as co-insured under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 30.1, except for the Third Party Liability, Workmen Compensation Policy Insurances, and the Contractor's Sub-contractors shall be named as co-insureds under all insurance policies taken out by the Contractor pursuant to GCC Sub-Clause 30.1 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 Employer

The Employer 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 |
|--------|-------------------|-----------------|------|----|
| | | | | |

Appendix-4: TIME SCHEDULE

1. The Project Completion Schedule shall pursuant to GCC Clause 4.

Appendix-5: Deleted

Appendix-6: SCOPE OF Supply & Erection and Operation & Maintenance BY THE EMPLOYER

The following personnel, facilities, works and supplies will be provided/supplied by the Employer, and the provisions of Tender Document shall apply as appropriate specially Section E, L & P.

All personnel, facilities, works and supplies will be provided by the Employer in good time so as not to delay the performance of the Contractor in accordance with the approved Time Schedule and Program of Performance pursuant to GCC Sub-Clause 14.3.

Unless otherwise indicated, all personnel, facilities, works and supplies will be provided free of charge to the Contractor.

Personnel Charge to Contractor – None

-----NIL-----

Facilities Charge to Contractor - None except as noted

Electricity and Water Charge to Contractor -
as noted

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

Works Charge to Contractor -
None

-----NIL-----

Supplies Charge to
Contractor – None

-----NIL-----

Appendix-7: LIST OF DOCUMENTS FOR APPROVAL OR REVIEW

Pursuant to GCC Sub-Clause 16.3.1, the Contractor shall prepare and present to the Project Manager in accordance with the requirements of GCC Sub-Clause 14.3 (Program of Performance), the following documents for:

A. Approval

- 1.
- 2.
- 3.

B. Review

- 1.
- 2.
- 3.

Note:

Bidder shall furnish the exhaustive list, which shall be discussed and finalised for incorporation into the Contract Agreement.

Appendix-8: GUARANTEES, LIQUIDATED DAMAGES FOR NON – PERFORMANCE

1. The equipment offered shall meet the rating and performance requirements stipulated in Technical Specification for various equipment or indicated in Data requirement.
2. The ratings and performance figures of the below mentioned equipment are guaranteed as per losses given in respective Indian Standard (up to date) by bidder.

| Sl. No. | Description |
|---------|---|
| A. | 12/10/8/6.3/5/3.15/1.6 MVA 33/11kV, 3 ph. Power Transformer |
| B. | 1000/630/500/315/200/100/63/25/16 KVA, 11/0.433kV, 3 phase Station & Distribution Transformer |
| C. | 16/10/5 KVA, 11/0.250kV, 1 phase Distribution Transformer |

3. If the aforementioned guarantees are not established at factory tests, then the Employer shall reject the equipment.

**Format N7: FORM OF SAFETY PLAN TO BE SUBMITTED BY THE
CONTRACTOR WITHIN FIFTEEN DAYS OF AWARD OF CONTRACT**

[TO BE EXECUTED ON A NON JUDICIAL STAMP PAPER WORTH RS. TWENTY ONLY]

SAFETY PLAN

THIS SAFETY PLAN is made this day of 20..... by a Company registered under the Companies Act, 1956/2013 (with amendment from time to time)/Partnership firm/proprietary concern having its Registered Office at[*to be modified suitably for JV Contractor*] (hereinafter called as 'Contractor' which expression shall include its successors and permitted assigns) for approval of Ajmer Vidyut Vitran Nigam Limited, a company incorporated under the Companies Act, 1956/2013 (with amendment from time to time) having its Registered Office at Vidyut Bhawan, Ajmer for its Contract for (*insert package name, project name along with Specification number of the Contract*).....

WHEREAS AVVNL(*abbreviated name of the Employer*)..... has awarded to the Contractor the aforesaid Contract vide its Notification of Award/Contract No. datedand Amendment No. (applicable when amendments have been issued) (hereinafter called the "Contract") in terms of which the Contractor is required to submit 'Safety Plan' along with certain documents to the Engineer In-Charge/Project Manager of the Employer within Sixty (60) days of Notification of Award for its approval.

NOW THEREFORE, the Contractor undertakes to execute the Contract as per the safety plan as follows:

1. THAT the Contractor shall execute the works as per provisions of Bidding Documents including those in regard to Safety Precautions / provisions as per statutory requirements.
2. THAT the Contractor shall execute the works in a wellplanned manner from the commencement of Contract as per agreed mile stones of work completion schedule so that planning and execution of construction works goes smoothly and consistently through out the contract duration without handling pressure in last quarter of the financial year/last months of the Contract and the shall be finalized in association with XXXX (*Name of Employer*) Engineer In-charge/Project Manager from time to time as required.
3. THAT the Contractor has prepared the safe work procedure for each activity i.e. foundation works including civil works, erection, stringing (as applicable), testing & commissioning, disposal of materials at site / store etc. to be executed at site, which is enclosed at **Annexure – 1A (SP)** for acceptance and approval of Engineer In-charge/Project Manager. The Contractor shall ensure that on approval of the same from Engineer In-charge/Project Manager , the approved copies will be circulated to Employer's personnel at site [Supervisor(s)/Executive(s)] and Contractor's personnel at site [Gang leader, supervisor(s) etc.] in their local language / language understood by gang.
THAT the Contractor has prepared minimum manpower deployment plan, activity wise as stated above, which is enclosed at **Annexure – 1B (SP)** for approval of Engineer In-charge/Project Manager.
4. THAT the Contractor shall ensure while executing works that they will deploy minimum 25% of their own experienced work force who are on the permanent roll of the company and balance 75% can be a suitable mixed with the hired gangs / local workers / casual workers if required. The above balance 75% work force should be provided with at least 10 days training by the construction agencies at sites and shall be issued with a certificate. No worker shall be engaged without a valid certificate. Hired gang workers shall also follow safe working procedures and safety norms as is being followed by company's workmen. It should also be ensured by the contractor that certified **workers** fitters who are climbing towers / doing stringing operations can be easily identifiable with a system like issue of Badge / Identification cards (ID cards) etc. Colour identification batches should be worn by the workers. Contractor has to ensure that inexperience workers / unskilled workers should not be deployed for skilled job.
5. THAT the Contractor's Gang leader / Supervisor / Senior most member available at every construction site shall brief to each worker daily before start of work about safety requirement

- and warn about imminent dangers and precautions to be taken against the imminent dangers (Daily Safety Drill). This is to be ensured without fail by Contractor and maintain record of each gang about daily safety instructions issued to workers and put up to XXXX(Name of Employer) site In-charge for his review and record.
6. THAT the Contractor shall ensure that working Gangs at site should not be left at the discretion of their Gang Leaders who are generally hired and having little knowledge about safety. Gang leader should be experienced and well versed with the safe working procedures applicable for transmission line/ Sub Station works. In case gang is having Gang leader not on permanent roll of the company then additional Supervisor from company's own roll having thorough knowledge about the works would be deployed so as to percolate safety instructions upto the grass root level in healthy spirits. Contractor has to ensure close supervision while executing critical locations of transmission lines / sub stations and ensures that all safety instructions are in place and are being followed.
7. THAT the Contractor shall maintain in healthy and working condition all kind of Equipments / Machineries / Lifting tools / Lifting tackles / Lifting gears / All kind of Ropes including wire ropes / Polypropylene ropes etc. used for Lifting purpose during execution of the project and get them periodically examined and load tested for safe working load in accordance with relevant provisions and requirement of Building & other construction workers Regulation of Employment and Conditions of Services Act and Central Rule 1998 or latest, Factories Act 1948 or latest, Indian Electricity Act 2003 before start of the project. A register of such examinations and tests shall be properly maintained by the contractor and will be promptly produced as and when desired by the Engineer In-charge/Project Manager or by the person authorised by him. The Contractor has to ensure to give special attention on the formation / condition of eye splices of wire rope slings as per requirement of IS 2762 Specification for wire rope slings and sling legs.
- THAT the Contractor has prepared a list of all Lifting machines, lifting Tools / Lifting Tackles / Lifting Gears etc. / All types of ropes and Slings which are subject to safe working load is enclosed at **Annexure – 2 (SP)** for review and approval of Engineer In-charge/Project Manager.
8. THAT the Contractor has to procure sufficient quantity of Personal Protective Equipment (PPE) conforming to Indian / International standards and provide these equipment to every workman at site as per need and to the satisfaction of Engineer-in-charge/Project Manager of **AVVNL**. The Contractor's Site Supervisor/ Project Manager has to ensure that all workmen must use Personal Protective Equipment at site. The Contractor shall also ensure that Industrial Safety helmets are being used by all workmen at site irrespective of their working (at height or on ground). The Contractor shall further ensure use of safety shoes by all ground level workers and canvas shoes for all workers working at height, Rubber Gum Boots for workers working in rainy season and concreting job, Use of Twin Lanyard Full body Safety Harness with attachment of light weight such as aluminium alloy etc. and having features of automatic locking arrangement of snap hook, by all workers working at height for more than three meters and also for horizontal movement on tower shall be ensured by contractor. The Contractor shall not use ordinary half body safety harness at site. The Contractor has to ensure use of Retractable type fall arrestors by workers for ascending / descending on suspension insulator string and other similar works etc., Use of Mobile fall arrestor for ascending / descending from tower by all workers. The contractor has to provide cotton / leather hand gloves as per requirement, Electrical Resistance Hand gloves for operating electrical installations / switches, Face shield for protecting eyes while doing welding works and Dust masks to workers as per requirement. The Contractor will have to take action against the workers not using Personal Protective Equipment at site and those workers shall be asked to rest for that day and also their Salary be deducted for that day. **AVVNL** may issue warning letter to Project Manager of contractor in violation of above norms.
- THAT the Contractor shall prepare a detailed list of PPEs, activity wise, to commensurate with manpower deployed, which is enclosed at **Annexure – 3 (SP)** for review and approval of Engineer In-charge/Project Manager. It shall also be ensured that the sample of these equipment shall be got approved from AVVNL supervisory staff before being distributed to

workers. The contractor shall submit relevant test certificates as per IS / International Standard as applicable to PPEs used during execution of work. All the PPE's to be distributed to the workers shall be checked by AVVNL supervisory staff before its usage.

The Contractor also agrees for addition / modification to the list of PPE, if any, as advised by Engineer In-Charge/Project Manager.

9. THAT the Contractor shall procure, if required sufficient quantity of Earthing Equipment / Earthing Devices complying with requirements of relevant IEC standards (Generally IECs standards for Earthing Equipments / Earthing Devices are – 855, 1230, 1235 etc.) and to the satisfaction of Engineer In-Charge/ Project Manager and contractor to ensures to maintained them in healthy condition.

THAT the Contractor has prepared / worked out minimum number of healthy Earthing Equipments with Earthing lead confirming to relevant IS / European standards per gang wise during stringing activity/as per requirement, which is enclosed herewith at **Annexure – 4 (SP)** for review and acceptance of Engineer In-Charge/ Project Manager prior to execution of work.

10. THAT the Contractor shall provide communication facilities i.e. Walky – Talkie / Mobile Phone, Display of Flags / whistles for easy communication among workers during Tower erection / stringing activity, as per requirement.

11. THAT the Contractor undertakes to deploy qualified safety personnel responsible for safety as per requirements of Employer/Statutory Authorities.

THAT the Contractor employing more than 250 workmen whether temporary, casual, probationer, regular or permanent or on contract, shall employ at least one full time officer exclusively as qualified safety officer having diploma in safety to supervise safety aspects of the equipment and workmen who will coordinate with Engineer In-charge /Project Manager/Safety Co-ordinator of the Employer. In case of work being carried out through sub contractors the sub – contractor's workmen / employees will also be considered as the contractor's employees / workmen for the above purpose. If the number of workers are less than 250 then one qualified safety officer is to be deployed for each contract. He will report directly to his head of organization and not the Project Manager of contractor He shall also not be assigned any other work except assigning the work of safety. The curriculum vitae of such person shall be got cleared from **AVVNL** Project Manager / Construction staff.

The name and address of such safety officers of contractor will be promptly informed in writing to Engineer In-charge with a copy to safety officer - In-charge before start of work or immediately after any change of the incumbent is made during the currency of the contract. The list is enclosed at **Annexure – 5A (SP)**.

THAT the Contractor has also prepared a list including details of Explosive Operator (if required), Safety officer / Safety supervisor / nominated person for safety for each erection / stringing gang, list of personnel trained in First Aid Techniques as well as copy of organisation structure of the Contractor in regard to safety. The list is enclosed at **Annexure – 5B (SP)**.

12. The Project Manager shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and/or property, and/or equipment. In such cases, the Contractor shall be informed in writing about the nature of hazards and possible injury/accident and he shall comply to remove shortcomings promptly. The Contractor after stopping the specific work can, if felt necessary, appeal against the order of stoppage of work to the Project Manager within 3 days of such stoppage of work and decision of the Project Manager in this respect shall be conclusive and binding on the Contractor.

13. THAT, if, any Employer's Engineer/ supervisor at site observes that the Contractor is failing to provide safe working environment at site as per agreed Safety Plan / **AVVNL** Safety Rule/ Safety Instructions / Statutory safety requirement and creates hazardous conditions at site and there is possibility of an accident to workmen or workmen of the other contractor or public or the work is being carried out in an unsafe manner or he continues to work even after being instructed to stop the work by Engineer / Supervisor at site / RHQ / Corp. Centre, the Contractor shall be bound to pay a penalty of Rs. 10,000/ - per incident per day till the

- instructions are complied and as certified by Engineer / Supervisor of Employer at site. The work will remain suspended and no activity will take place without compliance and obtaining clearance / certification of the Site Engineer / Supervisor of the Employer to start the work.
14. THAT, if the investigation committee of Employer observes any accident or the Engineer In-charge/Project Manager of the Employer based on the report of the Engineer/Supervisor of the Employer at site observes any failure on the Contractor's part to comply with safety requirement / safety rules/ safety standards/ safety instruction as prescribed by the Employer or as prescribed under the applicable law for the safety of the equipment, plant and personnel and the Contractor does not take adequate steps to prevent hazardous conditions which may cause injury to its own Contractor's employees or employee of any other Contractors or Employer or any other person at site or adjacent thereto, or public involvement because of the Contractor's negligence of safety norms, the Contractor shall be liable to pay a compensation of Rs. 10,00,000/- (Rupees Ten Lakh only) per person affected causing death and Rs. 1,00,000/- (Rupees One Lakh only) per person for serious injuries / 25% or more permanent disability to the Employer for further disbursement to the deceased family/ Injured persons. The permanent disability has the same meaning as indicated in Workmen's Compensation Act 1923 or latest. The above stipulations is in addition to all other compensation payable to sufferer as per workmen compensation Act / Rules
THAT as per the Employer's instructions, the Contractor agrees that this amount shall be deducted from their running bill(s) immediately after the accident, That the Contractor understands that this amount shall be over and above the compensation amount liable to be paid as per the Workmen's Compensation Act /other statutory requirement/ provisions of the Bidding Documents.
 15. THAT the Contractor shall submit Near-Miss-Accident report alongwith action plan for avoidance such incidence /accidents to Engineer – In-charge/ Project Manager. Contractor shall also submit Monthly Safety Activities report to Engineer – In-charge/ Project Manager and copy of the Monthly Safety Activities report also to be sent to Safety In-charge at RHQ of the Employer for his review record and instructions.
 16. THAT the Contractor is submitting a copy of Safety Policy/ Safety Documents of its Company which is enclosed at **Annexure – 6 (SP)** and ensure that the safety Policy and safety documents are implemented in healthy spirit.
 17. THAT the Contractor shall make available of First Aid Box [Contents of which shall be as per Building & other construction workers (Regulation of Employment and Conditions of Services Act and Central Rule 1998 or latest / **AVVNL** Guidelines)] to the satisfaction of Engineer In-Charge/ Project Manager with each gang at site and not at camp and ensures that trained persons in First Aid Techniques with each gang before execution of work.
 18. THAT the Contractor shall submit an 'Emergency Preparedness Plan' for different incidences i.e. Fall from height, Electrocution, Sun Stroke, Collapse of pit, Collapse of Tower, Snake bite, Fire in camp / Store, Flood, Storm, Earthquake, Militancy etc. while carrying out different activities under execution i.e. foundation works including civil works, erection, stringing (as applicable), testing & commissioning, disposal of materials at site / store etc. which is enclosed at **Annexure – 7 (SP)** for approval of the Engineer In-Charge/ Project Manager before start of work.
 19. THAT the Contractor shall organize Safety Training Programs on Safety, Health and Environment and for safe execution of different activities of works i.e. foundation works including civil works, erection, stringing (as applicable), testing & commissioning, disposal of materials at site / store etc. for their own employees including sub-contractor workers on regular basis.
The Contractor, therefore, submits copy of the module of training program, enclosed at **Annexure – 9 (SP)**, to Engineer In-charge/Project Manager for its acceptance and approval and records maintained.
 20. THAT the Contractor shall conduct safety audit, as per Safety Audit Check Lists enclosed at **Annexure – 8 (SP)**, by his Safety Officer(s) every month during construction of Transmission Lines / Sub Stations / any other work and copy of the safety audit report will be forwarded to the Employer's Engineer In-charge / Site In-charge/Project Manager for his comments and

feedback. During safety audit, healthiness of all Personal Protective Equipments (PPEs) shall be checked individually by safety officer of contractor and issue a certificate of its healthiness or rejection of faulty PPEs and contractor has to ensure that all faulty PPEs and all faulty lifting tools and tackles should be destroyed in the presence of **AVVNL** construction staff. Contractor has to ensure that each gang be safety audited at least once in two months. During safety audit by the contractor, Safety officer’s feedback from **AVVNL** concerned shall be taken and recorded. The Employer’s site officials shall also conduct safety audit at their own from time to time when construction activities are under progress. Apart from above, the Employer may also conduct surveillance safety audits. The Employer may take action against the person / persons as deemed fit under various statutory acts/provisions under the Contract for any violation of safety norms / safety standards.

21. THAT the Contractor shall develop and display Safety Posters of construction activity at site and also at camp where workers are generally residing.
22. THAT the Contractor shall ensure to provide potable and safe drinking water for workers at site / at camp.
23. THAT the Contractor shall do health checkup of all workers from competent agencies and reports will be submitted to Engineer In-Charge within fifteen (15) days of health checkup of workers as per statutory requirement.
24. THAT the Contractor shall submit information alongwith documentary evidences in regard to compliance to various statutory requirements as applicable which are enclosed at **Annexure – 10A (SP)**.
The Contractor shall also submit details of Insurance Policies taken by the Contractor for insurance coverage against accident for all employees are enclosed at **Annexure – 10B (SP)**.
25. THAT a check-list in respect of aforesaid enclosures alongwith the Contractor’s remarks, wherever required, is attached as **Annexure – Check List** herewith.

THE CONTRACTOR shall incorporate modifications/changes in this ‘Safety Plan’ necessitated on the basis of review/comments of the Engineer In-Charge/Project Manager within fourteen (14) days of receipt of review/comments and on final approval of the Engineer In-Charge/Project Manager of this ‘Safety Plan’, the Contractor shall execute the works under the Contract as per approved ‘Safety Plan’. Further, the Contractor has also noted that the first progressive payment towards Services Contract shall be made on submission of ‘Safety Plan’ alongwith all requisite documents and approval of the same by the Engineer In-Charge/Project Manager.

IN WITNESS WHEREOF, the Contractor has hereunto set its hand through its authorised representative under the common seal of the Company, the day, month and year first above mentioned.

For and on behalf of

M/s.....

WITNESS

1. Signature.....
Name.....
Address.....

- Signature.....
Name.....
Address.....

2. Signature.....
Name.....

Authorised representative
(Common Seal)

Address.....

(In case of Company)

Note:

All the annexure referred to in this "Safety Plan" are required to be enclosed by the contractor as per the attached " Check List "

1. Safety Plan is to be executed by the authorised person and (i) in case of contracting Company under common seal of the Company or (ii) having the power of attorney issued under common seal of the company with authority to execute such contract documents etc., (iii) In case of (ii), the original Power of Attorney if it is specifically for this Contract or a Photostat copy of the Power of Attorney if it is General Power of Attorney and such documents should be attached to this Safety Plan.
2. For all safety monitoring/ documentation, Engineer In-charge / Regional In-charge of safety at RHQ will be the nodal Officers for communication.

CHECK LIST FOR SEFETY PLAN

| S. N. | Details of Enclosure | Status of Submission of information/ documents | Remarks |
|-------|--|--|---------|
| 1. | Annexure – 1A (SP) Safe work procedure for each activity i.e. foundation works including civil works, erection, stringing (as applicable), testing & commissioning, disposal of materials at site / store etc. to be executed at site. | Yes/No | |
| 2. | Annexure – 1B (SP) Manpower deployment plan, activity wise foundation works including civil works, erection, stringing (as applicable), testing & commissioning, disposal of materials at site / store etc. | Yes/No | |
| 3. | Annexure – 2 (SP) List of Lifting Machines i.e. Crane, Hoist, Triffor, Chain Pulley Blocks etc. and Lifting Tools and Tackles i.e. D shackle, Pulleys, come along clamps, wire rope slings etc. and all types of ropes i.e. Wire ropes, Poly propylene Rope etc. used for lifting purposes along with test certificates. | Yes/No | |
| 4. | Annexure – 3 (SP) List of Personal Protective Equipment (PPE), activity wise including the following along with test certificate of each as applicable: 1. Industrial Safety Helmet to all workmen at site. (EN 397 / IS 2925) with chin strap and back stay arrangement. 2. Safety shoes without steel toe to all ground level workers and canvas shoes for workers working on tower. | Yes/No | |

| S. N. | Details of Enclosure | Status of Submission of information/ documents | Remarks |
|-------|---|--|---------|
| | 3. Rubber Gum Boot to workers working in rainy season / concreting job. 4. Twin lanyard Full Body Safety harness with shock absorber and leg strap arrangement for all workers working at height for more than three meters. Safety Harness should be with attachments of light weight such as of aluminium alloy etc. and having a feature of automatic locking arrangement of snap hook and comply with EN 361 / IS 3521 standards. 5. Mobile fall arrestors for safety of workers during their ascending / descending from tower / on tower. EN 353 -2 (Guided type fall arresters on a flexible anchorage line.) 6. Retractable type fall arrestor (EN360: 2002) for ascending / descending on suspension insulator string etc. 7. Providing of good quality cotton hand gloves / leather hand gloves for workers engaged in handling of tower parts or as per requirement at site. 8. Electrical Resistance hand gloves to workers for handling electrical equipment / Electrical connections. IS : 4770 9. Dust masks to workers handling cement as per requirement. 10. Face shield for welder and Grinders. IS : 1179 / IS : 2553 11. Other PPEs, if any, as per requirement etc. | | |
| 5. | Annexure – 4 (SP) List of Earthing Equipment / Earthing devices with Earthing lead conforming to IECs for earthing equipments are – (855, 1230, 1235 etc.) gang wise for stringing activity/as per requirement | Yes/No | |
| 6. | Annexure – 5A (SP) List of Qualified Safety Officer(s) alongwith their contact details | Yes/No | |
| 7. | Annexure – 5B (SP) Details of Explosive Operator (if required), Safety officer / Safety supervisor for every erection / stringing gang, any other person nominated for safety, list of personnel trained in First Aid as well as brief information about safety set up by the Contractor alongwith copy of organisation of the Contractor in regard to safety | Yes/No | |
| 8. | Annexure – 6 (SP) | Yes/No | |

| S. N. | Details of Enclosure | Status of Submission of information/ documents | Remarks |
|-------|--|--|---------|
| | Copy of Safety Policy/ Safety Document of the Contractor's company | | |
| 9. | <p>Annexure – 7 (SP)</p> <p>'Emergency Preparedness Plan' for different incidences i.e. Fall from height, Electrocutation, Sun Stroke, Collapse of pit, Collapse of Tower, Snake bite, Fire in camp / Store, Flood, Storm, Earthquake, Militancy etc. while carrying out different activities under execution i.e. foundation works including civil works, erection, stringing (as applicable), testing & commissioning, disposal of materials at site / store etc.</p> | Yes/No | |
| 10. | <p>Annexure – 8 (SP)</p> <p>Safety Audit Check Lists (Formats to be enclosed)</p> | Yes/No | |
| 11. | <p>Annexure – 9 (SP)</p> <p>Copy of the module of Safety Training Programs on Safety, Health and Environment, safe execution of different activities of works for Contractor's own employees on regular basis and sub-contractor employees.</p> | Yes/No | |
| 12. | <p>Annexure – 10A (SP)</p> <p>Information alongwith documentary evidences in regard to the Contractor's compliance to various statutory requirements including the following:</p> | | |
| (i) | <p>Electricity Act 2003</p> <p>_____</p> <p>[Name of Documentary evidence in support of compliance]</p> | Yes/No | |
| (ii) | <p>Factories Act 1948 or latest</p> <p>_____</p> <p>[Name of Documentary evidence in support of compliance]</p> | Yes/No | |
| (iii) | <p>Building & other construction workers (Regulation of Employment and Conditions of Services Act and Central Act 1996 or latest) and Welfare Cess Act 1996 or latest with Rules.</p> <p>_____</p> | Yes/No | |

| S. N. | Details of Enclosure | Status of Submission of information/ documents | Remarks |
|--------|---|--|---------|
| | <i>[Name of Documentary evidence in support of compliance]</i> | | |
| (iv) | Workmen Compensation Act 1923 or latest and Rules. _____ <i>[Name of Documentary evidence in support of compliance]</i> | Yes/No | |
| (v) | Public Insurance Liabilities Act 1991 or latest and Rules. _____ <i>[Name of Documentary evidence in support of compliance]</i> | Yes/No | |
| (vi) | Indian Explosive Act 1948 or latest and Rules. _____ <i>[Name of Documentary evidence in support of compliance]</i> | Yes/No | |
| (vii) | Indian Petroleum Act 1934 or latest and Rules. _____ <i>[Name of Documentary evidence in support of compliance]</i> | Yes/No | |
| (viii) | License under the contract Labour (Regulation & Abolition) Act 1970 or latest and Rules. _____ <i>[Name of Documentary evidence in support of compliance]</i> | Yes/No | |
| (ix) | Indian Electricity Rule 2003 and amendments if any, from time to time. _____ <i>[Name of Documentary evidence in support of compliance]</i> | Yes/No | |
| (x) | The Environment (Protection) Act 1986 or latest and Rules. | Yes/No | |

| S. N. | Details of Enclosure | Status of Submission of information/ documents | Remarks |
|--------|---|--|---------|
| | _____ [Name of Documentary evidence in support of compliance] | | |
| (xi) | Child Labour (Prohibition & Regulation) Act 1986 or latest. _____ [Name of Documentary evidence in support of compliance] | Yes/No | |
| (xii) | National Building Code of India 2005 or latest (NBC 2005). _____ [Name of Documentary evidence in support of compliance] | Yes/No | |
| (xiii) | Indian standards for construction of Low/ Medium/ High/ Extra High Voltage Transmission Line _____ [Name of Documentary evidence in support of compliance] | Yes/No | |
| (iv) | Any other statutory requirement(s) [please specify] _____ [Name of Documentary evidence in support of compliance] | Yes/No | |
| 13. | Annexure – 10B (SP) Details of Insurance Policies alongwith documentary evidences taken by the Contractor for the insurance coverage against accident for all employees as below: | | |
| (i) | Under Workmen Compensation Act 1923 or latest and Rules. _____ [Name of Documentary evidence in support of insurance taken] | Yes/No | |
| (ii) | Public Insurance Liabilities Act 1991 or latest _____ [Name of Documentary evidence in support of insurance taken] | Yes/No | |

| S. N. | Details of Enclosure | Status of Submission of information/ documents | Remarks |
|--------------|--|---|----------------|
| (iii) | Any Other Insurance Policies _____ <i>[Name of Documentary evidence in support of insurance taken]</i> | Yes/No | |

Format N8: 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 (Yes/No) | Observations | Location | Picture No. |
|-------|--|-----------------|--------------|----------|-------------|
| 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 | | | | |

| S. No | Description | Status (Yes/No) | Observations | Location | Picture No. |
|-------|--|-----------------|--------------|----------|-------------|
| 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 | | | | |
| 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 meggared | | | | |
| 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 | | | | |

| S. No | Description | Status (Yes/No) | Observations | Location | Picture No. |
|-------|---|-----------------|--------------|----------|-------------|
| 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 | | | | |
| 76 | lockability and proper closing of door of LTDB | | | | |
| 77 | Gland plate and glands are used for cable entry in LTDB | | | | |
| 76 | No unused holes on gland plates | | | | |
| 77 | Availability of 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 earthing at different points using 8 SWG GI wire | | | | |
| 80 | Proper painting and No physical damages on LTDB | | | | |
| 81 | Suitable loop length of cables in LTDB | | | | |
| 82 | 3 Nos earthing pit and earth mat /risers using 50X6mm GI Flat are used as under: | | | | |
| a | a) Earth Pit – 1 for Transformer Neutral, | | | | |
| b | b) Earth pit - 2 for Lightning Arrester, | | | | |
| c | c) Earth pit – 3 for Equipment body earthing | | | | |
| 83 | Metering of DTR substation | | | | |
| 84 | Type of meters used and its healthiness | | | | |
| 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 | Energy meters (@ 11 kV feeder , DT , consumer) at installed at appropriate height | | | | |
| 89 | Earthing Electrodes short/missing | | | | |
| 90 | Commissioning Defect: DT charged/installed but not merged | | | | |

| S. No | Description | Status (Yes/No) | Observations | Location | Picture No. |
|----------------|--|-----------------|--------------|----------|-------------|
| 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 | | | | |
| 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 | | | | |

| S. No | Description | Status (Yes/No) | Observations | Location | Picture No. |
|-------|---|-----------------|--------------|----------|-------------|
| 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 | | | | |
| 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 | | | | |

| S. No | Description | Status (Yes/No) | Observations | Location | Picture No. |
|-------|---|-----------------|--------------|----------|-------------|
| 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 | | | | |
| 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 | | | | |

| S. No | Description | Status (Yes/No) | Observations | Location | Picture No. |
|-------------------|--|-----------------|--------------|----------|-------------|
| 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 stay sets to avoid line deflection | | | | |

| S. No | Description | Status (Yes/No) | Observations | Location | Picture No. |
|-------|--|-----------------|--------------|----------|-------------|
| 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 Earth 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 | | | | |

| S. No | Description | Status (Yes/No) | Observations | Location | Picture No. |
|-------|---|-----------------|--------------|----------|-------------|
| 42 | If under sized conductor used | | | | |
| 43 | Proper conductor clearances to ground is there to avoid bird fault on end sectionizer support where disc insulator are used | | | | |
| 44 | Proper pole to pole span length in the line. It should not be less than 50 m. | | | | |
| 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 "SAUBHAGYA " inscription not done (properly) | | | | |
| 60 | Engraving of poles (Name of Manufacturer, SL Nos etc.) not done | | | | |
| 61 | Line Spacers not used | | | | |
| 62 | Guy insulator not used in stay wire | | | | |
| 63 | Inadequate length of barbed wire | | | | |
| | | | | | |

LT Domestic Service connection to Household

| S. No | Description | Status (Yes/No) | Observations | Location | Picture No. |
|-------|-------------|-----------------|--------------|----------|-------------|
| | | | | | |

| S. No | Description | Status (Yes/No) | Observations | Location | Picture No. |
|-------|--|-----------------|--------------|----------|-------------|
| 1 | Approximate length of service line taken from nearby LT pole/Distribution Board/Distribution box | | | | |
| 2 | Following materials are provided in the premises of consumer: | | | | |
| A | Energy meter | | | | |
| B | Metal meter box | | | | |
| C | Double pole miniature circuit breaker | | | | |
| D | Meter board | | | | |
| E | Earthing point | | | | |
| F | LED lamp | | | | |
| 3 | The consumer meter has been tested at distribution licensee's test laboratory, | | | | |
| 4 | The size of service cable is 2.5 mm ² twin core (unarmoured) PVC insulated cables with aluminium conductors | | | | |
| 5 | Service cable is free of joints | | | | |
| 6 | The size of the bearer wire is 3.15 mm (10 SWG) GI wire (55-95 kg. quality) | | | | |
| 7 | Suitable meter board has been installed as per specification | | | | |
| 8 | Suitable Switch Board has been installed (as per specification) | | | | |
| 9 | Single phase Energy meter is installed as per specification with acrylic cover | | | | |
| 10 | Type and size of PVC pipe/GI pipe support as per specification | | | | |
| 11 | Proper ground clearance of service line as per the guidelines | | | | |
| 12 | GI pipe/MS angle (35mmx35mmx5mm) clamped firmly using 40x3mm MS flat clamps at at-least two locations | | | | |
| 13 | Use of GI Medium Class pipe as per specification | | | | |
| 14 | Use of double pole miniature circuit breaker as per specification | | | | |
| 15 | Meter box for single phase meter made provided for meter protection of the specified dimensions | | | | |
| 16 | Reel Insulator are provided as per requirements | | | | |
| 17 | Egg Insulator as per requirements | | | | |
| 18 | Protection and Earthing as per specification and CEA regulations has been provided at consumer premises | | | | |

| S. No | Description | Status (Yes/No) | Observations | Location | Picture No. |
|-------|---|-----------------|--------------|----------|-------------|
| 19 | Each Household has been provided with internal house wiring and accessories between switch board and Angle Holder as per specifications | | | | |
| 20 | All the construction activities related to power supply in the households have been performed as per REC construction standards. | | | | |
| 21 | Wattage of LED lamp provided at consumer premises | | | | |
| 22 | Type of holder used for LED lamp | | | | |
| 23 | Following ISI marked internal electrification material in consumer premises: | | | | |
| a | 5A socket | | | | |
| b | 5A 3 pin piano type switch | | | | |
| c | 5A pendant holders | | | | |
| 24 | Type and size of following boards: | | | | |
| a | Switch board | | | | |
| b | Meter board | | | | |
| 25 | Height of switch board in consumer premises | | | | |
| 26 | Protection from direct sunlight and rain water to meter box at consumer premises | | | | |
| 27 | Proper tensioning of service cable at consumer premises | | | | |

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 PIA | | | | |
| 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 | | | | |

It is indicative, more may be provided by Discom.

Format N9A – Permit to Work Register

Name of 33 KV S/S PTW/ Book No.

The Shift In-charge, 33/11 KV Sub-Station

_____.

Kindly permit to work undersigned on following feeder from _____ To

- 1.
- 2.
3. _____

Signature:

Name of Employee: Designation: Office:

Time:

Date:

PTW

I _____ hereby permit to work Shri _____ on

 feeder _____ from _____ AM/PM

- (i) Feeder is isolated from 33/11 KV S/S.
- (ii) Earthing to be done at work site

Shift In-charge:

Designation:

Office:

Signature of Employee:

Return of PTW Time Page No.

I _____ hereby return the PTW No. _____ issued to me at _____ on dated
 _____ after completing of work. All men and material have been removed from the line.

Signature:

Name:

Designation:

Office:

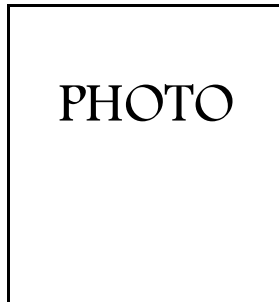
Time:

Date:

Format N9B – Identity Card

IDENTITY CARD
(Contractors labour)

Card S. No.



Name of the Employee:
Father's name:
Age/Date of birth:
Name of contractor:
Name of the work:
Work Location:
Work Order No. & date.:

Employee Signature

Signature of contractor: Counter signature:

Valid fromTo Signature of concerned XEN
(This card is valid only for 60 days) with rubber seal

AVVNL.....Phone. No.

Note: - This identity card is valid for use in the 33/11 KV AVVNL Sub-Station premises only

Format N9C – Log Sheet

THE DETAILS TO BE FILLED HOURLY BY AUTHORISED CONTRACTOR PERSON ON DUTY

| HOUR | LOAD OF TRANSFORMER | VOLTAGE OF TRANSFORMER | AMBIENT TEMPRATUR E | TRIPPING OF FEEDER BREAKER | OIL LEVEL | BREATHER CONDITION | REMARKS |
|-------------|----------------------------|-------------------------------|----------------------------|-----------------------------------|------------------|---------------------------|----------------|
| 1.00 | | | | | | | |
| 2.00 | | | | | | | |
| 3.00 | | | | | | | |
| 4.00 | | | | | | | |
| 5.00 | | | | | | | |
| 6.00 | | | | | | | |
| 7.00 | | | | | | | |
| 8.00 | | | | | | | |
| 9.00 | | | | | | | |
| 10.00 | | | | | | | |
| 11.00 | | | | | | | |
| 12.00 | | | | | | | |
| 13.00 | | | | | | | |
| 14.00 | | | | | | | |
| 15.00 | | | | | | | |
| 16.00 | | | | | | | |
| 17.00 | | | | | | | |
| 18.00 | | | | | | | |
| 19.00 | | | | | | | |
| 20.00 | | | | | | | |
| 21.00 | | | | | | | |
| 22.00 | | | | | | | |
| 23.00 | | | | | | | |
| 24.00 | | | | | | | |

Format N9D – Maintenance of Power Transformer

(Maintenance of Power Transformers)

THE PARTICULAR TO BE FILLED BY CONTRACTOR PERSON ON DAILY BASIS (WITHIN 24 HOURS) FOR POWER

| S. No. | Equipment /Item to be inspected | Inspection Note | Status | Remark /Intimation | Signature |
|--------|---------------------------------|---|---------------------------|-----------------------------|-----------|
| 1. | Oil level in Transformer | Check against oil level of Transformer | OK / Not OK | Intimate JEN/AEN | |
| 2. | Relief diaphragm | Inspect crack broken | Yes /No | Do | |
| 3. | Dehydrating breather | Check that air passage are free and color of active agent | Silica gel is pink or not | Do | |
| 4. | Earthing of Transformer | Observe any crackness of flat of earthing and dryness | OK/ Not OK | Pour water in earthing pits | |

Format N9E – Maintenance of Circuit Breaker

THE PARTICULAR TO BE FILLED CONTRACTOR PERSON ON DAILY BASIS (WITH IN 24 HOURS) FOR INSPECTION AND MAINTENANCE OF CIRCUIT BREAKER

| S. No. | Equipment/ items to be inspected | Inspection | Status | Intimation |
|--------|--------------------------------------|--|-------------|--------------------------------|
| 1. | General Cleanliness | Switch gear premises and circuit breaker Cleanliness | OK/Not OK | Intimate AEN/JEN |
| 2. | Oil | Oil Position | Any Leakage | Do |
| 3. | OCB/ KIOSK | Any unusual small noise | Yes/No | Do |
| 4. | Auxiliary Fuses | Intact | Yes/No | Do |
| 5. | Indicating and messaging instruction | Improper working order | Yes/No | Do |
| 6. | Battery | Water Level | OK/Not Ok | To be filled |
| 7. | Lightning Arrester | Position of dirt, top fitting and oxide film | OK/Not Ok | Clean with dry clean and tight |

Format N9F – Transformer Failure Report

(Format shall be provided later)

Format N9G – Certificate from Principal Employer

FORM OF CERTIFICATE BY PRINCIPAL EMPLOYER (RULE 21 (2))

Certified that I have engaged the applicant (name of the contractor) as a contractor in my establishment. I undertake to be bound by all the provisions of the contractor labour (Regulation and Abolition) act, 1970 and the contract labour (Regulation and Abolition) Rajasthan State Rules, 1971, in respect of the employment of contract labour by the applicant in my establishment.

Place:-

Signature of Principal employers

Date:-

Name & address of employers

Format N9H – Renewal with Licensing Officer

(SEE RULE 25(1))

GOVERNMENT OF RAJASTHAN
OFFICE OF THE LICENSING OFFICER

License No. _____ Dated: _____ Fee paid Rs. _____

1. License is hereby granted to _____ under section 12 (2) of the Contract Labour (Regulation & Abolition) Act, 1970, subject to the condition specified in Annexure/ The license shall remain in force.

Till: _____

Dated: _____

Signature and seal of licensing officer

RENEWAL
[RULE 29 (2)]

| Date of Renewal | Fee paid for renewal | Date of expiry |
|-----------------|----------------------|----------------|
| | | |
| | | |
| | | |

Date:- _____

Signature and seal of licensing officer

Format N9I – Register of Particulars of Contractors

(See Rule 73)

Part-I**REGISTER OF PARTICULARS OF CONTRACTORS**(1) Name and address of the
Principal –Employer(2) Name and address of the
Establishment

| S. No. | Name and address of contractor | Nature of work on contractor | Location of contractor work |
|--------|--------------------------------|------------------------------|-----------------------------|
| 1. | 2. | 3. | 4. |

| Period of contract from To | Amount/Value of contractor | Max. No. of workmen employed by contractor | Security deposits with the Principal Employer |
|----------------------------|----------------------------|--|---|
| 1. | 2. | 3. | 4. |

Format N9J – Progress of Contract Work**PROGRESS OF CONTRACTOR WORK**

Name of Contractor:

Nature of work:

| Wages period | Max. number of workmen employed by the contractor during the wages period | Total amount of wages earned by the workmen | Amount actually disbursed on pay day. |
|--------------|---|---|---------------------------------------|
|--------------|---|---|---------------------------------------|

Format N9K – Register of
Workmen Employed
FORM-VIII
(See Rule 74)

REGISTER OF WORKMEN EMPLOYED BY CONTRACTOR

Name and address of contractor: _____ Name and address of establishment in /under which contract is carried on _____

_____ Name and location of Employer work _____ Name and address of Principal- _____

| S. No. | Name and surnames of workmen | Age and Sex | Father's /Husband 's name | Name of employment/Designation |
|--------|------------------------------|-------------|---------------------------|--------------------------------|
|--------|------------------------------|-------------|---------------------------|--------------------------------|

| Permanent Home address of workmen (Village & Tehsil/Taluka and Distt. | Present address | Date of commencement of employment Date of termination | Date of termination of employment | Signature or thumb impression of workmen | Remarks |
|---|-----------------|---|-----------------------------------|--|---------|
|---|-----------------|---|-----------------------------------|--|---------|

Format N9L

-

Employment
CardForm-IX

(See Rule 75)

EMPLOYMENT CARD

Name and address of Contractor _____

Name and address of Establishment in/ under which contract is certified on _____

Name & Address of Principal- Employer _____

| Name of workman | S. No. in the register of workman employed | Name of employment/designation | Wages rate (with particular of unit in case of piece work) |
|-----------------|--|--------------------------------|--|
| 1 | 2 | 3 | 4 |

| Wage period | Period of employment | Remarks | Signature of contractor |
|-------------|----------------------|---------|-------------------------|
| 5 | 6 | 7 | 8 |

Format N9M – Annual Return

FORM-X

See Rule 81(2)

ANNUAL RETURN OF PRINCIPAL EMPLOYER TO BE SENT TO THE REGISTERING OFFICER.

Return for the year ending 31st Dec _____

- (1) Full name and address of the Principal-Employer.
- (2) Name of Establishment :
 - (a) District :
 - (b) Postal Address.
 - (c) Nature of operation/
Industry / work carried
on.
- (3) Full name of the manager or person responsible for supervision and control of the Establishment.
- (4) Maximum No. of work men employed as contract labour on any day during the year.
- (5) Total number of days during the year on which contract labour was employed .
- (6) Total number of man- days worked by contractor labour during the year.
- (7) Maximum No. of workmen employed directly on any day during the year.
- (8) Total no. of man days during the year on which directly employed labor was employed.
- (9) Total No. of man days worked by directly employed workmen .
- (10) Nature of work on which contract labour was employed.
- (11) Amount of security Deposits made by contractors (Give contractor-wise).
- (12) Amount of security deposit forfeited together with the names of contractor, if any.
- (13) Whether there **is** any changes in the management of the establishment its location or any particular furnished to Registering officer in the form of Application for Registration at the time of Registration, if so, from what date?

Place:

Date:

Principal-Employer

Format N9N – Muster Roll
FORM-XI

(Sec Rule 77)

Name & Address of Contractor

Nature & Location of work.

Name and address of establishment in /-
Under which carried on.

Name & Address of Principal Employer

For the month of

| S. No. | Name of workmen | Father/Husband Name | Sex |
|--------|-----------------|---------------------|-----|
| 1. | 2. | 3. | 4. |

| Dates | | | | | Remarks |
|-------|----|----|----|----|---------|
| 1. | 2. | 3. | 4. | 5. | 6. |

SECTION - O: Other Annexures

Format O1 Queries to be raised by Bidder (On Letterhead of Entity submitting Pre-bid Queries)

| | |
|------------------------|------------------|
| In Response to NIT No: | AJD/SE/TW/TN-378 |
|------------------------|------------------|

To
Superintending Engineer (TW)
Ajmer Vidyut Vitran Nigam Limited,
 Vidyut Bhawan, Room No.216
 Panchsheel Nagar, Makarwali Road,
 Ajmer-305004, Rajasthan

Sub: Queries for Tender for the work of survey, design, supply, erection, testing, commissioning & 10 years comprehensive operation & maintenance (O&M) of 33/11 KV Grid Sub-station (GSS) & associated infrastructure on Opex model in AVVNL under TN-378.

Ref: NIT NO: AJD/SE/TW/TN-378 dated; 21.09.2019

Dear Sir,

Please find below our queries for the said tender:

| S.No. | Clause No. | Change suggested | Rationale behind the suggested change |
|-------|------------|------------------|---------------------------------------|
| | | | |
| | | | |
| | | | |

Signature & Seal
 Name of Authorized Signatory
 Designation
 Name of Entity
 Date
 Place

Please note: The queries are to be provided also at the email Id: setwipdsavvnl@gmail.com in scanned pdf as well as MS Word copy

SECTION - P: Detailed Technical Specifications

INDEX

| S.No. | Technical Specification Item's Name | Page no. |
|--------------|---|-----------------|
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| 2 | 33 KV Pins, 11 KV Pins and LT Pins | 12-15 |
| 3 | 33 KV/11 KV /LT Pin Insulators | 16-18 |
| 4 | 33KV, 800 AMP. isolators with & without earth switch with 24 KV post insulators and 11KV , 400 AMP. isolators with 24 KV post insulators without earth blade | 19-29 |
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| 6 | Sub-Station structure for mounting of 11/0.4 KV transformers on double pole / 33 KV line DP structure/ 33 KV sub-station structure and sub-station structure for single phase 16 KVA DT | 33-35 |
| 7 | hot dip galvanized steel stay sets of size 16x1800mm and 20x2400mm | 36-40 |
| 8 | danger label/ plates for 33/11 KV & 11/0.4 KV sub-stations | 41-42 |
| 9 | 12 KV outdoor vacuum circuit breakers | 43-57 |
| 10 | 36 KV outdoor vacuum circuit breakers | 58-66 |
| 11 | ISI marked PVC insulated multi-core un-armoured NON-FRLS control cables | 67-72 |
| 12 | NFC type anchor (dead end) & suspension assemblies for LT aerial bunched XLPE insulated aluminium conductor cables with bare messenger wire as well as insulated messenger wire for overhead lines suitable for working voltage upto and including 1100 volts | 73-81 |
| 14 | (A) 33 KV line DP (B) 1.8 meterlong MS channel bracket with clamp (C)1.4 meter long MS channel bracket with clamp | 82-83 |
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| 16 | Galvanized M.S.ROD type earthing set with clamps and G.I. wire | 88-89 |
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| 18 | G.S wire size 6 SWG and 8 SWG | 93-94 |
| 19 | 11 KV CTPT metering sets | 95-101 |
| 20 | 33 KV horn gap fuse sets with post 2X24 KV insulators (UN-ASSEMBLED) & 11 KV horn gap fuse sets with 1X24 KV post insulators (UN-ASSEMBLED) | 102-112 |
| 21 | P.G. CLAMPS for dog, panther conductor and T-clamp for panther conductor | 113-116 |
| 22 | (1) 11 KV 45 KN disc insulators T & C type. (2) 11 KV 45 KN disc insulators B & S type | 117-120 |
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PREFACE- TECHNICAL SPECIFICATION

- 1.0 It is not the intent to specify completely herein all details of the design and construction of equipment's. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation upto the Bidder's guarantee in a manner acceptable to the Purchaser, who will interpret the meanings of drawings and specifications and shall have the power to reject any work or material which in his judgment is not in accordance therewith. The offered equipment shall be complete with all components necessary for its effective and trouble free operation along with associated equipment's, interlocks, protection schemes etc. Such components shall be deemed to be within the scope of supply, irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

The plant/ equipment/ material 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 irrespective of whether they are specifically indicated in the Bid document or not.

Bidder must establish that a proper quality assurance program is being followed by them for manufacture of plant / equipment. Quality assurance Program must have a structure as detailed in following paragraphs.

Quality assurance and failure prevention starts with careful study and scrutiny of our technical specifications & requirements. Bidder / manufacture shall carefully study all the technical parameters and other particulars and the Bidder /manufacture shall categorically give his confirmation that these requirements shall be met in a satisfactory manner.

Bidder/manufacture shall furnish the checks exercised in design calculations. The salient features of design shall be made available to the Employer.

Bidder/manufacture shall indicate the various sources of the items being procured. Type of checks, quantum of checks and acceptance norms shall be intimated and random test and check results should be made available for inspection whenever so desired.

The Bidders shall invariably furnish following information.

- i. Statement giving list of important raw materials, names if sub-Bidder/manufactures for the raw material, list of standards according to which the raw material is purchased & copies of test certificates thereof.
- ii. Information & copies of test certificates as in (i) above in respect of bought out items.
- iii. List of machines & manufacturing facilities available.
- iv. Levels of automation achieved 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 & details of such tests and inspections.

- vi. List of testing equipments available with the bidder for testing of materials specified & test plant limitation, if any, vis-a-vis type, special, acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly brought out in schedule of deviations from specified test equipments.

2. Pre-dispatch Inspection:

- 2.1 Pre-dispatch inspection shall be performed on various materials at manufacturer's work place for which contractor shall be required to raise requisition giving at least 15-day time. Depending on requirement, inspection shall be witnessed by representatives of Employer, PMA/TPIA and/or REC/MOP or any appointed agency.
- 2.2 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 Employer in performance of dispatch instruction shall be recovered from partial turnkey contractor.
- 2.3 The Employer's representative may carry out stage inspection of the plant/ equipment during manufacturing/ assembling stage. The Employer shall have absolute right to reject the raw material/component/sub-assemblies or complete equipment not found to be conforming to the specification or being of poor quality/ workmanship. The stage inspection will particularly include tests specified for any particular plant or equipment in the technical specification, general routine tests and physical measurements to be conducted during manufacturing stages as per manufacturer's standard practice.
- 2.4 The date of receipt of the letter /call for inspection of material in the office of the work order placing authority shall be deemed as the date of call for inspection and not the date mentioned in the letter or the date of dispatch. 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 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, recycled 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 vendors/ sub-vendor shall also be cancelled for all AVVNL projects.
- 2.5 In case material is failed in testing at works or at CTL lab , then re inspection of material shall be done after depositing of amount of Rs.7500/- only for the works located in the State of Rajasthan and an amount of Rs.15,000/- for the works located outside the State of Rajasthan which shall be paid by the contractor as re-inspection charges to the **Senior Accounts Officer (EA & Cash), AVVNL, Ajmer**. Further, in cases where traveling by air is involved the inspection charges will be recovered on actual basis. The contractor will deposit the amount with the **Senior**

Accounts Officer (EA & Cash), AVVNL, Ajmer under intimation to the work order placing authority, failing which the subsequent call for inspection shall not be entertained.

- 2.6** The contractor shall also furnish the latest calibration certificate(s) of the testing instruments / equipments used for the testing of the materials / equipments as covered in the owner order, to the inspecting Officer. The testing instruments / machines should be got calibrated by the contractor from time to time from the Manufacturer of the testing instruments or any Govt. recognized testing laboratory/NABL accredited laboratories. The calibration certificate(s) should not, in any case, be older than one year at the time of presenting the same to the inspecting Officer. In case the contractor fails to comply with the conditions as aforesaid, a certificate in writing of the inspector / representative of the Owner that the contractor has failed to provide the facilities shall be conclusive.

3. TYPE TEST

- 3.1** The type test certificate for any item shall not be more than five (5) years old from the date of submission of the bid.
- 3.2** The Employer may get the Type test or routine tests of any equipment done at Accredited Laboratory by NABL in the country. The type test may be done even after receipt of materials at contractor's site store but not after the guarantee period for the equipment as described elsewhere. The results of such tests will be decided on pass fail basis. In case the equipment fails to pass the Type test, the cost of such test shall be borne by the Contractor.
- 3.3** The Bidder /manufacturing programme shall not be interrupted merely because the plant/equipment has been offered for inspection.
- 3.4** Specification for individual plant /equipment is subject to the conditions mentioned above.
- 3.5** The bidder shall prior to use any material in execution of the work for which technical specification have not been mentioned will use any material after obtaining necessary approval of GTP & Drawing from **SE(TW),A.V.V.N.L., Ajmer**.
- 3.6** If bidder intend to use any material with superior specification then that as specified in the bid document. The prior approval of **SE(TW),A.V.V.N.L., Ajmer** shall be obtained before use and the rates for such substitution will be limited to as per the awarded rates.
- 4 PROCUREMENT FROM MANUFACTURERS / VENDORS:**

The Contractor shall be permitted to procure materials from the manufactures / vendors who have following qualified requirements:

- (i) The vendor should be a established / reputed manufacture / supplier who should have supplied the material to erstwhile RSEB or any present distribution company, RVVPNL or any other power utility and the contractor / bidder are required to indicate the names & address of the manufactures of various items from which he proposes to buy the same.
- (ii) The manufacturing units shall have all facilities for conducting acceptance & routine tests of equipment / materials.
- (iii) The vendor must have supplied materials as per specifications laid down in the bid-documents of erstwhile RSEB / NIGAMS and have arranged their type testing not before last five years,
- (iv) The vendors approvals shall be obtained for supply of the equipment / materials from the Engineer well in advance.

Note:-

1. Latest Technical specifications of MM wing of Ajmer Discom will prevail for all the items incorporated in this project. However, Technical Specifications of some of the major items are given hereunder for ready reference.
2. All fabricated materials, steel structures, Cross Arms, Top hampers, nut-bolt, washers etc., shall be GALVANISED.

Technical specification for the various items required for execution of project.

TECHNICAL SPECIFICATION FOR SUPPLY OF PCC POLES WITH FACTOR OF SAFTY 2.5

1. SCOPE :

This specification covers the design, manufacture, inspection, testing and delivery of finished 8 Mtrs 200 Kg, 9 Mtrs 200 Kg and 9 Mtrs 400 Kg rectangular shaped, solid prestressed cement Concrete poles, witnessing of tests before dispatch and its transportation from the firm's works to consignee's headquarters. These poles are to be used for erection of 33 KV, 11 KV & LT overhead lines.

2. DETAILS OF APPLICABLE STANDARDS/SPECIFICATION/MANUALS :

The pole shall comply with the relevant provisions made in the following Indian Standards Specification (now BIS) with latest amendments / REC specifications.

| | | |
|---|---|--|
| 1 | REC manual No.13/1977 (part-I) | Manual on manufacturing of solid poles part-I design aspects. |
| 2 | REC manual No.13/1977 (Part-II) | Manual on manufacturing of solid PCC poles part- II manufacturing aspects. |
| 3 | REC specification No.15/1979 (amended upto 1983 & thereafter) | Prestressed cement concrete poles (FOS/2.5) for 11 KV and LT lines. |
| 4 | IS:1678/1978 (Latest amended) | Specification for PCC poles for overhead power traction & telecommunication lines. |
| 5 | IS:2905/1989 (Latest amended) | Method of test for PCC poles for overhead power and telecommunication lines. |
| 6 | IS:7321/1974 (Latest amended) | Code of practice for selection handling and erection of concrete poles for overhead power and telecommunication lines. |
| 7 | IS:1343/1980(Latest amended) | Code of practice for prestressed concrete |
| 8 | IS: 456/1978 (Latest amended) | Code of practice for plain and reinforced concrete |
| 9 | IS: 1785(Latest amended) | For HT steel wires for prestressed concrete |

3. MATERIAL

The following quality of material should be used for manufacturing of PCC poles.

- (i) **CEMENT** : The cement used in manufacture of prestressed concrete poles shall be ordinary or rapid hardening Portland cement conforming to IS:269/1976 (specification for ordinary

and low heat Portland cement) or IS:8041-E-1978 (specification for rapid hardening Portland cement) or Portland cement conforming to IS:8112/1976.

- (ii) **AGGREGATES** : Aggregates used for the manufacture of prestressed concrete poles shall conform to IS:383/1970 (specification for coarse and fine aggregates from natural sources for concrete). The nominal maximum size of fine aggregates shall not exceed 10 mm.
- (iii) **WATER** :Water should be free from chlorides, sulphates, other salts and organic matter. Potable water is generally suitable.
- (iv) **ADMIXTURES** :These admixtures should not contain calcium chloride or other chlorides and salts which are likely to promote corrosion of pre-stressing steel.
- (v) **PRE-STRESSING STEEL** : The prestressing steel wires including those used as un-tensioned wires should conform to IS:1785 –1966 Part-I (Specification for plain hard drawn steel wire) or IS:6003/1970 (Specification for indented wire for prestressed concrete). The type design for plain wires of 4 mm diameter are with a guaranteed ultimate strength of 175 Kg./sq.mm.
- (vi) **CONCRETE MIX** :The concrete mix. shall be designed to the requirements laid down for controlled concrete (also called design requirement laid down/mix. concrete) in IS:1343/1980 (Code of practice for prestressed concrete) and IS:456/1978 (code of practice for plain and reinforced concrete) subject to the following special conditions :
- Min. working cube strength at 28th day should be at least 420 Kg. / cm.²
 - The mix. should contain at least 380 Kg. cement per cubic meter of concrete.
 - The concrete strength at transfer should be at least 210Kg. / cm.²
 - The mix. should contain as low water content as is consistent with adequate workability. If it becomes necessary to add water to increase the workability the cement content should also be raised in such a way that the original value of water cement ratio is maintained.
- (vii) **REINFORCEMENT** :The reinforcing bars and wires used for manufacturing of prestressed cement concrete poles shall conform to the following Indian standards.
- Mild steel bars conforming to IS:432/1966.
 - High tensile steel wires conforming to IS:1785/1966.
- (viii) **WELDING AND LAPPING OF STEEL**: The high tensile steel wire shall be continuous over the entire length of the tendon. Welding shall not be allowed in any case. However, jointing or coupling be permitted provided the strength of the joint or coupling is not less than the strength of each individual wire.

4. DESIGN REQUIREMENT :

The poles shall be designed to meet the following requirements.

- The poles shall be planted directly in the ground with a planting depth of 1.5 meters.
- The working load on the poles shall be 200 Kg./400 Kg applied at 0.6 Mtr. from top.
- The factor of safety shall not be less than 2.5 for 200 Kg and 2.0 for 400 Kg.
- The average permanent load should be 40% of the working load.
- The Factor of safety against first crack load shall be 1.0
- The ultimate moment capacity in the longitudinal direction should be at least one fourth of that in the transverse direction.

- g) The max. compressive stress in concrete at the time of transfer of prestress should not exceed 0.8 times the cube strength.
- h) The concrete strength at transfer shall not be less than half of the 28th day strength ensured in the design i.e. : $420 \times 0.5 = 210 \text{ KG./SQ.MM.}$
- i) The concrete cover, measured from outside of prestressing tendon shall be 20 mm.
- j) At the design value, of first crack load the modules of rupture shall not exceed 55.2 Kg./cm for M-42 concrete.

5. MARKING :

The poles shall be clearly & indelibly marked with the following particulars by engraving properly at a height of 3 meters from the bottom end so as to be easily readable after erection. Marking should not be painted.

1. S.No. of pole.
2. Date, month and year of manufacturing
3. Name/mark of manufacturer.

It should be distinct and should not resemble with mark of other manufacturers and if it resembles with marking of other manufacturers then you should change your marking.

4. Length and working loadM/....Kg.
5. AVVNL- TN -.....

RED STRIP PAINTING: A strip of 30-40 mm shall be painted on one side (transverse face) of the pole at a planting depth (1.5Meter from bottom) with oil paint of red color in such a manner that the red strip shall be visible above the ground. Poles without marking of red strip will not be accepted and considered as rejected.

6. INSPECTION, TESTING & CHECKING :

The inspection and testing shall be carried out at supplier's works as per relevant ISS: GTP/ Spec. before dispatch

The supplier shall incorporate the following certificate in his offer letter which should indicate Sr. No. & total No. of poles casted on different dates, as offered for the present inspection:

- a) That all the PCC poles included in the lot under the present inspection conform to the design, strength and workmanship required as per the purchase order, GTP of the specification and contract drawing under the TN.
- b) That none of the PCC poles offered for the present inspection was previously rejected / not considered for inspection or tested for transverse load strength by any other inspecting officer.

The supplier shall furnish the following certificates / tests results to our Inspecting Officer at the time of inspection, if desired.

- a) The supplier shall furnish test results from the manufacturer to substantiate that HT steel wire of required quality was used in the manufacture of PCC poles under the present inspection.
- b) The supplier shall certify that cement, prestressed steel wires, M.S. Bars, aggregates and other material had been used as per the required specifications, to manufacture the PCC Poles under the present inspection.

The supplier shall arrange the required number of PCC Poles out of the offered lots as per the sampling plan under this specification for witnessing the various tests by Inspecting Officer. The poles so tested in presence of the Inspecting Officer shall be preserved for at least 30 days from

the date of inspection for subsequent checking by any other representative for the purchaser if needed. The supplier shall intimate in writing name and address of purchaser of these tested poles.

The supplier shall provide the following documents to Inspecting Officer, to facilitate and authenticate the process of inspection, checking and testing.

- a) Copy of approved Drawing.
- b) Details of all meters/ instruments /equipments to be used in the process of checking and testing of the material along with the details for their last calibration (original) certificates of calibration indicating that calibration had been done to full range on all the scales to verify that the last calibration and sealing was got done from the manufacturer or an independent test house approved by NABL /Government within one year prior to the date of inspection.

Inspection shall not be carried out further, if the above requirements are not fulfilled satisfactorily.

A. SAMPLING:

- a) In a consignment, 500 poles or a part thereof of the same overall length, same dimensions and belonging to the same batch of manufacturer shall be grouped together to constitute a lot.
For ascertaining the conformity of the materials in the lot to the requirements of the specification, samples shall be tested from each lot separately.
The number of poles to be selected from the lot shall depend on the size of the lot and shall be according to table as under:-

Sample size and criterion for conformity :

| Size of lot or sub-lot in numbers (N) | Dimensional requirement | | No.of poles for transverse strength test (n) |
|---|-------------------------|---|---|
| | sample size (n) | Permissible No. of defective samples | |
| 1 | 2 | 3 | 4 |
| Upto 100 | 10 | 1 | 1 |
| 101 to 200 | 15 | 1 | 3 |
| 201 to 300 | 20 | 2 | 4 |
| 301 to 500 | 30 | 3 | 5 |

The minimum size of lot which can be offered for inspection is 300 Nos. of pole except in case of last lot which may be for left out balance quantity. Lot size once offered for inspection, cannot be reduced subsequently under the re-inspection, unless re-inspection charges for each lot/sub-lot out of the original lot is deposited.

- b) Deviation in selection of samples may be effected by the Inspecting Officer only if he thinks that the purpose of checking/testing will be better served by such deviation.
- c) The number of poles, in every lot/sub lot, which does not satisfy, the requirement of overall length, cross section and uprightness shall not exceed the corresponding number given in Col.3 of the above Table. If the number of such poles exceeds the corresponding number, supplier shall segregate the pole not confirming the requirement of specification and shall submit the remaining poles for checking. Fresh poles as per sample size indicating in Col.2 will be drawn from the remaining poles of the offered lot or sub lot and subject to similar checking. If the number of effective poles in the second sample of poles also exceeds the permissible number indicated in Col.3 the then the subject lot or sub lot under

inspection will be rejected without further checking. Result of all such checking shall be recorded.

- d) PCC poles, in every lot/sub lot sampled for transverse load strength test shall satisfy the requirement of the test. Initially, selection of sample and inspection and testing of poles will be undertaken as usual as is being done according to IS:1678/1998 and IS:2905/1989 with latest amendments. In case the samples selected satisfied the dimensional requirements and also withstand transverse load test, the lot stands cleared.

In case of one or more poles fail during transverse load test, then twice the number of originally tested shall be selected from those already selected and subjected to the tests. If these poles withstand the transverse load test the entire lot will be deemed to have passed the tests and will be cleared, but if one or more pole fails during double sampling, then leaving aside the sub-lots for which double sampling was done and where samples could not withstand transverse load test, the remaining sub-lots representing poles from which have withstood transverse load test will be accepted provided they satisfy clause No. 9.3.2 of IS:1678/1978. However, the destruction test from the sub-lots will be done by the inspecting officer on the poles on which transverse load was performed and the acceptance of these sub-lots will be on the basis of the test results observed by the inspecting officer during destruction test on the respective representative poles.

- e) All the poles subject to transverse load strength test shall be preserved for atleast 30 days from the date of inspection for any subsequent checking by any other representative of the purchaser, if required. These poles shall not be dispatched /supplied to the purchaser.
- f) One pole from the poles subject to transverse load strength test, from every lot/sub lot, shall be destructed for following measurement/checking.
- i) To measure clear thickness of concrete cover at three points one within 1.8 meter from the bottom end of the pole, the second within 0.6 meter from the top end of the pole and the third at an inter-mediate point. The mean value shall be compared with the specified value.
- ii) To check Nos., size & configuration of steel reinforcement and GI earth wire.

The destructed poles shall also be preserved for atleast thirty days from the date of inspection for subsequent checking by any other representative of the purchaser if required.

B) INSPECTION :

Inspection shall comprise of :

- a) Verification of offered quantity as per packing list.
- b) Visual inspection for shape, workmanship and finishing of the PCC poles.
- c) Checking of dimensions as per the ISS/GTP/ Spec.
- d) Verification of marking and red/ black strip as per GTP.

C) WITNESS OF TRANSVERSE LOAD TESTS :

- i) On PCC poles selected for transverse load strength test as per sampling plan.
- ii) On one PCC pole from every lot/sub lot be destructed to ascertain the No., size and configuration of steel reinforcement and GI earth wire etc.

The supplier should have transverse load testing arrangements of its own.

Testing arrangement shall be preferably as specified in the relevant specification i.e. IS:1678/1978 & IS:2905/1989 (both latest amended). As per provision of Clause No.6.2.3 of IS:2905/1989 the load shall be applied at a point stipulated in the relevant IS by means of a suitable device such

as a wire rope and winch placed in a direction normal to the direction of the length of the pole so that the minimum length of the straight rope under pull is not less than the length of the pole.

As per provision of Clause No.6.2.5 "load measurement" of IS: 2905/1989. The dynamometer or any other satisfactory method of load measurement shall be calibrated at regular intervals(Not more than one year) and capable of measuring load to the accuracy of 50 N may be adopted.

The transverse strength test on poles shall be conducted in accordance with IS:2905. A prestressed concrete pole shall be deemed not to have passed the test if cracks wider than 0.1 mm appear at a stage prior to the application of the designed transverse load at first crack and the observed ultimate transverse load is less than the designed ultimate transverse load.

7. TEST AT SITE :

The purchaser reserves the right to get the material tested after receipt of inspected poles at sites/ stores and claiming any compensation or rejecting the poles if not found according to specification. All charges consequent to rejection, rectification and replacement shall be borne by the supplier.

8. TOLERANCE :

The following tolerances shall be allowed :

| | | |
|-------|---|--------------------|
| i) | Overall length of PCC poles. | ±15 mm |
| ii) | Top and bottom dimension. (Breadth and depth of PCC poles) | ± 3 mm |
| iii) | Clear concrete cover over HT steel wires (Average of measurements at three sections). | - 2 mm |
| iv) | Uprightness or straightness of the PCC poles | 0.5 % |
| v) | Internal dia of eye hook | + 20 mm and – 5 mm |
| vi) | Dia of holes | ± 1 mm |
| vii) | Diameter of HT wires as per IS: 280/1979 | ± 0.05 % |
| viii) | Diameter of GI wire as per IS:280/1979 | ± 2.5% |
| ix) | Diameter of MS rod for eye hook as per 1786/1966 | ± 4% |

Higher dimensions of poles shall attract no penalty / deduction as it will not be considered as deviation.

9. GUARANTEED TECHNICAL PARTICULARS :

The tenderer shall furnish the guaranteed technical particulars of the PCC poles as required in the schedule-V by mentioning specific figures therein. Any item of the GTP left unfilled or simply written as per ISS etc. shall be considered as incomplete GTP and such tender is liable to be rejected.

10. CRITERIA FOR ACCEPTANCE:

The inspected PCC poles should be strictly in accordance to the GTP of the specification otherwise the material shall be treated as rejected and shall not be accepted. However, the poles with some minor deviations may be accepted with deductions as per rates prescribed and in force.

Higher dimensions of poles shall not attract any penalty / deduction, as it will not be considered as deviation.

TECHNICAL SPECIFICATIONS FOR GALVANISED M.S FORGED PINS FOR 33 KV/11KV / LT PIN INSULATORS (33 KV PINS, 11 KV PINS and LT PINS)

1.0 SCOPE :

This specification covers the design, manufacture, inspection testing before dispatch, supply and delivery of Galvanized M.S. Forged Pins specified herein for their satisfactory operation in 33 KV/11 KV/LT Sub-Transmission lines in Rajasthan.

2.0 PRINCIPAL PARAMETERS :

The 33 KV/11KV/LT galvanized M.S. Forged Pins suitable for use with 33 KV /11 KV/LT Pin Insulators(Confirming to ISS:731:1971 with latest amendments if any) shall comply in all respects with the ISS:2486 (Part-I):1993 & ISS:2486(Part-2/1989) (with latest amendments if any).

3.0 DRAWINGS :

Detailed drawings must be furnished. The drawing shall comply with IS 2486(Part-I)/1993 & IS:2486 (Part-II)/1989 with latest amendment if any. The 33 KV/11KV/LT Galvanized M.S. Forged Pins shall be suitable for use with 33 KV/ 11KV/ LT Pin Insulator (conforming to IS 731/1971 with latest amendment, if any) respectively.

4.0 GENERAL TECHNICAL REQUIREMENTS :

4.1 HEADS :

The head shall be of steel and shall be in accordance with Fig.1 of IS:2486 (Part-2) / 1989 with latest amendments, if any. They shall screw into a thimble fixed in the pin hole of the insulators. The dimensions of the gauges for these heads are given in fig. 2 to 4 of aforesaid IS.

4.2 PINS :

The 33 KV/ 11KV/ LT galvanized M.S. Forged Pins suitable for use with 33 KV/ 11KV/ LT Pin Insulators (Conforming to IS:731/1971 with latest amendments if any) shall comply in all respects with the IS: 2486 (Part-1)/1993 & IS:2486 (Part-2)/1989 with latest amendments if any. The dimensions of the line pins shall be as given in fig. of the above mentioned ISS.

4.3 STALKS :

The stalk length of line pins shall be measured above the seating face of the collar conforming to IS:2486 (Part-2)/1989.

4.4 SHANKS :

The shank length of the line pins shall be measured below the seating face of the Collor & conforming to IS:2486 (Part-2)/1989.

4.5 GALVANISED M.S.FORGED PINS :

i) GALVANISATION :

All ferrous pins and nuts shall be hot dipped galvanized. The galvanization shall conform to IS: 2633/1986 with latest amendments and satisfy the requirements given in IS:4759/1984. The threads on

the nuts & tapped holes shall be cutout after galvanizing & shall be well oiled or greased. Spring washers shall be electro galvanized conforming to service grade No.4 of IS:1573/1986(latest amended).

- ii) FAILING LOAD : As per GTP
- iii) DIMENSIONS :

The 33 KV/ 11KV/ LT Pins for supply under this specification shall be of small steel head as per figure of IS:2486 (Part-2)/ 1989 and shall have the following dimensions as per GTP .

4.6. THREADS :

Threads shall be as specified in IS:4218 (Part-2) /1976 and matching with corresponding 33 KV/ 11 KV/ LT Pin Insulators conforming to IS:731/1971 (with latest amendments if any)

4.7 HEXAGON NUTS :

Hexagon Nuts shall conform to IS:1363(Part-3):1992 (latest amended).

4.8 SPRING WASHERS :

Spring washers shall conform to IS:3063:1972 (Latest amended).

4.9 MATERIAL DESIGN AND WORKMANSHIP :

4.9.1 GENERAL :

- i) All raw materials to be used in the manufacture of these pins shall be subject to strict raw material quality control and to stage testing/quality control during manufacturing stage to ensure the quality of the final end product. Manufacturing shall conform to the best engineering practices adopted in the field of high voltage transmission. Bidders shall therefore offer pins as are guaranteed by them for satisfactory performance on 33 kV /11 KV /LT Sub-transmission Lines.
- ii) The design, manufacturing, process and material control at various stages be such as to give maximum working load, highest mobility, best resistance to corrosion, good finish, elimination of sharp edges and corners.

4.10 TESTS

4.10.1 TEST BEFORE DESPATCH: The 33 KV Galvanized M.S.Forged pins and accessories shall be subjected at maker's works before dispatch, to the tests mentioned here-under as per IS: 2486(Part.1)/1993 (with latest amendments).

4.10.2 ROUTINE TESTS :

The following tests shall be conducted on each unit by the bidder at his works as per relevant standard - IS:2486 (Part-1)/1993 (latest amended) :

- a) Visual Examination

4.10.3 ACCEPTANCE TESTS :

The following tests shall be conducted on samples taken at random from a lot as per relevant standard, IS:2486 (Part-1)/1993 (latest amended) and as per GTP in presence of purchaser's representative :

- a) Verification of dimensions
- b) Galvanizing Test
- c) Mechanical Tests

5.0 PACKING& FORWARDING :

- i) All Galvanized M.S. Forged pins shall be packed in double bags, one HDP bag (inner) and one gunny bag (outer) or in double gunny bag. The gross weight of each packing shall not normally exceed 50 Kg.
- ii) The packing shall be of sufficient strength to withstand rough handling during transit, storage at site and subsequent handling in the field.

6.0 TEST CHECKING OF MATERIAL AT CTL

- 6.1 The material received in the stores of the NIGAM shall be subjected to the test checking at stores before final acceptance of the material, the procedure for the same shall be as under :

6.2 SAMPLING

Samples as per following sampling plan from each inspected lot received in stores shall be selected for test checking of material and shall be got tested. The selection of sample from the material received at stores shall be done as soon as material is received in stores without the presence of the representative of the supplier. However, testing of sample(s) at CTL shall be carried out in the presence of representative of the supplier after identification / confirmation by him that sample so selected belongs to them. In case the supplier disputes that the selected samples does not pertain to them, then fresh sample shall be selected in the presence of the representative of the supplier and test(s) be carried out.

One sample of 33 KV Pin out of each sub-lot / lot of 1000 Nos. or part thereof.

One sample of 11 KV Pin out of each sub-lot / lot of 3000 Nos. or part thereof.

One sample of LT Pin out of each sub-lot / lot of 3000 Nos. or part thereof.

6.3 TESTS

The following tests shall be carried out on the above items :

- a) Visual Examination, Verification of Dimension, weight and marking
- b) Mechanical Test.
- c) Galvanization (Uniformity) Test.

Only those test shall be conducted at CTL for which facility with CTL is available.

- 6.4 Test of the material shall be got done at the test laboratory of the NIGAM i.e. CTL, Ajmer in the presence of representative of supplier. For witnessing of the testing, clear 7 (seven) days' notice shall be given to the supplier by fax/ speed post stating date, time & place where the test is to be conducted. In case the supplier do not attend for witnessing the testing, the testing shall be proceeded and completed and action be taken as per the contract.
- 6.5 The witnessing officers of the NIGAM or as designated by the purchaser shall send copies of test reports to the purchaser, consignees and the supplier.

7.0 CRITERIA FOR ACCEPTANCE

- 7.1 Visual Examination, Verification of Dimension, weight and marking as per specification/ ISS

- 7.2 Mechanical test.

In case of failure of sample in Mechanical Test, the material contained in the lot / sub-lot to which the sample belongs, shall be rejected. The rejected material shall have to be replaced by the supplier free of cost.

- 7.3 Galvanization (Uniformity) Test.

- 7.3.1 The sample(s) shall be first tested for (n-2) number of dips where (n) is specified number of dips in the contract. If the sample(s) does not pass the uniformity of Galvanization Test for (n-2) dips, the material shall be rejected and the material relating to relevant lot / sub-lot to which sample(s) pertains shall have to be replaced by the supplier free of cost.
- 7.3.2 If the sample has passed the uniformity of Galvanization Test for (n-2) dips, then it shall be tested for (n-1) dips. If the sample has not passed the uniformity of Galvanization Test with (n-1) dips, then material pertaining to relevant lot / sub-lot shall be accepted with a deduction @ 10% of cost of material.
- 7.3.3 If the sample has passed the uniformity of Galvanization Test with (n-1) dips, then sample shall be tested for last one dip of one minute to complete the test for 'n' dips. If the sample does

not pass the uniformity of Galvanization Test with `n' dips, then the material pertaining to relevant lot/ sub-lot shall be accepted with a deduction @ 5% of cost of material.

7.3.4 If the sample(s) have passed the Test with number of dips as specified in the contract (n), then material pertaining to relevant lot / sub-lot shall be accepted.

8.0 TEST CHARGES :

All test charges incurred towards test checking of the material in CTL shall be borne by the NIGAM.

9.0 IDENTIFICATION & MARKING :

9.1 Each Pin shall be marked with the manufacturer's name or trade mark.

Prescribed technical specification for supply of

(Name of Material/Equipment/Machinery/T&P etc.)

GALVANISED M.S FORGED 33KV/11KV/PINS

| S.No. | Technical specification which material/equipment/ Machinery/T&P shall conform | Name of IS/other standard specification to which material should conform | Other particulars to if any. |
|-------|---|--|--|
| 1. | Specification for Insulator fittings for overhead power lines with nominal voltage greater than 1000 V General requirements and test | IS:2486 Part-1 | BS:3288(International Standard) IEC:120 |
| 2. | Dimensional Requirements Hexagonal Head Bolts, Screws and Nuts of Product grade C Hexagonal Nuts (Size range M.5 to M.36) | Part-2 IS:1363 (Part.1) IS:1363 (Part.3) | |
| 3. | Metric Screw Threads | IS:4218 | |
| 4. | Dimensions for radii under the heads of bolts and screws. | IS:4172 | |
| 5. | Recommended practice for Hot dip galvanizing of Iron & Steel. | IS:2629 | |
| 6. | Specification for Zinc | IS:209 | |
| 7. | Dimensions for nominal lengths and threads length for bolts, screws and studs. | IS:4206 | |
| 8. | Schedules for wrought steel for general engineering purpose Steel specified by tensile and/or yield properties, | IS:1570 (Part.1) | |
| 9. | Specification for Carbon steel forgings for general engineering purposes. | IS:2004 | |
| 10. | Method for determination of Zinc coating on Zinc coated iron steel articles. | IS:6745 | |
| 11. | Electroplated coatings of zinc on iron and steel. | IS:1573 | |
| 12. | Introduction & general information for threaded(Part-1) fasteners. | IS:1367 | |
| 13. | Product grades & tolerances Part-II | IS:1367 | |
| 14. | Mechanical properties & test methods for Bolts screws and | IS:1367 Part-III | |

| | | |
|-----|---|-------------------------------|
| | studs with full load ability. | |
| 15. | Plain washers(I revision) | IS:2016 |
| 16 | Recommended practice for hot dip galvanized of iron & steel. | IS:2629 |
| 17. | Methods of testing uniformity of coating of zinc coated article | IS:2633 (II revision). |
| 18. | Spring Washer | IS:3063/1972 (Latest amended) |

Certified that we agree to all the aforesaid technical specification

TECHNICAL SPECIFICATION AND OTHER REQUIREMENT FOR 33 KV/11 KV /LT PIN INSULATORS

SCOPE : This specification covers the design, manufacture, testing, supply and delivery of 33 KV/11 KV /LT Pin Insulators for use of 11 KV overhead power lines in Rajasthan.

- 1.0** The 11 KV Pin Insulator shall be brown glazed porcelain and shall have minimum failing load of 5 KN.
- 2.0** The 11 KV Pin insulator shall comply in all respects with the IS:731/1971 (With latest amendments).
- 3.0** The insulator marked with ISI certification mark will be given preference.

4.0 GENERAL REQUIREMENT :

- a) The porcelain should be sound, free from defects thoroughly vitrified and smoothly glazed.
- b) The glaze of the insulators shall be brown in color. The glaze shall cover all the porcelain parts of the insulators except those which serve as supports during fixing or are used for the purpose of assembly.
- c) The design of the insulator shall be such that the stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. The porcelain shall not engage directly with hard metal.
- d) Cement used in the construction of the insulator shall not cause fracture by expansion or loosening by contraction and proper care shall be taken to locate the individual parts correctly during cementing. The cement shall not give rise to chemical reaction with metal fitting and its thickness shall be uniform as possible.

4.01 THIMBLES :

The insulators shall suitably be provided with cemented in zinc or lead thimbles.

4.02 FAILING LOAD :

The 33 KV Pin Insulator shall have a minimum failing load of 10 KN .
 The 11 KV Pin Insulator shall have a minimum failing load of 5 KN .
 The LT Pin Insulator shall have a minimum failing load of 3.5 KN .

4.03 THREADS :

The Pin Insulators with cemented in thimbles shall have the threads suitable for use with large & small steel head galvanized M.S. Forged Pins covered under ISS:2486 (with its latest amendments if any).

4.04 DRAWING :

The bidder shall submit detailed drawing along with bid showing design and dimensions in absence of which, the offer is likely to be ignored.

4.05 TESTS BEFORE DESPATCH :

The material shall be subjected at manufacturer's works before dispatch to the routine & acceptance tests given here-under as per IS:731/1971 (latest amended).

4.06 ROUTINE TESTS :

These tests are to be carried out to check various requirements of Pin insulators which are likely to vary during production. The following tests shall be conducted / carried out on each insulator by the bidder at his works as per relevant IS:731/1971 (Latest amended) and he should furnish certificate / record thereof during pre-dispatch inspection:-

- i) Visual Examination (clause 10.13)
- ii) Electrical Routine Test (clause 10.15)

4.07 ACCEPTANCE TESTS :

These tests shall be carried out on the samples taken from the lot for the purpose of the acceptance of lot which are to be conducted as per relevant IS:731/1971 (latest amended) :

- i) Verification of dimensions (Clause 10.5)
- ii) Temperature Cycle test (Clause 10.6)
- iii) Mechanical Failing Load test (Clause 10.8)
- iv) Puncture test (Clause 10.10)
- v) Porosity Test (Clause 10.11)

4.08 ADDITIONAL ACCEPTANCE TEST- INSULATION RESISTANCE TEST

In addition to acceptance test, insulation resistance test shall also be conducted on the samples. For carrying out test, the sampling procedure given in appendix C of IS:731/1971 (2nd revision) shall be followed.

The procedure for carrying out this test shall be as under:

- a) Clean insulator and dry properly, then Meggar the insulator with 2.5 KV/ 5 KV Meggar.
- b) IR value so measured should not be less than 1000 (one thousand) mega ohms. The testing and criteria for conformity shall be as applicable to puncture test.

4.09 SAMPLING :

The sampling procedure as laid down in IS:731/1971 with latest amended shall be followed for carrying out specified acceptance tests.

4.10 TOLERANCE ON DIMENSIONS / TEST RESULTS :

As per IS:731/1971 (latest amended).

4.11 TESTS AT SITE :

The purchaser reserves the right to conduct all tests on each type of insulator after arrival at site and bidder shall guarantee test certificates figures under actual service conditions.

4.12 PACKING :

All insulators shall be packed in suitable crates or boxes so as to withstand rough handling of packing.

4.13 GUARANTEED TECHNICAL AND OTHER PARTICULARS :

The full guaranteed technical and other particulars shall be given in the Performa given in Schedule-V Any deviation from the specifications referred to above shall be supported by adequate justification.

4.14 TEST CHECKING OF MATERIAL AT STORES

The material received in the stores of the NIGAM shall be subjected to the test checking at stores before final acceptance of the material, the procedure for the same shall be as under :

4.15 SAMPLING

One sample of 33 KV Pin insulator out of each sub-lot / lot of 1000 Nos. or part thereof,
One sample of 11 KV Pin insulator out of each sub-lot / lot of 3000 Nos. or part thereof,
One sample of LT Pin insulator out of each sub-lot / lot of 3000 Nos. or part thereof,
from each inspected lot received in stores shall be selected from each store for test checking of material and shall be got tested.

one extra sample of Pin insulator for conducting Puncture test.

The sample selection shall be done as soon as the material is received by the consignee, without calling the representative of supplier. However, testing at CTL or elsewhere as arranged by NIGAM shall be done in the presence of representative of supplier after identification/confirmation by the supplier's representative that sample(s) so selected belong to them.

4.16 TESTS

The following tests shall be carried out on the above items :

- a) Visual examination, verification of dimensions, creepage distance etc,
- b) Mechanical failing Load Test
- c) Porosity test
- d) Puncture Test

In case if the facility for conducting any of the above test(s) is not available at the NIGAM's CTL, the purchaser reserve the right to get such test (s) conducted at any independent NABL Test House.

- i) For witnessing of the testing, clear 7 days' notice shall be given to the supplier stating date, time & place where the test is to be conducted. The testing shall be started after identification / confirmation of sample by the representative of the supplier that sample selected for testing pertain from the lot supplied by them. In case the supplier does not attend for witnessing the testing, the testing shall be proceeded and completed and action be taken as per the contract.
- ii) The CTL shall send copies of test reports to the purchaser, consignees and the supplier and Sr. Accounts Officer (CPC).
- iii) Only those tests shall be conducted at CTL for which facility with CTL is available.

4.17 CRITERIA FOR ACCEPTANCE

In case of failure of any of sample (s) in any of the above tests, the material contained in the lot / sub-lot received in store to which the samples belong, shall be rejected. The rejected material shall have to be replaced by the supplier free of cost.

4.18 TEST CHARGES :

All test charges incurred towards test checking of the material received in our stores shall be borne by the NIGAM

TECHNICAL SPECIFICATION AND OTHER REQUIREMENT FOR 33KV, 800 AMP ISOLATORS WITH & WITHOUT EARTH SWITCH WITH 24 KV POST INSULATORS AND 11KV , 400 AMP. ISOLATORS WITH 24 KV POST INSULATORS WITHOUT EARTH BLADE ASSEMBLED.

1.0 SCOPE:

This specification covers design, manufacture, assembly testing at manufacturer's works, packing and & delivery with accessories and auxiliary equipments at site(s) of 33 KV,800 AMP. Isolators with& without Earth Switch with 24 KV Post Insulators and 11 KV,400 AMP. Isolators without Earth Switch with 24 KV Post Insulators required for installation at various 33/11KV Sub Stations in **Ajmer** Discom. The manufacturer shall also provide design, drawing and bill of material for supporting structures for installation of their Isolators with and without earth switch.

It is not the intent to specify completely herein all details of the design and construction of equipments. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous operation upto the supplier's guarantee acceptable to the Purchaser, who will interpret in a manner the meaning of drawings and specifications and shall have the power to reject any work or material which in his judgment is not in accordance herewith. The equipment offered shall be complete with all components necessary for its effective and trouble free operation alongwith associated equipments, interlocks, protection schemes etc. Such components shall be deemed to be within the scope of supply, irrespective of whether those are specifically brought out in this specification and/or the commercial order or not. All similar parts particularly movable ones shall be interchangeable.

2.0 STANDARDS :

Unless otherwise specified elsewhere in this specification, the rating as well as performance and testing of the isolators shall conform to the latest revisions and amendments of the following standards available at the time of placement of order.

| Sl. No. | Standard No. | Title |
|---------|--------------|--|
| 1. | IS:9921 | Alternating current isolators (disconnectors) and Earthing switches. |
| 2. | IEC:60129 | -do- |
| 3. | IS:2544/1973 | Insulators. |
| 4. | IS:5350 | Outdoor cylindrical post (Pt-III/1971) insulators. |
| 5. | IS:2629/1985 | Recommended practice for hot dip galvanizing of iron and steel. |
| 6. | IS:4759/1996 | Hot dip galvanization coating on structural steel. |
| 7. | IS:2633/1986 | Method of testing uniformity of coating on Zinc coated articles. |

8. IS:1573/1986 Electroplated coatings of zinc on iron and steel.
9. IS:6735/994 Spring washers.
10. IS:2016/1967 Plain washers.
11. IS:5561/1970 Electrical power connectors. (Terminal connectors)
12. Indian Electricity Rules.
13. IS:9530/1980 Recommended practice for silver plating.
14. BS:2816/1964 Testing of silver plating thickness
15. IS:5925/1970 Recommended practice for silver plating for general engineering purposes.

3.0 PRINCIPAL PARAMETERS :

3.1 The equipment covered in this specification shall meet the technical requirements listed below :

| S.NO. | Particulars | 33 KV Isolators | 11KV Isolator |
|----------------------------------|---------------------------------|----------------------|---------------------|
| A) PARTICULARS OF SYSTEM: | | | |
| i) | Nominal system voltage :KV(rms) | 33 | 11 |
| ii) | Highest system voltage :KV(rms) | 36 | 12 |
| iii) | Rated Frequency.:Hz. 50 | 50 | 50 |
| iv) | Number of phases. | 3 | 3 |
| v) | System Neutral Earthing | Effectively earthed | Effectively earthed |
| B) Service conditions | | As per clause No.4.0 | |

C) Characteristics of a disconnector or earthing switch:

The values of the Parameters/Particulars mentioned below shall not be less than the specified against each.

| S.NO. | Particulars | 33 KV Isolators | 11KV Isolator |
|-------|--|--|---------------|
| 1. | Number of poles. | 3 | 3 |
| 2. | Class - Indoor or Outdoor | Out door | Out door |
| 3. | Rated voltage :KV(rms) | 33 | 11 |
| 4. | Operating mechanism | Manual | Manual |
| 5. | Type of disconnector.(AB) central post rotating. | Triple pole, gang operated double break, | |
| 6. | Rated insulation level: | _____ | |
| a) | 1.2/50 Micro Sec. lightning impulse withstand voltage. | _____ | |
| i) | To earth & between poles: KV (Peak) | 170 | 75 |
| ii) | Across the isolating distance .KV (Peak) | 195 | 95 |
| b) | One minute P.F. withstand voltage. | 70 | 28 |
| _____ | | | |
| i) | To earth & between poles: | 70 | 28 |

| | | |
|---|------|-----|
| KV (rms) | | |
| ii) Across the isolating distance.KV(r.m.s.) | 80 | 32 |
| 7. Rated normal current-A (rms) | 800 | 400 |
| 8) i) Rated short time withstand current for three second. KA (rms) | 25 | 16 |
| ii) Rated peak withstand current: KA(Peak) | 62.5 | 40 |

3.2 SPECIFIC TECHNICAL REQUIREMENTS :

| | | |
|---|--------------------------|--------------------------------------|
| 1. Phase to Phase separation(min.) (Centre to Centre) | 1200mm | 760mm |
| 2. Minimum centre to centre distance between two poles of same phase. | 400mm | 300mm |
| 3. Size of base channel on which insulators are to be mounted. | 100x50mm | 100x50mm |
| 4. Size of vertical operating pipe(Down pipe) | | |
| i) Length | 4.6m | 6m for equipment without earth blade |
| ii) Nominal bore. | 25 mm | 25mm |
| 5. Minimum length of operating handle. | 500 mm | 500mm |
| 6. Nominal bore of phase coupling pipe. | 20 mm | 20mm |
| 7. Minimum cross-sectional area of terminal pad . | 500sq. mm(Min.) | 50X50X4.5mm |
| 8. (a) Minimum cross-sectional area of fixed contacts. | 380 sq.mm (Min.) | 220sq.mm(Min.) |
| (b) Minimum cross-sectional area of one finger | (95 Sq.mm.x4 Nos.) | (55sq.mmX4 Nos.) |
| 9. Minimum nos. of fingers in a fixed contact. | 95 sq.mm. | 55 sq.mm |
| 10. Diameter of Arcing Horn (Rod). | 2 pairs | 2 pairs |
| 11. Size of flexible earthing connector : | (4 fingers) | (4 fingers) |
| i) Minimum cross-sectional area. | 10 mm | 8 mm |
| ii) Length. | | |
| iii) For operating handle | -----160 sq.mm ----- | |
| 12. Name of conductor for which Electric power connector shall be suitable | -----150 mm ----- | |
| 13. Min. size of stainless steel spring to be provided with fixed contact. | 50 Sq.mm.x 150 mm length | DOG |
| i) Gauge | | |
| ii) Outer diameter | 14SWG | 16SWG |
| iii) Minimum nos of turns per coil. | 22mm | 15mm |
| iv) Min. total length. | 6 nos. | 6 nos. |
| 14. Minimum number of guides to be provided for down pipe. | 28mm | 28 mm |
| 15. Minimum size of bimetallic strip to be provided between Aluminium terminal connector and copper terminal pad. | 2 nos. | 3/2 nos. |
| | 75X75X1 mm | 50X50X1 mm |

| | | |
|--|--------------------------|------------|
| 16. Top & bottom pitch circle diameter of post insulator (to be procured separately) for which isolator hardware shall be suitable. | 76 mm | 76 mm |
| 17. Numbers of minimum size of bolts to be provided for fixing terminal connector with terminal pad. | 4x3/8"dia | 4X1/4" dia |
| 18. Max. temperature rise allowed above ambient temperature of 50 degree centigrade | -----25 degree cen.----- | |

4.0 GENERAL TECHNICAL REQUIREMENTS :

- 4.1 The Isolators shall be constructed out of best quality of material suitable for weather conditions prevailing in Rajasthan. The workmanship shall be of the highest grade and the entire manufacture shall be in accordance with the modern Engineering practices. All ferrous parts shall be given an anticorrosive finish and shall be hot dip galvanized. The other parts shall be substantially non corrosive. The bearings in the current path shall be shunted by flexible copper connectors of adequate cross section and the bearing housings shall be completely weather proof with arrangement to facilitate the lubrication of the bearings.
- 4.2 The Isolators shall be of triple pole, gang operated, double break, three posts with central post rotating, banging type suitable for outdoor horizontal mounting with one vertical break earthing blade per pole for fixing on either side of the poles or without any earthing blades. The switch Isolators shall be manually operated. The operating handle shall have arrangement for locking Isolators/ earth switch in 'ON' and 'OFF' positions.
- 4.3 For reasons of safety, the switch isolator should be so designed that no dangerous leakage current can pass from the terminals of one side to any terminals of the other side of the switch Isolator.
- 4.4 The frame of each Isolator and earthing switch shall be provided with reliable earthing terminal for each phase for connection to an earthing conductor having a clamping bolt/screw of not less than 12mm diameter. The terminal shall be marked with 'Earth' symbol. The isolators with earthing switch shall be provided with flexible earthing connectors between the earthing blade and the frame of isolator. The requirement of flexible earthing connector shall not be insisted in case of isolators without earthing blade.
- 4.5 The isolators shall be provided with arcing horns of fixed type with make before and break after actual making and breaking of isolator main contacts. The arcing horn shall be made of G.I. Rod and their position shall remain unchanged after mechanical endurance test (slight welding is permitted for this fabrication purpose).
- 4.6 All similar materials and removable parts of similar equipment shall be interchangeable with each other.
- 4.7 The vertical operating pipe and phase coupling pipe shall be of galvanized mild steel tube (medium class) as per IS-1161.
- 4.8 Suitable arrangement shall be provided to padlock the operating handle of isolating switches and earth switch in 'ON' & 'OFF' positions.
- 4.9 All ferrous parts shall be hot dip galvanized and uniformity of zinc coating shall satisfy requirement of IS-2633. The pipes /tubes shall be galvanized in accordance with IS-4736.
- 4.10 All contact surfaces shall be silver /nickel plated as per IEC:60129 and their temperature rise shall be maximum 25 degree centigrade. The current density shall be less than 2.5 Amps. per Sq.mm. in copper, or minimum cross sectional area shall be as specified.

4.11 The height of 2 x 24 KV pedestal post type(E-32) insulator (conforming to IS:5350 Part-III & IS:2544) stack to be used with 33 KV isolator hardware shall be 508 mm.

4.12 BASE CHANNELS :

The channels shall be of sizes mentioned in clause No.3.0 "Principal parameters" of this specification and shall conform to IS- 808.

4.13 BEARINGS :

4.13.1 The bearing assembly for each rotating central post shall have one number taper thrust roller bearing at top & one number ball bearing at the bottom/other end of bearing housing. The entire mechanical load shall be suspended on thrust bearings. Cross sectional drawings of the bearings shall be furnished with the tender.

4.13.2 The vertical operating shaft shall be supported with taper thrust roller bearing on the top and atleast two guides in between at uniform interval alongwith its length in order to ensure smooth and easy operation.

4.13.3 A galvanized MS Angle/channel of suitable length shall be provided for fixing of fourth bearing assembly. The holes provided shall be of movable type at equal distance to that of base channel holes.

4.14 OPERATING MECHANISM :

4.14.1 The operating mechanism shall be suitable for normal operations by one man without undue efforts. The mechanism shall be so designed that all the three blades are in positive continuous control throughout the entire cycle of operation. It shall not be possible after final adjustment have been made for any part of the mechanism to be displaced at any point in the travel so as to allow improper functioning of switch, whether the switch is in opened or in closed condition.

4.14.2 All G.I. Pipes used in operating mechanism of isolators and earth switches shall be of medium class as per IS-1161.

4.14.3 The Isolators with or without earthing switches complete with the operating mechanism should not come out of its own in open or closed position due to the effect of gravity, wind pressure, vibrations, reasonable shocks or accidental touching of operating rods. The arrangement made and stoppers provided to prevent over travel shall be clearly shown in the tender drawings.

4.14.4 The Isolators should also be capable of resisting in closed position, the dynamic and thermic effects of the maximum possible short circuit current at the installation point. Their construction should be such that it should not open under the influence of short circuit current.

4.14.5 The earthing of operating handle shall be made through flexible copper strip of size as per IS:9921(Pt-III)-1982, connected to the supporting metallic structure.

4.15 CONTACTS :

4.15.1 The fixed contacts shall be of spring loaded reverse loop type as detailed in Clause No.4.2 (8&9) . The minimum length of each finger should be 105 mm or equal to type tested isolator whichever is higher for 33KV 800 Amp. isolator. The moving contacts shall be of solid hard drawn electrolytic copper of tubular sections.

4.15.2 The contacts and switches blades shall be of liberal cross section to withstand the rated continuous current. The copper contacts shall be silver/ nickel plated as per IEC:60129 and female contacts fingers shall be provided with spring of Phosphor Bronze or stainless steel. The spring shall be fixed in the finger contacts through Teflon/nylon insert at both ends so that no transfer of current is possible through spring and direct electric heating of springs is avoided.

- 4.15.3 The contacts must be made of liberally rated electrolytic hard drawn copper suitably plated to withstand damage on account of weather conditions prevailing at site and accidental arcing. High pressure contact switch shall be designed with a contact pressure 1/2 (Half)Lb per Amp. of capacity. The tenderer shall specifically confirm that the material components and cross sectional areas of all current carrying parts shall be either exactly same or superior to that of isolator got type tested for short circuit test, temperature rise test and Mili volt drop test as per relevant standards.
- 4.15.4 Full details of the contacts and switch blades shall be given with cross sectional drawings to dimension. The temperature rise of the contacts shall not exceed 25 degree centigrade at an ambient temperature 50 Degree C.
- 4.15.5 The current density in current carrying parts shall not exceed 2.5A per sq.mm for copper and 1.0A per sq.mm for Aluminum considering with & without holes for overlapping for which supporting calculations must be submitted with offer.

4.16 TERMINAL PAD :

The terminal pad shall be made of electrolytic copper flat and should be liberally sized, so as to receive terminal connectors through minimum 4 Nos. of nuts and bolts of suitable size.

4.17 ELECTRIC POWER CONNECTORS (TERMINAL CONNECTORS) :

- 4.17.1 The isolators shall be provided with 6 Nos of bimetallic rigid type universal terminal connectors of aluminum alloy suitable for conductors as per clause No.5.0. The size of terminal connector should match with terminal pad size. The terminal connector shall also be suitable for horizontal and vertical takeoff arrangement.
- 4.17.2 Thickness of bimetallic strip between terminal pad and aluminum terminal connector shall be at least 1 mm. The current density in terminal connectors shall be less than 1.0 Amps. per Sq.mm. The connectors shall conform to all the test requirement of IS-5561 with latest amendments.

4.18 EARTHING BLADES :

- 4.18.1 The earthing blades wherever required shall be manually operated in the manner similar to the main blades. The earth switch shall match the main isolators in quality and shall be capable of withstanding all electrical and mechanical stresses. The earthing blades shall be counter balanced to ensure smooth and easy operation. All ferrous parts used in the operating mechanism shall be galvanized. The design of earth switch shall match with main switch isolator in all respects.
- 4.18.2 The earth switch moving blades and contacts shall be of copper, the cross sections of which shall be either exactly same or superior to that of main switch or earth switch got type tested for short circuit test. This shall be specifically confirmed by the tenderer.
- 4.18.3 The earth switch shall be mechanical interlocked with associated isolator to prevent the earthing blades from closing when the main blades are closed and vice versa,. The tenderer are advised to enclose tender drawing to show salient feature incorporated in the switches to ensure satisfactory performance of this duty.

4.19 BOLTS, NUTS & WASHERS :

- 4.19.1 All bolts, nuts & washers required for assembling the equipment and for fixing them on to the structure shall be galvanized and shall be supplied with the equipment at no extra cost.
- 4.19.2 Bolts & nuts shall also be provided with lock washers and lock nuts required for fixing post insulators/post insulator stacks on base plate/base channel.

4.20 ACCESSORIES AND FITTINGS :

The following accessories and fittings shall be provided with the isolators.

- i) Handle suitable for pad locking in 'ON' & 'OFF' position.
- ii) Three earthing terminals having clamping bolts of at least 12mm diameter.
- iii) Name Plate shall be provided on the equipment as per IS/9921.
- iv) Galvanized arcing horns of liberally rated renewable rod type with make before and break after arrangement.
- v) Mechanical interlock for earthing switches.
- vi) Base Channels.
- vii) Electric power connectors (Terminal connectors)

4.21 CLEARANCES :

The isolators shall have clearances conforming to relevant IS and should meet the requirements of the impulse voltage tests as specified therein.

4.22 The equipment covered by this specification shall be used outdoor and maximum temperature attained by any part of the equipment in service at site conditions and full load current shall not exceed the permissible limits mentioned in IS:9921 at an ambient temperature of 50 Degree C. Tenderers are required to mention specific degree of maximum temp. rise in GTPs.

4.23 The temperature rise test after fitting terminal connectors shall also be carried out as routine test on one switch isolator out of each lot offered for inspection. The limit shall not exceed those specified under this specification.

4.24 Where **Porcelain Insulators** are offered they shall be made of homogeneous and vitreous porcelain of high mechanical and dielectric strength. It shall have sufficient mechanical strength to sustain electrical and mechanical loading on account of wind load, short circuit forces etc., Glazing of the porcelain shall be of uniform brown or dark brown color with a smooth surface arranged to shed away rain water. The porcelain shall be free from laminations and other flaws or imperfections that might affect the mechanical or dielectric quality. It shall be thoroughly vitrified, tough and impervious to moisture. The porcelain and metal parts shall be assembled in such a manner and with such material that any thermal differential expansion between the metal and porcelain parts throughout the range of temperature specified in this specification shall not loose the parts or create undue internal stresses which may affect the mechanical or electrical strength or rigidity of the unit as a whole or stack of two units. The assembly shall not have excessive concentration of electrical stresses in any section or across leakage surfaces. Cement used in the construction of post insulators shall not cause fracture by expansion or loosening by construction and proper care shall be taken to locate correctly the individual parts during cementing. The cement used shall not give rise to chemical reaction with metal fittings and its thickness shall be uniform. The insulator shall be suitable for water washing by rain or artificial means in service condition. Profile of the insulator shall also conform to the relevant IS.

4.25 Cap to be provided on top of the insulator shall be of high grade cast iron or malleable steel casting. It shall be machine faced and hot dip galvanized. The cap of 24KV Post Insulators shall have four numbers of tapped holes spaced on a pitch circle diameter of 76mm . The threads of the tapped holes in the post insulator metal fittings shall be cut after giving anti-corrosion protection and shall be protected against rust by greasing or other similar means, all other threads shall be cut before giving anticorrosion protection and shall conform to IS: 4218 with latest version thereof The tapped holes shall be suitable for bolts with threads having anticorrosive protection.

The effective depth of threads shall not be less than the nominal diameter of the bolt. The cap shall be so designed that it shall be free from visible corona.

- 4.26 The casting shall be free from blow holes, cracks and such other defects.
- 4.27 All the ferrous metal parts shall be given an anticorrosive finish and shall be hot dip galvanized smoothly as per IS:3638 (as amended upto date), IS:2633 or any other equivalent authoritative standard. The other parts shall be substantially non corrosive. The material shall be galvanized only after shop operations upon it have been completed. The metal parts before galvanizing should be thoroughly cleaned of any paint, grease, rust, scales or alkali or any foreign deposit which are likely to come in the way of galvanizing process. The coating on the metal parts shall withstand minimum four one minute dips in copper sulphate solution as per the relevant IS.
- 4.28 The insulator unit shall be assembled in a suitable jig to ensure correct positioning of the top and bottom metal fittings relative to one another. The faces of the metal fittings shall be parallel and at right angles to the axis of the insulator and the corresponding holes in the top and the bottom metal fittings shall be in a vertical plane containing the axis of the insulator.
- 4.29 It shall be the sole responsibility of the Supplier to carry out thorough inspection and quality checks on the insulators at the insulator supplier's works, before offering the isolators for Purchaser's inspection.
- 4.30 The porcelain and hardware surface coming in contact with cement shall be coated with bituminous paint for cushioning to relieve mechanical stress caused by temperature variation and cement expansion.
- 4.31 The post insulators shall conform to IS:5350. The total creepage distance of 24KV post insulator as individual unit shall be minimum 430mm .
- 4.32 Following makes of the Post Insulators shall be acceptable for the supply of 33 KV & 11 KV Isolator
- | | |
|---|--|
| i) M/s.Jaipur Glass & Potteries, Jaipur | viii) M/s.IEC, Bhopal. |
| ii) M/s.India Potteries, Kolkata. | ix) M/s.MIL, Allahabad. |
| iii) M/s.Bikaner Ceramics, Bikaner. | x) M/s.Jay Shree Insulators, Vadodara |
| iv) M/s.CJI Porcelain, Khurja. | xi)M/s.Birla NGK Insulators Pvt. Ltd., Halol |
| v) M/s.Vishal Malleable, Ankeleshwar. | xii) M/s.MIL, Abu Road. |
| vi) M/s.Allied Ceramices Pvt. Ltd., Kolkata | xiv) M/s BHEL |
| vii) M/s.WSI, Chennai. | |
| xiii) M/s.Sarvana Insulators Ltd., KurinjiPadi, DistCuddalore, (Tamilnadu). | |
- 4.33 Besides above, the Post Insulators manufactured by the vendors approved by the Power Grid Corporation of India Ltd (PGCIL) and National Thermal Power Corporation (NTPC) shall also be acceptable.

5. TEST

The manufacturer is required to conduct following routine tests as per relevant IS on the Isolators complete with required Post Insulators at manufacturer's works .

5.1 ROUTINE TEST :

1. Routine mechanical test on post insulators.
2. Routine electrical tests on post insulators.
3. Tests as per IS:2633.

5.2 ACCEPTANCE TESTS :

The following tests shall be got conducted in presence of purchaser's representative as per relevant standards at the place of manufacturer before dispatch without any extra charges. The tests at Sr. No.1 to 6 are to be carried out on completely assembled isolator as per IS:9921(Pt-IV). The sampling for the inspection of completely assembled isolators, offered for final inspection shall be on 10% of offered quantity(unless otherwise specified). The tests at Sr. No.7 to 12 are to be carried out on Post insulators as per IS:2544 and sampling will also be as per same IS, at original manufacturer's works.

1. Measurement of resistance of main circuit of Isolator as per IS:9921 (Part-IV).
2. Mechanical operating test on atleast one sample selected at random from each type& rating.
3. Mechanical endurance test shall be done as acceptance test on one Isolator of each type & rating from every lot. Mechanical endurance test shall be conducted on the main switch as well as earth switch of one disconnector of each type & rating. Bare contacts shall not be acceptable in any case.
4. Verifications of dimensions as per approved drawing on one Isolator set of each type & rating.
5. Temperature rise test on one set of Isolator of each rating from the offered lot.
6. Preece Test on one Isolator of each type and voltage rating as per relevant IS.
- 7 Verification of dimensions of post insulators.
8. Temperature Cycle Test on post insulators.
9. Mechanical strength Test on post insulators.
10. Puncture Test on post insulators.
11. Porosity Test on post insulators.
12. Galvanizing Test on post insulators.

5.3 TEST ON BOUGHT OUT ITEMS

Tests are not required to be performed on bought out equipments like terminal connectors etc. at the works of manufacturer except operational tests. Furnishing Test Certificate of Isolators and Post Insulators from the original equipment manufacturers shall be deemed to be satisfactory evidence. Inspection of the tests at Sub-contractors works will be arranged by the supplier whenever required.

At the option of the purchaser, the material received in the stores may be utilized in the field after receipt of successful test reports from CTL, Ajmer

6.0 TOLERANCE :

Tolerance shall be allowed as per respective /relevant Indian Standards unless otherwise specified.

However, no negative tolerance shall be allowed on current carrying parts.

7.0 INSPECTION

All the tests and Inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the tenderer and purchaser at the time of purchase. The tenderer shall offer required numbers of post insulators for Purchaser's inspection and after clearance of insulator, he will offer assembled Isolators for purchaser's inspection. The tenderer shall afford the inspection officer(s) representing the purchaser all reasonable facilities without charges, to satisfy him that the material is being furnished in accordance with this specification. The purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is a dispute regarding the quality of supply.

The Inspection may be carried out by the purchaser at any stage of manufacture/ before dispatch as per relevant standard.

Inspection and acceptance of any material under the specification by the purchaser, shall not relieve the tenderer of his obligation of furnishing material in accordance with the specification and shall not prevent subsequent rejection if the material is found to be sub-standard.

The purchaser reserves the right to insist for witnessing the acceptance/ routine testings of the bought out items.

8.0 TEST CHECKING OF MATERIAL AT STORES

The material received in the stores shall be subjected to the test checking at stores before final acceptance of the material, the procedure for the same shall be as under.

8.1 SAMPLING

One sample out of each sub-lot / lot consisting of following quantities or part thereof from each inspected lot received in stores shall be selected for test checking of material and shall be got tested. The selection of sample from the material received at stores shall be done as soon as material is received in stores without the presence of the representative of the supplier. However, testing of sample(s) at CTL shall be carried out in the presence of representative of the supplier after identification / confirmation by him that sample so selected belongs to them.

33 KV 800 Amp. Isolator with & without E.B. with Post Insulator– 50sets

11 KV 400 Amp. Isolator without E.B. with Post Insulator –100 sets

8.1(a) one extra sample of 24 KV post insulator for conducting Puncture test.

8.2 TESTS

The following tests shall be carried out on the above items :

- a) Visual examination , verification of dimensions, weight and marking as per PO/ GTP/ Approved drawing.
- b) Checking of current carrying parts as per approved drawings.
- c) Post Insulators :
 - i) Mechanical strength test.
 - ii) Porosity test
 - iii) Puncture Test
- d) All galvanized parts. - Uniformity of galvanization test.

In case if the facility for conducting any of the above test(s) is not available at the NIGAM's CTL, the purchaser reserve the right to get such test (s) conducted at any independent NABL Test House.

For witnessing of the testing, clear 7 (seven) days' notice shall be given to the supplier by fax/ speed post stating date, time & place where the test is to be conducted. In case the supplier do not attend for witnessing the testing, the testing shall be proceeded and completed and action be taken as per the contract.

The Officer Incharge of **Central Testing Lab (CTL) Ajmer** shall send copies of test reports to the purchaser, consignees and the supplier.

8.3 CRITERIA FOR ACCEPTANCE

- a) Visual examination , verification of dimensions, weight and marking.
As per Specification/GTP/Approved drawing.
- b) Checking of current carrying parts as per approved drawings.

If the dimensions of the current carrying metal part are in conformity with approved drawings, the material shall be accepted. When the dimensions of above parts are less than those minimum specified in the approved drawings but upto a limit of 5%, the material contained in the Lot / Sub-lot to which the sample belong shall be accepted subject to the conditions that the current density in above part is in conformity with contract and deductions at the rate of 2% cost of above parts for every 1% or part thereof reduction in weight due to less dimensions. The deduction shall be made for weight of above parts calculated on the basis of dimensions observed and found less. The weight shall be compared with one calculated on the basis of the minimum dimensions for the parts approved in the drawings. When the dimensions are less than more than 5% as compared to the dimensions as per approved drawings, the material contain in the lot/ sub-lot to which the sample belongs shall be rejected and shall have to be replaced by the supplier.

b) Post Insulators : (i) Mechanical strength test.(ii) Porosity test(iii) Puncture test.

In case of failure of any of samples in any of the above test , the material contained in the lot / sub lot received in the stores to which the sample(s) belong shall be rejected. The rejected material shall have to be replaced by the supplier free of cost.

d) All galvanized parts. - Uniformity of galvanization test.

- i) The sample(s) shall be first tested for (n-2) number of dips where n is specified No. of dips in the contract. If the sample does not pass the uniformity of galvanization test for (n-2) dips, the material shall be rejected and the material relating to relevant sub-lot/ lot to which the sample(s) pertains shall have to be replaced by the supplier free of cost.
- ii) If the sample has passed the uniformity of galvanization test for (n-2) dips, then it shall be tested for (n-1) dips. If the sample has not passed the uniformity of galvanization test with (n-1) dips, the material pertaining to relevant lot/sub-lot shall be accepted with a deduction @ 4% of cost of galvanized material parts.
- iii) If the sample passed the uniformity of galvanization test with (n-1) dips, then sample shall be tested for last one dip of one minute to complete the test for `n' dips. If the sample does not pass the uniformity of galvanization test with `n' dips, then the material pertaining to relevant lot/sub-lot shall be accepted with a deduction @ 2% of cost of galvanized material parts.
- iii) If the sample(s) have passed the test with number of dips as specified in the contract (n), then material pertaining to relevant lot/sub-lot shall be accepted.

8.4 TEST CHARGES :

All test charges incurred towards test checking of the material received in our stores shall be borne by the NIGAM except that of personal expenses of the representative of the supplier for witnessing the tests.

9.0 NAME AND RATING PLATE :

All items of the equipments included in this specifications shall be provided with a weather and corrosion proof plate **of name/trade mark of manufacturer, rating and TN in according with the provision of the IS:9921. The name & rating plate should be riveted on base channel. Further there should be proper marking on the base channel for identifying RYB phase.**

11.0 GUARANTEED TECHNICAL PARTICULARS:

Guaranteed technical particulars in Schedule-V shall be furnished alongwith type tests reports, detailed drawings and bill of material etc.

12.0 COMPLETENESS OF EQUIPMENT:

All fittings, accessories or material which may have not been specifically mentioned in this specification, but which are usual or necessary for the equipment shall be deemed to have been included in this specification. All equipments shall be complete in all respect.

13.0 LATENT DEFECTS, ERRORS & OMISSIONS:

Any material/ equipments or part thereof that develops defects, errors or omissions in the apparatus, not disclosed prior to the final acceptance by the purchaser, but occur or are disclosed during the guarantee period, shall be corrected promptly. The equipment or part thereof shall be replaced by the supplier free of charges and all expenses for the transportation, handling, installation of such replacement or any other incidental charges shall be borne by the supplier.

TECHNICAL SPECIFICATION FOR PURCHASE OF VARIOUS STEEL SECTIONS(Galvanized)

1. SCOPE:-

- 1.1 This specification covers for design, manufacture, stage testing, inspection & testing before dispatch, packing supply and delivery of steel plates, strips, section, flats, bars etc. for use in structural work.
- 1.2 These sections shall be suitable for welded, bolted and riveted structures and for general engineering purposes.
- 1.3 Where welding is employed for fabrication and guaranteed weld-ability is required, welding procedure should be as specified in IS:9595:1980.

2.0 Standards:

Except as modified in this specification, the material, and purpose of material covered under "SCOPE" clause 1.1 to 1.3 shall confirm to the latest revision with amendments thereof the following bureau of Indian Standard & where the relevant ISS is not available, the material/equipment should comply the latest B.S.S.

| S.No. | Bureau of Indian Standards. IS No. | Title |
|-------|------------------------------------|--|
| 1 | 2062 | Steel for General structural purpose (Fifth revision) |
| 2 | 228 | Method of chemical analysis of steel (second revision) |
| 3 | 1608/1995 | Mechanical testing of metals- Tensile testing (Second Revision) |
| 4 | 1757/1988 | Method for charpy impact test (V notch) for metallic material (second revision) |
| 5 | 3803 Part-I/ 1989 | Steel-conversion of elongation values Part-I Carbon & alloy Steels (Second revision) |
| 6 | 8910/1978 | Ground technical delivery requirements for steel & steel products. |
| 7 | 10842/1984 | Testing & evaluation procedure for Y groove crackability test. |
| 8 | 1786/1985 | High Strength Deformed Steel Bars and wires for concrete reinforcement. |
| 9 | 1599/1985 | Method for bend test(second revision) |
| 10 | 1052/1985 | Rolling and cutting tolerances for hot rolled steel products (Third Revision). |

3.0 GENERAL TECHNICAL REQUIREMENT

The technical, parameters to which the steel sections shall confirm are as under:-

3.1 MECHANICAL PROPERTIES:

| | | |
|----|---|---|
| a. | Grade | A |
| b. | Designation | Fe 410 W A |
| c. | Tensile strength min., mpa | 410 |
| d. | Yield strength min., mpa | <20, 20-40 >40 mm mm mm 250 240 230 |
| e. | Elongation percent, min.(at gauge length 5.65xSQRT (So) | 23 |
| f. | Internal Diameter of Bend min. | 3t |
| g. | Charpy V Notch Impact energy J, min. | |

3.2 CHEMICAL COMPOSITION

| | | |
|----|-------------------------------|--|
| a. | Grade | A |
| b. | Designation | Fe 410 W A |
| c. | Ladle Analysis, percent, Max. | C- 0.23 Mn- 1.50 S - 0.050 P - 0.050 Si - 0.40 |
| d. | Supply condition. | As rolled |
| e. | Carbon equivalent (CE) Max. | 0.42 |
| f. | De-oxidation mode | |

3.3 MASS & STANDARD LENGTH

| S.No | Name of the Steel Sections | Size in mm | Mass in Kg. Per Metre | Required length in metre (Standard length) |
|------|----------------------------|------------|-----------------------|--|
| 1 | MS Channel | 100x50x6 | As per ISS | 8-11 |
| 2 | MS Angle | 65x65x6 | As per ISS | 8-11 |
| 3 | MS Angle | 50x50x6 | As per ISS | 8-11 |
| 4 | M.S. Flat | 50x6 | As per ISS | 8-11 |

3.4 TOLERANCE IN STANDARD LENGTH:- $\pm 5\%$ for all sections

3.5 TOLERANCE IN DIMENSIONS:- As per relevant IS

3.6 PACKING AND MARKING:-

a) Packing As per ISS

b) Marking The steel sections shall be marked with color

code as per IS and each product shall carry a tag or be marked with the manufacturer name or trade mark.

WORKMANSHIP

- i) All finished steel shall be well and clearly rolled to dimensions, sections and masses specified. The finished material, shall be reasonably free from surface flows, laminations, rough/jagged and imperfect edges and other harmful defects.
- ii) Minor surface defects may be removed by the manufacturer.

4.0 IDENTIFICATION MARKING:

Each individual structure / section shall carry a code number conforming to component number given to it in the drawing / Bill of material. The code number of approved size shall be stamped with a metal dye of 16

mm size on the member and shall be legible. The name of manufacturers in suitable code and the word “AVVNL/TN No” shall also be stamped / punched on each individual section with metal dye of not less than 16 mm size.

If the above marking is not found on the material received in the stores, the receipted challan shall not be given by the concerned stores. The challan shall only be issued after verification of material by the Store officer.

5.0 QUALITY ASSURANCE PLAN:

The bidder shall invariably furnish the following information alongwith his offer, failing which the offer shall be liable for rejection. Information shall be separately given for individual type of steel section.

- i) Statement giving list of important raw materials, names of sub-supplier for the raw material, list of standards according to which the raw material are tested, list of tests normally carried out on raw material in presence of bidders representatives, copies of tests certificates.
- ii) Information and copies of test certificates as in (i) above in respect of bought out items.
- iii) List of manufacturing facilities available
- iv) Level of automation achieved 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 tests and inspections.

The supplier shall submit the routine test certificates of bought out items and raw material at the time of routine testing.

6.0 PACKING & FORWARDING

The various sections of steel shall be packed in such a manner so that same should be able to resist hazard involved in transportation, unloading, stacking etc.

7.0 TESTS

Tests before dispatch:- The various steel sections before dispatch shall be subject to following tests as per IS:2062 at the maker's works.

ROUTINE TEST/ACCEPTANCE TEST:

- (i) Dimensional checking & visual inspection.
- (ii) Weight checking
- (iii) Chemical composition test
- (iv) Mechanical properties tests
- (v) Galvanization test

8.0 INSPECTION

The inspection shall be carried out on each lot separately. The following number of pieces selected at random shall be subjected to inspection/ testing and checking.

- | | |
|---------------------------------------|--|
| a) Workmanship and dimension checking | : 1 samples from each 50 MT or part thereof. |
| b) Chemical test | : One sample of each section from the entire lot of material offered for inspection. |
| c) Tensile test | : One sample from every 50 MT or part thereof of each section. |
| d) Bend test | : One sample from every 50 MT or part thereof of each section. |

All the tests and inspection shall be carried out at the place of manufacturer unless otherwise especially agreed upon by the bidder and purchaser at the time of purchase. The bidder shall afford all reasonable facilities without charges for the inspecting officer(s), to satisfy him that the material is being furnished in accordance with this specification. The purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is a dispute regarding the quality of supply.

The inspection may be carried out by the purchaser at any stage of manufacture/ before dispatch as per relevant standard.

Inspection and acceptance of any material under the specification by the purchaser, shall not relieve the bidder of his obligation of furnishing material in accordance with the specification and shall not prevent subsequent rejection if the material is found to be defective. The bidder shall keep the purchaser informed in advance, about manufacturing programme so that arrangements can be made for inspection.

The test for chemical and mechanical properties shall have to be arranged in presence of Inspecting officer at recognized Lab.

9. HOT DIP GALVANISED TEST :

The finished galvanized steel articles when subject to dip test in standard copper sulphate solution for the testing of galvanization quality should be able to witness four dips of one minute each as per BS:729/1961 Pt-I without any copper deposits on the surface.

The weight of zinc coating should not be less than 610 grams per sq.m for rods and 460 grams per sq.m for plates as per BS:729/1961 Pt-I.

TECHNICAL SPECIFICATION FOR SUPPLY OF SUB-STATION STRUCTURE FOR MOUNTING OF 11/0.4 KV TRANSFORMERS ON DOUBLE POLE / 33 KV LINE DP STRUCTURE/ 33 KV SUB-STATION STRUCTURE AND SUB-STATION STRUCTURE FOR SINGLE PHASE 16 KVA DT.(Galvanized)

1. SCOPE

This specification covers fabrication, testing & delivery of fabricated steel items as a complete package, complete in all respect as per GTP/Drawings (to be provided by the purchaser to the successful bidder). The steel sections generally used, tentative unit weight of fabricated item is as per GTP. The final bill of material for the purpose of payment shall be prepared and submitted by the supplier after approval of model assembly by the purchaser.

2. STANDARDS :

All materials and equipments shall comply in all respect with the requirements of the latest edition of the relevant Indian Standard Specification(s) except as modified in this specification. Where the relevant ISS is not available, the material / equipment should comply the latest BSS. All the items should be made / fabricated/tested from steel sections conforming to IS:2062 (latest amended).

3. DRAWING & MODEL ASSEMBLY :

3 sets of drawing shall be furnished by the bidder based on AVVNL drawing for according approval of the purchaser before commencement

4. MARKING

Each individual structure / section shall carry a code number conforming to component number given to it in the drawing / Bill of material. The code number of approved size shall be stamped with a metal dye of 16 mm size on the member and shall be legible. The name of manufacturers in suitable code and the word "AVVNL/ TN No" shall also be stamped / punched on each individual section with metal dye of not less than 16 mm size.

If the above marking is not found on the material received in the stores, the receipted challan shall not be given by the concerned stores. The challan shall only be issued after verification of material by the Store officer.

5. INSPECTION, TESTING & CHECKING :

The finished product before acceptance shall be subject to inspection in respect of workmanship, checking of dimension/weight & testing as per requirement of relevant IS:2062 (latest amended), approved drawings and bill of material, at the suppliers works if not supported by test certificates of main producers viz. SAIL/TISCO/RINL. The certificate for type test (chemical composition & mechanical properties test) issued by prime producer(s) shall be furnished along with the inspection call to the SE(TW), otherwise testing shall be arranged at independent Lab on the cost of supplier. The certificate and relevant invoices shall be in the name of the firm on whom the order is placed by the Nigam. **In case bidder use the steel sections manufactured by prime producers then the inspecting officer shall verify and record in the inspection report regarding stamping and mark of prime producers.** The certificate(s) in the name of other parties/ sources shall not be accepted and in such cases the tests for chemical and mechanical properties shall have to be arranged in the presence of inspecting officer(s) at recognized lab.

The supplier shall present the latest Calibration Certificate(s) of testing instruments/ equipments to be used for the testing of the material covered in the purchase order to the authorized inspecting officer/inspecting agency of the purchaser. The testing instruments/ meters/ apparatus etc. should be got calibrated by the supplier from time to time from independent test laboratory/ house having valid accreditation from National/ Accreditation Board for testing and calibrating laboratories for testing equipments/ original manufacturer having trace ability to NABL/NPL or equivalent.

The calibration certificate(s) should not in any case be older than one year at the time of presenting the same to the inspecting officer/inspecting agency of the purchaser. The testing instruments/equipments should be duly sealed by the Calibrating agency and be indicated in the calibration certificate(s).

The following facilities are to be provided by the supplier at his own cost to the inspecting officer of AVVNL.

- (a) Suitable accommodation.
- (b) Local conveyance between arrival point, place of stay, works and departure point.
- (c) The supplier shall assist in arranging return ticket and reservation on the request of the inspecting officer for which the payment shall be made by the inspecting officer. In case of joint inspection, single or shared double room accommodation shall be provided.

6. TESTS

Test before dispatch:- The various steel section/structure before dispatch shall be subject to following test as per IS:2062(latest amendment) at the manufacturer's works

Routine test/acceptance test

- (i) Dimensional checking and visual inspection
- (ii) Weight checking
- (iii) Chemical composition test
- (iv) Mechanical property test
- (v) Galvanization test

7. SAMPLING:

The inspection shall be carried out on each lot separately. The following number of pieces selected at random shall be subject to inspection/ testing and checking.

- a) Workmanship and dimension checking : 3 % samples from finished item.
- b) Chemical test : One sample of each steel section
from the entire lot of material
offered for inspection.
- c) Tensile test : One sample of each steel section
from every 50 MT or Part thereof.
- d) Bend test : One sample of each steel section
from every 50 MT or Part thereof.

8. TOLERANCE IN DIMENSIONS :

The tolerance(s) shall be permissible as per IS: 1852: (latest amended). Further the following tolerance(s) on fabricated items will also be allowed.

- i) Tolerance in overall length $\pm 3\text{mm}$
- ii) Tolerance in edge dimensions (centre of hole to end) $\pm 2\text{mm}$
- iii) Tolerance in hole centre $\pm 2\text{mm}$
- iv) Circular holes No tolerance
- v) Weight Tolerance $+2\%$ to $(-)\ 4\%$

9. GUARANTEED TECHNICAL PARTICULARS :

The bidder shall furnish the guaranteed technical particulars of the material as required in the schedule-V by mentioning specific figures therein. Any item of the GTP left unfilled or simply written as per ISS etc. shall be considered as incomplete GTP and such tender is liable to be rejected.

10. PACKING AND FORWARDING

The finished items complete in all respect dully inspected and cleared for dispatch, shall have to be delivered in Nigam's stores located anywhere in Ajmer Discom by Road. Unloading of material at store(s) is Suppliers responsibility.

11. CRITERIA FOR ACCEPTANCE

The inspected material should be strictly in accordance to the GTP of the specification otherwise the material shall be treated as rejected and shall not be accepted.

12. WEIGHT

The weight of structure shall mean the weight of structures calculated by using standard sectional weights of all steel structural members of the sizes indicated in the fabrication drawings and/or subsequently revised drawings and bill of material without taking into consideration the reduction in weight due to drilling of bolt-holes, skew cuts, chamfering etc. or the increase in weight due to galvanization.

The material shall be acceptable if found within permissible tolerance limit i.e. +2% and (-)4%.

13 HOT DIP GALVANISED TEST :

The finished galvanized steel articles when subject to dip test in standard copper sulphate solution for the testing of galvanization quality should be able to witness four dips of one minute each as per BS:729/1961 Pt-I with out any copper deposits on the surface.

The weight of zinc coating should not be less than 610 grams per sq.m for rods and 460 grams per sq.m for plates as per BS:729/1961 Pt-I.

TECHNICAL SPECIFICATION FOR GALVANISED STEELSTAYSETS OF SIZE 16X1800MM AND 20x2400 MM

1.0 SCOPE

This specification covers the design, manufacture, inspection, testing before dispatch, supply and delivery F.O.R. destination anywhere in Ajmer Discom of hot dip galvanized steel stay sets of size 16x1800 mm and 20X2400(oiled threads) with G.S. Anchor plates, as per pattern-1 of BS:16/1974.

1.1Size 20X2400 mm

Hot dip galvanized steel stay sets of dia 20mm, 2400 mm long (oiled threads complete with ratchet nut, GS anchor plates size 380x380x4 mm (having square hole size as 22 x 22 mm in centre) & fitted with cast iron cross head and steel bow dia 14 mm conforming to pattern-1 of BS:16/1974

1.2Size 16X1800 mm

Hot dip galvanized steel stay sets of dia 16mm, 1800 mm long (oiled threads complete with ratchet nut, GS anchor plates size 300x300x4 mm (having square hole size as 18 x 18 mm in centre) & fitted with cast iron cross head and steel bow dia 12 mm conforming to pattern-1 of BS:16/1974

2.0 PRINCIPAL PARAMETERS :

The hot-dip galvanized steel stay sets and anchor plates shall strictly conform to BS:16/1974 with latest amendments thereof as per pattern-1 in all respect, except herein otherwise stated. The ratchet nut and the cross head bow shall be having three (3) cuts in place of six(6) . The dimensions of the cross head portion of the bow of each type of stay set shall be as per the drawing enclosed at Appendix-A (i) & (ii). Tolerances in dimensions shall be governed by the values appearing at Schedule of GTP.

The stay sets shall have galvanizing as per BS:729/1961 part-I with latest amendments thereof and shall be galvanized by hot dip galvanization process.

3.0 GENERAL TECHNICAL REQUIREMENTS :

- i) The rod and bow shall be free from flaws and other defects, shall be of good finish and the cross head shall not fail, draw and deformed when the assembly is tested to fracture as their full section by tensile strength. The ratchet nuts and ratchet face of each cross head shall be well formed, so that any nut and any cross head of the appropriate size shall provide good ratchet action. The treads of stay sets shall be cut after galvanizing and shall be lubricated with good quality of mobile oil to prevent rusting.
- (ii) The rods and bow shall be of steel suitable to give strength as per table of tensile strength as at 5.2(a) below:

- (iii) The cross head may be made of forged mild steel/ hot rolled steel. The ratchet nuts shall be of steel or malleable cast iron.
- (iv) The side of each bow shall be well riveted into the cross head (sound/strong iron casting) & shall not draw when the complete assembly is tested to fracture by tensile stress.
- (v) In case of galvanized steel stay sets & anchor plates, all the ferrous metal parts shall be smoothly & continuously hot dip galvanized with zinc, the nuts shall have neat fit so that they can be turned easily throughout the length of the threads on the bolts & nuts shall be capable of developing the full strength of the bolts. The galvanizing shall satisfactorily withstand the test specified BSS:729/1961 Part-I with latest amendments.
- (vi) The parts of stay sets of the same type shall be strictly interchangeable.
- (vii) The steel anchor plates shall be clearly cut off and punched and shall be free from cracks after punching.
- (viii) The rods, bows and plates shall strictly conform to table 3 and 6 of BS:16/1974 (stay rods No.13 M & 15 M & anchor plates No.23 M1 & 45 M1) in respect of dimensions etc. and figure 4& 5 (Pattern-I) in respect of shape etc. The dimensions of the cross head portion of the bow shall be as per the drawing enclosed at Appendix-A of this section.

4.0 TEST :

4.1 TEST BEFORE DESPATCH :

The G.S.Stay Sets and accessories shall be subjected at manufacturer's works before dispatch to the following test(s) as per BS/IS.

A) ROUTINE TEST ON EACH UNIT AS PER RELEVANT STANDARD :

The dimension of the stay rods, bows and plates shall strictly conform to table 3 and 6 of BS-16/1974 (Stay rods No.13 M & 15 M and anchor plates No.23 M-1 & 45 M-1) in respect of dimensions etc., and fg. No.4 & 5 (Pattern-1) in respect of shape etc. the dimensions of cross head portion of the bow shall be as per drawing

4.2 ROUTINE / ACCEPTANCE TEST :

The following tests shall be got conducted in presence of Purchaser's representative.

a) TENSILE TEST :

The finished stay sets when subject to tensile test shall comply with the requirement of the tensile strength as per the table given below:

| S.No. | Diameter of rods | Breaking load |
|-----------------------|------------------|---------------|
| 1. | 20 mm | 96 KN |
| 2. | 16 mm | 62 KN |
| (1 KN = 101.972 Kgf) | | |

b) HOT DIP GALVANISED TEST :

The finished stay sets when subject to dip test in standard copper sulphate solution for the testing of galvanization quality should be able to witness four dips of one minute each as per BS:729/1961 Pt-I without any copper deposits on the surface.

The weight of zinc coating should not be less than 610 grams per sq.m for rods and 460 grams per sq.m for plates as per BS:729/1961 Pt-I.

4.3 SAMPLING PLAN FOR INSPECTION:

Since the sampling procedure/ plan has not been mentioned in the BS:16/1974, the following sampling plan shall be applicable for inspection testing/ checking of the stay sets.

(i) FOR TENSILE STRENGTH TEST : 1 out of 1000 Nos.

CRITERIA FOR CONFORMITY :

If one or more sample(s) fail, twice the number of samples originally tested shall be selected and shall be subjected to the test. If there is no failure among these samples, the lot or the sub lot shall be considered to have satisfied the requirement of this test. If one more sample(s) of the second sample fails, the lot or sub lot represented by the corresponding samples shall be considered not to have passed the test.

(ii)FOR PHYSICAL DIMENSIONAL CHECKING AND GALVANISATION TEST:

The sampling plan will be as under :

The lot offered for inspection, be divided in sub lot not exceeding 5000 Nos. sets for each sub lot. Acceptance or otherwise of sub lot shall be determined on the basis of performance of the samples selected from it as per details mentioned as under :

| Size of sub-lot | Sample size | Sample size for re-inspection | Permissible Failure | |
|-----------------|-------------|-------------------------------|----------------------|---|
| | | | From Ist sample size | From total samples including re- inspection |
| | | | n1 | n2 |
| Upto 1000 | 2 | 4 | 0 | 1 |
| 1000 to 2000 | 4 | 8 | 0 | 1 |
| 2001 to 3000 | 6 | 12 | 1 | 2 |
| 3001 to 5000 | 10 | 20 | 1 | 3 |

4.4 CRITERIA FOR CONFORMITY

Sub lot shall be considered as conforming to the requirement of the acceptance test if the Nos. of failure found in first samples selected as per Col. No.2 of above table, are upto the No. mentioned in Col.4. If the No of failure is more than or equal to the sample mentioned in Col.5 lot shall be considered as not conforming to the requirement of acceptance and shall be rejected. If the No. of failure is between c1 and c2, a second sample of n2 stay sets shall be selected and subjected to acceptance test. If the number of failure in the two samples sizes (n1+n2) combined is less than c2, the lot shall be considered as conforming to the requirement of acceptance tests otherwise it shall be considered to have failed.

4.5 TOLERANCE ON TEST RESULTS :

As per BS:16/1974 and GTP of specification .

The purchaser reserve the right to conduct all test(s) on stay sets after arrival at site and the contractor shall guarantee tests certificate under actual service condition(s).

5.0 INSPECTION

5.1 All the tests (as mentioned at Clause 5.1 and 5.2) and Inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the bidder and purchaser at the time of purchase. The bidder shall afford the inspection officer(s) representing the purchaser all reasonable facilities without charges, to satisfy him that the material is being furnished in accordance with this specification. The purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is a dispute regarding the quality of supply.

5.2 The Inspection may be carried out by the purchaser at any stage of manufacture/ before dispatch as per relevant standard.

- 5.3** Inspection and acceptance of any material under the specification by the purchaser, shall not relieve the bidder of his obligation of furnishing material in accordance with the specification and shall not prevent subsequent rejection if the material is found to be defective. The Bidder shall keep the purchaser informed in advance, about manufacturing programme so that arrangements can be made for inspection.
- 5.4** The purchaser reserves the right to insist for witnessing the acceptance/ routine testings of the bought out items.
- 5.5** The Bidder shall give 15 days' advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests. The inspection charges would be to the purchaser's account.

6.0 DOCUMENTATION :

- 6.1** All drawing(s) shall conform to International Standard Organization (ISO) 'A' series of drawing sheet / Indian Standards Specification IS:656. All drawing(s) shall be in ink and suitable for microfilming. All dimension(s) shall be in SI Units.

6.2 List of drawing(s) and documents :

The bidder shall submit four sets of drawings, complete with fully dimensioned elevation, cross sectional and longitudinal section drawings of each type of material and its assemblies. All drawings shall be to scale with full details.

All important dimensions being given therein and the material of which each part is made of shall be clearly indicated. The drawing of cross head portion and bow and tolerance in the dimensions as per this specification shall be forming a part of contract.

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

The equipment shall conform to high standard of engineering, design workmanship and latest revisions of relevant standards at the time of ordering and purchaser shall have the power to reject any work or materials which in his judgment, is not in full accordance herewith.

7.0 MARKING:

Each bow of stay sets shall be provided with the following marking :

- a) Name of Manufacturer or Trade Mark.
- b) AVVNL/TW/TN No.....

The marking on bow should be embossed during the course of casting.

8.0 TEST CHECKING OF MATERIAL

The material received shall be subjected to the test checking at CTL before final acceptance of the material, the procedure for the same shall be as under :

9.0 SAMPLING

One sample out of each sub-lot / lot consisting of following quantities or part thereof in case of each type of G.S. Stay Set from each inspected lot received in stores shall be selected for test checking of material and shall be got tested.

- I. G.S Stay Set of size 16X1800 mm– 1000 sets.
- II. G.S Stay Set of size 20X2400 mm – 1000 sets.

The selection of sample from the material received at stores shall be done as soon as material is received in stores without the presence of the representative of the supplier. However, testing of sample(s) at CTL shall be carried out in the presence of representative of the supplier after identification / confirmation by him that sample so selected belongs to them. In case the supplier

disputes that the selected samples does not pertain to them, then fresh sample shall be selected in the presence of the representative of the supplier and test(s) be carried out.

10.0 TESTS

The following tests shall be carried out on the above items :

- a) Visual Examination, Verification of Dimension(s), weight and marking Test
- b) Tensile strength test.
- c) Galvanization (Uniformity) Test.

10.1 Only those tests shall be conducted at CTL for which facility with CTL is available.

10.2 CRITERIA FOR ACCEPTANCE

- a) Visual Examination, Verification of Dimension(s), weight and marking .

As per specification/ ISS/ BIS

- b) Tensile strength test.

In case of failure of sample in tensile strength test the material contained in the lot / sub-lot to which the sample belongs, shall be rejected. The rejected material shall have to be replaced by the supplier free of cost.

- c) Galvanization (Uniformity) Test.

- i) The sample(s) shall be first tested for (n-2) number of dips where (n) is specified number of dips in the contract. If the sample(s) does not pass the uniformity of Galvanization Test for (n-2) dips, the material shall be rejected and the material relating to relevant lot / sub-lot to which sample(s) pertains shall have to be replaced by the supplier free of cost.
- ii) If the sample has passed the uniformity of Galvanization Test for (n-2) dips, then it shall be tested for (n-1) dips. If the sample has not passed the uniformity of Galvanization Test with (n-1) dips, then material pertaining to relevant lot / sub-lot shall be accepted with a deduction @ 10% of cost of material.
- iii) If the sample has passed the uniformity of Galvanization Test with (n-1) dips, then sample shall be tested for last one dip of one minute to complete the test for 'n' dips. If the sample does not pass the uniformity of Galvanization Test with 'n' dips, then the material pertaining to relevant lot/ sub-lot shall be accepted with a deduction @ 5% of cost of material.
- iv) If the sample(s) have passed the Test with number of dips as specified in the contract (n), then material pertaining to relevant lot / sub-lot shall be accepted.

11.0. TYPE TEST REPORTS :

11.01 The bidder shall furnish valid and authenticated type test certificates from a Govt. approved / Govt. recognized / NABL Accredited laboratory / ILAC i.e. International Laboratory Accredited Laboratory (in case of foreign laboratory) of similar rating and design of tendered material/ equipment. Such type test certificates should not be older than 05 years as on the date of bid opening. For this purpose date of conducting type test will be considered.

The type test certificate by in house laboratory of tendering firm even if it is a Govt. approved / Govt. recognized / NABL accredited / ILAC accredited, shall not be accepted, in case of their own tender. This will not apply if tendering firm is Govt. company / public Sector undertaking.

11.02 The bidder should furnish documentary evidence in support of the laboratory whose type test have been furnished, that the said laboratory is a Govt. / a Govt. approved / a Govt. recognized / NABL accredited laboratory / ILAC accredited (in case of foreign laboratory).

- 11.03 The type test certificates shall be furnished either in original or copy duly attested by notary.
- 11.04 The bids of only those bidders shall be considered to be meeting the type test criteria who furnishes complete type test certificate with the bid as per above provision.

TECHNICAL SPECIFICATION FOR THE SUPPLY OF DANGER PLATES FOR 33/11 KV & 11/0.4 KV SUB-STATIONS

1.0 SCOPE

This specification covers the fabrication, manufacture, testing, checking & supply of Danger Label/ plates for 33/11KV & 11/0.4 KV Sub-Stations. Before dispatch of material, the inspection testing & checking will be witnessed by the representative of the purchaser.

2.0 SPECIFICATIONS & STANDARDS:

The relevant ISS to which this material shall conform are indicated as below:-

| S.NO. | Bureau of Indian Standards | Title |
|-------|-------------------------------|--|
| a) | IS:2551-1982 (Latest amended) | For general checking |
| b) | IS-5-1978 (Latest amended) | For colors for ready mixed paints and enamels. |
| c) i. | IS:3972 (Pt.2/Sec.1):1985 | For resistance to citric acid at room temperature and boiling temperature. |
| ii) | IS:3972 (Pt.2/Sec.1):1985 | For low & high voltage tests for detecting and locating defects. |
| iii) | IS:3972 (Pt.1)Sec.1):1982 | For production of Specimen for testing. |

3.0 DIMENSIONS:-

| S. No. | Items | Nominal thickness of M.S. Plate (Min.) | Other dimension as per ISS | |
|--------|--|--|-------------------------------|--------------|
| | | | Length in mm | Width in mm. |
| 1. | Danger Plates for 33/11 KV & 11/0.4 KV Sub-stations. | 1.6mm | 250 | 200 |
| | | | IS-2551/1982 (latest amended) | |

4.0 Material

The Danger plates shall be made from mild steel sheet of at least 1.6mm thick and vitreous enameled white with letters, figures and conventional skull and cross bones in signal red color conforming to IS-5-1978 on the front side and rear side should be enameled black. The edges & rear side should be enameled black. Holders for fixing the plates should be drilled not punched.

5.0 TESTS:-

In order to ensure that Danger plates conform to the specification the following tests are to be carried out:-

- a) Visual Examination.
- b) Dimensional check including checking of thickness of M.S. Plate and weight.
- c) Test for weather proofness.
- d) Checking of thickness of enamel.
- e) Resistance to citric acid at room temperature.
- f) Low & high voltage tests for detecting and locating defects.

6.0 INSPECTION:-

The number of samples of danger plates selected at random from the lot shall be in accordance with the table given below:-

| Lot size | First sample for tests a,b,c, d,e & f. | sample size for checking of thickness of steel plate & enameling. | Permissible Rejection number. | Second sampling. | Permissible Rejection number |
|----------|--|---|-------------------------------|------------------|------------------------------|
| a) | Upto 500 | 5 | 1 | 0 | 2 |
| b) | 501 to 800 | 7 | 2 | 0 | 3 |
| c) | 801 to 1300 | 10 | 4 | 0 | 3 |
| d) | 1301 to 3200 | 15 | 6 | 1 | 4 |
| e) | 3201 to 8000 | 25 | 8 | 2 | 5 |
| f) | 8001 & above | 35 | 10 | 2 | 7 |

The checking of the thickness of M.S. plates and enameling on the plates number of samples as per Column 3 is acceptable provided the rejection of the samples is not more than the number mentioned in column 4.

In the event of rejection being more than the number in Column 4 double the sampling as per Column 5 be done. In case of rejection of samples is beyond the number mentioned at 6, the lot shall be considered rejected.

On inspection/ testing/checking, if the material is found acceptable as per above criteria the purchaser's representative shall seal the material, before dispatch.

7.0 MARKING

The essential information that would be necessary to identify the manufacture of Danger Plates such as AVVNL /TN No..... shall be marked in such a manner & position on the plates that it does not interfere with the other information and should be of permanent nature.

8.0 TEST CHECKING OF MATERIAL AT TESTING LABORATORY:

The material received in Nigam shall be subjected to the test checking at testing laboratory before final acceptance of material. The procedure for testing shall be as under:

i) SAMPLING

One sample out of each sub lot/ lot of (1000 Nos.) thousand Nos. or part thereof from each inspected lot received in stores shall be selected from each store for test checking of material and shall be got tested. The selection of sample from the material received at stores shall be done as soon as material is received in stores without the presence of the representative of the supplier. However, testing of sample(s) at CTL or elsewhere as arranged by the AVVNL shall be carried out in the presence of representative of the supplier after identification / confirmation by him that samples so selected belong to them.

ii) TESTS

The following test shall be carried out on the above samples :

- a) Visual examination , verification of dimensions, weight and marking as per GTP/ISS/Specification/ approved drawing.

iii) CRITERIA FOR ACCEPTANCE

Visual Examination, verification of dimensions, weight and markings as per Specification/ GTP/ ISS/approved drawing.

iv) TEST CHARGES :

All test charges incurred towards test checking of the material received in our stores shall be borne by the NIGAM except that of personal expenses of the representative of the supplier for witnessing the tests.

9.0 PACKING

You shall pack the material in the suitable wooden cases so that the material may not be damaged in the transit and also remain protected from the atmosphere.

TECHNICAL SPECIFICATION FOR 12KV OUTDOOR VACUUM CIRCUIT BREAKER KIOSKS

1.0 SCOPE

This specification is intended to cover the design manufacture, assembly, testing at manufacturer's works, supply, delivery of 12Kv Vacuum Circuit breaker Kiosks with current transformers, Potential transformers, protection relays, metering instruments etc. Complete with all accessories and Installation & Commissioning by the supplier as per Schedule-III (Part-B) for efficient & trouble free operation (Separate price for Installation & Commissioning and Civil works).

1.1

It is not the intent to specify completely here in all details of the design and construction of equipments. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation upto the Bidder's guarantee in a manner acceptable to the Purchaser, who will interpret the meanings of drawings and specifications and shall have the power to reject any work or material which in his judgment is not in accordance there with. The offered equipment shall be complete with all components necessary for its effective and trouble free operation alongwith associated equipments, interlocks, protection schemes etc. Such components shall be deemed to be within the scope of supply, irrespective of whether those are specially brought out in this specification and/ or the commercial order or not.

2.0 STANDARDS

The 12KV vacuum circuit breaker Kiosks shall conform to latest revisions with amendments of standards as under unless specified otherwise. Equipment meeting any other authoritative standard which ensure equal or better quality than the standard mentioned above will also be acceptable. In such cases a copy of standard (English version) adopted, should be enclosed with the tender.

| | |
|------------------|---|
| IEC62271/100-200 | High Voltage Switchgear & Control gears. |
| IS:13118/IS-3427 | Circuit Breaker/ metal enclosed Switchgear and control gear. |
| IS: 3156 | Voltage transformers. |
| IS: 2705 | Current transformers. |
| IS: 3231 | Electrical Relays for power system. |
| IS:1248 | Meters and Instruments |
| IS:14697-1999 | Specification for AC static transformer operated watt hour and VAR hour meters class 0.2 S & 0.5 S. |

| | |
|---|---|
| IEC-62053-22-2003 IEC-62052-11-2003 | Specification for AC Static Watt hour Meters, class 0.2 S & |
| CBIP Technical Report No.88 revised July, 1996 read with amendment issued (April,99, September,99 and also any other amendment thereafter). | Specification for AC Static Electrical Energy Meter. |

3.1 CLIMATIC CONDITIONS:

Equipment to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions:-

| | |
|---|------------------------|
| i) Peak ambient air temperature C in shade. | 50 DEG |
| ii) Minimum ambient air temperature in shade | (-) 5 DEG C |
| iii) Maximum relative humidity. | 95 % |
| iv) Minimum relative humidity | 10% |
| v) Dust storms are liable to occur from the period March to July | |
| vi) Height above mean sea level | less than 1000M |
| vii) Average number of thunder DAYS storms days per annum. | 40 |
| Average annual rainfall area) | 10- 100cm(Depending on |
| ix) Number of months of tropical monsoon conditions p.a. | 4 |

4.0 PRINCIPAL PARAMETERS OF CIRCUIT BREAKERS

| | |
|---|----------------------------|
| 4.1 TYPE AND RATING | 12 kV |
| 4.1.1 Type | Vacuum circuit breaker |
| 4.1.2 Service | Outdoor |
| 4.1.3 Pole | 3 |
| 4.1.4 Rated voltage (nominal/max.) | 11/12 kV |
| 4.1.5 Rated frequency | 50 HZ |
| 4.1.6 System Neutral earthing | Effectively grounded. |
| 4.1.7 INSULATION LEVEL | |
| 4.1.7.1 Impulse withstand | 75 kVp |
| 4.1.7.2 One minute power frequency withstand voltage. | As per relevant standards. |
| 4.1.8 Rated Current | |
| 4.1.8.1 Continuous at 50C. | 630 A |
| 4.1.8.2 Short time current for 3 Sec. | 16 kA |
| 4.1.9 Rated Breaking Capacity | |
| 4.1.9.1 Symmetrical | 16 kA |
| 4.1.9.2 Asymmetrical | As per relevant standard |

| | | |
|----------|---|---|
| 4.1.10 | Rated making capacity | 2.50X16 KA |
| 4.1.11 | Rated short time with-stand current 3 secs. | 16 KA |
| 4.1.12 | Total break time Closing time | 3 cycles(Max.) 4 cycles (Max.) |
| 4.1.13 | Creepage distance | 300 mm or more |
| 4.1.14 | Protection class of kiosk | IP-55 as per IEC 529 |
| 4.1.15 | Operating duty For gang operation | O-0.3 Sec-CO-3min-CO |
| 4.1.16 | Operating Mechanism | motor operated spring charged closing mechanism or Magnetic Actuator. |
| 4.1.17 | Spring charging Motor | 220V-240V |
| 4.1.17.1 | Heater/Lamp/Socket. | 240V AC |
| 4.1.18 | Terminal Connector | |
| 4.1.18.1 | Type | Bimetallic clamp type/ Al. alloy. |
| 4.1.18.2 | Suitable for ACSR conductor | 10% Panther and 90% Dog Conductor |
| 4.2 | System details | |
| 4.2.1 | H.V. System | |
| | Voltage (Nominal/Max.) | 11/12 kV |
| | Phases | 3 |
| | System Neutral | Effectively earthed. |
| | Fault level | 16 KA r.m.s. Symmetrical |
| 4.2.2 | Auxiliary power Supply | |
| 4.2.2.1 | A.C. Supply | 1. 415 volts 3 ph 4 W 50 Hz 2. 240V 1 Ph 2 W 50 Hz |

5. GENERAL TECHNICAL REQUIREMENTS:-

5.1 DESIGN CRITERIA

The bidder shall quote 12KV Outdoor VCB Kiosks conforming to M-2 class only. The equipment will be used in high voltage system having characteristics as listed in the specification. The equipment will be installed out door in a hot, humid and tropical atmosphere. All equipment, accessories and wiring shall have tropical protection, involving special treatment of metal and insulation against fungus, insects and corrosion.

The maximum temperature in any part of the equipment at specified rating shall not exceed the permissible limits as stipulated in the relevant standards.

The equipment shall be capable of with standing the dynamic and thermal stresses of listed short circuit current without any damage or deterioration.

The safety clearances of all live parts of the equipment shall be as per relevant standards.

The cowling provisions shall be provided on the roof of 12KV outdoor VCB Kiosk to avoid direct inception of water at any joint.

5.2 SPECIFIC REQUIREMENTS

5.2.1 The vacuum circuit breaker kiosk shall be for outdoor installation. The duty of the circuit breaker shall involve satisfactory interruption of short circuit currents as listed in the specification. The breaker shall be capable of interruption of low reactive current (lagging/leading) without undue overvoltage.

5.2.2 CONSTRUCTIONAL FEATURE

5.2.2.1

- a) The circuit breakers shall be triple pole horizontal fixed type enclosed in Kiosk of CRCA sheet steel of 3 mm thickness for load bearing members and 2mm thickness for non-load bearing members and shall comply with latest edition of IS:13118/3427/IEC-56. The Kiosk shall be vermin proof and dust tight. The switchgears and Control gears shall be complete with all necessary supporting frameworks, Nuts and bolts etc. for securing the same to the floor. The operating mechanism shall operate (close/open) all the three phases simultaneously. The operating mechanism links etc. should be accessible for maintenance. The circuit breakers and its operating mechanism shall be fully interlocked to prevent mal-operation. All the breakers shall be supplied with necessary clamps and connectors suitable for appropriate current ratings. Rigid type bimetallic/ Al.alloy terminal connectors of 630 Amps. Current rating form part of supply. Suitable arrangement of earthing the switchgears shall be provided. All the connecting busbars shall be made of copper.
- b) Hinges of door shall be concealed type to avoid rusting and obstructive opening of the door.
- c) The quality of welding shall be good and there should not be any lumps and splatters on the panel.
- d) All the connecting bus bar and current carrying parts shall be made of copper.
- e) All the gasket shall be of chemically treated neoprene.
- f) Hole & Pinlocking (Checknut) arrangement should also be provided while fixing the vacuum interrupter at bottom side.

5.2.2.2 Switchgear (Vacuum Circuit breakers etc.) and control gear (CTs., PTs, relays etc.) shall be mounted on the same Kiosk. Bus bars shall be air insulated with PVC insulation/ sleeves on electrostatic powder coating. The bus bars should be of electrolytic copper with permissible limits of current density. Size of the bus bars and current density should be specified in the tender. The bus bars conductor shall conform to Indian standard 8084 and 3427 and shall be rated for 630A, STC 16KA for 3sec.

5.2.2.3 All the meters, instruments, relays etc. shall be mounted on the switchgear kiosk. The outdoor circuit breakers Kiosk shall be suitable for AC shunt tripping arrangement.

5.2.2.4 The Kiosk shall have an arrangement for emergency shunt tripping from remote place in addition to arrangement for local emergency tripping (Mechanical). The kiosk shall also have a system to check the "Trip circuit healthy check "in all the three phases. Necessary trip and closing coils shall be provided for operation of the breakers.

5.2.2.5 All the six terminals shall be brought out through appropriate class bushings.

5.2.2.6 The arcing contacts shall be made of homogeneous special alloy so that surge voltage are reduced to negligible level & multiple re ignition is eliminated.

5.2.2.7 The circuit breaker kiosk shall be electrically and mechanically trip free under various conditions.

5.2.2.8 The provision shall be kept on the kiosk roof and roof bushing assembly to adopt arcing horns.

5.2.2.9 The lifting arrangement shall not cause any effective loss of creepage distance/ phase to earth clearances as specified in the ISS/ IEC.

5.2.3 MAIN CONTACTS

The main contacts shall have adequate area and contact pressure for carrying rated continuous and short time current without excessive heating liable to cause pitting and welding.

The breakers may be provided with silver plated contacts, if necessary, to meet the requirement of IS:13118/ IEC56 where higher temperature rise is permitted with silver plated contacts. The quantity of silver facing shall be such that after carrying out one tenth of total number of operations specified for mechanical endurance tests, there is still continuous layer of silver on contacts.

5.2.4 NUMBER & TYPE OF SPARE, AUXILIARY CONTACTS/ SWITCHES:

Adequate number of spare auxiliary switches/ contacts both of normally open & normally close type but not less than four each shall be provided on the circuit breaker for use in the indication and controlling scheme of circuit breakers.

5.2.5 INTERLOCK

All electrical and mechanical interlocks which are necessary for safe and satisfactory operation of the circuit breaker shall be provided.

5.2.6 BUSHINGS FOR CIRCUIT BREAKER KIOSK

a) The outdoor circuit breakers shall be metal enclosed fitted with weatherproof/ suitable type bushing conforming to IS:2099 and shall be designed to have the necessary mechanical strength and rigidity required and shall be free from objectionable interference and external and internal corona. The porcelain shall be of the wet process type, homogeneous, free from laminations and cavities or other flaws which could affect its chemical & mechanical strength and shall not be injuriously stressed by temperature change. The porcelain shall be thoroughly vitrified tough and impervious to moisture and shall be evenly glazed. The glazing shall be free from blisters or burrs. The bushing shall be designed manufactured & tested in accordance with latest edition of IS:2099. The type and characteristic data bushing shall be clearly specified.

b) The bushing shall not be subjected to direct point loading. They shall be provided with neck around clamps for evenly distributed pressure.

c) The bushing shall be mounted using suitable clamps and gasket arrangement to provide

required degree of protection.

- d) The bushing assembly shall be provided with locknut and check nut which will be non-magnetic and non-corrosive.

5.2.7 OPERATING MECHANISM

Characteristics of Operating mechanism of circuit breaker and associated equipments

Method of operation: The circuit breaker shall be equipped with power operated mechanism to operate all three phases simultaneously using 220/240VAC Motor operated spring closing mechanism or magnetic actuator type. It shall be electrically & mechanically trip free under various conditions. Kiosk shall also be provided with hand operated spring charging closing mechanism. Operation counter and mechanically ON-OFF indicator shall be provided.

5.2.8 VACUUM CIRCUIT BREAKER

The three phase vacuum circuit breaker will have three vacuum interrupters (one interrupter per phase) mounted on same carriage. The interrupters shall be air insulated with epoxy resin/ insulated phase barriers. Each interrupter shall have fixed and moving contacts in sealed envelopes having vacuum below 10^{-6} torr. The metallic bellow shall permit axial movement of moving contact and act as vacuum seal. The contacts shall have requisite mechanical strength and good electrical and thermal conductivity and shall be made of copper chromium alloy. Complete literature of vacuum bottles shall be furnished.

In order to have safe operation under fetal conditions, the vacuum interrupter should be housed in epoxy pole unit and make of Vacuum Interrupter will be as "BEL, CGL, SIEMENS, ABB, ALSTOM/ AREVA/ MEGAWIN".

Any other equivalent make of V.I. shall also be acceptable subject to prior approval of AVVNL Ajmer.

5.2.9 VOLTAGE TRANSFORMERS

- | | | | |
|-------|---|---|-------------------------------------|
| i) | Highest equipment voltage | : | 12 KV |
| ii) | No. of phases. | : | 3 Nos. single phase VTs |
| iii) | Insulation level. | | |
| | a) Impulse withstand voltage | : | 75 KVP |
| | b) One minute power frequency withstand voltage on : | | |
| | i) Primary winding | : | As per relevant standard. |
| | ii) Secondary winding | : | 2 KV rms |
| iv) | Frequency. | : | 50 Hz. |
| v) | Transformation ratio. | : | 11000/110 V |
| vi) | Rated output. | : | 100VA/Phase |
| vii) | Accuracy class. | : | 0.5 |
| viii) | Rated voltage factor. | : | 1.2 continuous & 1.5 for 30 sec. |
| ix) | Type of insulation | : | Resin cast. |

VTs, shall be provided with HRC type fuses on the secondary side. The VT fuses on primary side shall also be provided with all safety precautions. One of the secondary terminals of the VTs, shall be solidly earthed. Three numbers single phase voltage transformer of this rated output will be

required for each circuit breaker kiosk. Voltage transformers shall be fixed type and shall be suitable for single phasing.

5.2.10 CURRENT TRANSFORMERS

| | | | |
|------|--|---|-------------------------------|
| i) | Rated voltage. | : | 12 KV |
| ii) | Insulation level. | | |
| | a) Impulse withstand voltage | : | 75 |
| | b) One minute power frequency withstand voltage on : | | |
| i) | Primary winding: | | As per relevant standard. |
| ii) | Secondary winding | : | 2 KV rms |
| iii) | Frequency. | : | 50 Hz. |
| iv) | Rated continuous thermal current: | | 120% of rated primary current |
| | v) Short time thermal rating and its duration. | : | 16 KA for 3 sec. |
| vi) | Transformation ratio of : | | Core-I |
| | Core.IICTs 400-200-100/5-5A | | ----- |
| | a) Rated output | | 15 VA 15 VA |
| | b) Class of accuracy | | 5 P 0.5S |
| | c) Accuracy limit factor. | | 15 - |
| | d) Purpose | | Relaying Metering |
| vii) | Max.instrument security factor. | : | - 5 |

12KV current transformers shall be single phase. The core shall be of grade non ageing laminated silicon steel of low hysteresis loss and high permeability to ensure high accuracy at both normal and fault current.

5.2.11 The rating of secondary winding shall be 5Amps. Required transformers ratio can be achieved in any manner, However, the current transformers will have to satisfy the requirement of rated VA burden, Class of accuracy, accuracy limit factor and short time thermal rating as have been specified above at all transformation ratio.

The rating of current transformers of all classes regarding ratio error, knee point voltage, resistance of secondary winding etc. shall have to be co-ordinate with the requirement of protective relays and protection scheme without any extra cost.

5.2.12 INDICATING AND INTERGRATING METERS/INSTRUMENTS:

All indicating instruments shall be of switch board type, back connected suitable for flush mounting and provided with dust and vermin proof cases for tropical use and finished in suitable colour. All instruments shall have practical laboratory means of adjustment of accuracy. The limits of errors for ammeters/ voltmeter shall be permissible for class 1.5 instruments as per IS:1248. The ammeters and voltmeters shall be suitable scaled to indicate the current for all the ratings of current/ voltage transformers. A phase selector switch with four/ six positions shall be used to measure the current/ voltage of each phase. The meter shall be located at eye level to facilitate observation of readings correctly.

Any alarm scheme shall have both audio-visual annunciations in redundancy of each other and appropriate accept and reset push buttons shall be part of alarm scheme.

5.2.13 RELAYS:

The circuit breaker shall be fitted with numerical relay having shunt trip coil for operation on 3overcurrent & one earth fault element. The numerical relay to be provided with the 12KV Outdoor VCB Kiosk, should be so designed so as to operate/ trip on earth fault as well as on over current faults but should not operate on unbalance load conditions during single phasing (which can be achieved through residual voltage control or otherwise).

The circuit breaker shall have suitable arrangement for power supply of relay and breaker operation through shunt trip coil using power pack. The power pack should be suitable for 6Nos. closing/ tripping operations and for future remote communication as well as breaker testing during long time power failure. The output voltage may be as per manufacturer's design. The charging of Power pack shall be through 230VA.C. supply available at Sub-Station.

The make, model No., type and Technical specification of the relay as well as power pack are required to be mentioned in the bid.

The Relay & Power Pack arrangement system should be warranted for 5 years (in line with warranty of breaker).

The numerical relays shall have following features:-

- a. Self-Diagnosis
- b. Minimum last five abnormal events recording (over current & earth fault) including fault level and phase along with date & time.
- c. On-lined is play of current.
- d. Communicable with open Protocol having RS-485 port.
- e. The relay should contain four shots, three phase, programmable & auto reclose control feature.

The relay shall be numerical type mounted in flush pattern on the panel board. The relay should be rated for 110VAC as well as DC & 5Ampere CT secondary. The relay should conform to latest IEC specifications. The tenders shall furnish the detail in this regard along with the offer.

Relay TTB shall have trip by pass arrangement.

All the relays shall be provided with test blocks in panel so designed that the relays may be tested at site. The relays should have provision of testing either through test block or test plug easily accessible by injecting the voltage/ current/ frequency (as applicable) from external testing instruments/ source without first disconnecting/ re-energizing the primary electrical circuit protected by the relays. Facilities for isolating the tripping circuit during such testing shall also be provided.

The requirement of test block shall not be applicable in case of draw out type relays which can be tested by using test plug without removing the relay from its casing.

The testing facilities provided in the relays shall be specifically stated in the bid. Necessary test plug etc. as may be required for proper testing shall be included in the contractor's scope of supply. One test plug with five panels or part thereof are to be supplied.

The technical suitability of relays/ schemes may also be examined by Protection Wing of Discoms & acceptability will be judged appropriately.

The bidder must furnish type test reports as per relevant ISS/IEC along with bid to suit the environmental conditions of our State, in respect of the relay (of the type and design offered) which should have been type tested in NABL accredited test laboratory in respect of such tests for which the lab has been accredited (for Indian make Relays)/ CPRI/ Nationally accredited testing laboratory (for Foreign make Relays). These type test reports should not be older than Five years from the date of opening of bid.

The Following makes of Relays are acceptable:-

- a. Areva.

- b. ABB.
- c. EasunReyrolle
- d. C&S
- e. JVS
- f. SEL
- g. ASHIDA
- h. MEGAWIN
- i. STELMEC
- j. CGL

Any other equivalent make of relays shall also be acceptable subject to prior approval of Ajmer Discom.

5.2.14 WIRING:

All wiring shall be of switch board type consisting of copper conductor of 2.5sq.mm cross section insulated with poly vinyl chloride insulation suitable for 660V service and in accordance with relevant IS:732. Poly vinyl chloride used shall have excellent resistance against burning, moisture, oil and vermin and shall be finished with clear colour. Rubber insulated wiring shall not be acceptable. Tenderers shall furnish the details of method being adopted by them for joint/connections.

All instruments and panel wiring shall be of heat resisting and self-extinguishing type in compliance with British Standard Practice/ IS. Plastic or porcelain cleats of the limited compression type shall be used for holding wiring runs. All wires shall be suitable for bending to meet the terminal studs at right angles. Metal cases of all apparatus mounted on kiosk shall be separately earthed by means of copper wire or strips. The following colour schemes of the wiring shall be used as per IS:375.

- a) AC three phase circuits:
 - i) No.1 phase : Red
 - No.2 phase : Yellow
 - No.3 phase : Blue
 - ii) Neutral conductor : Black
 - iii) Connection to earth :Green

5.2.15 TERMINALBLOCKS:

Terminal blocks shall be 650 V grade, box clamp type ELMEX 10sq.mm or approved equal. Not more than two wires shall be connected to any terminal.

Spare terminals equal in number to 20% of active terminals shall be furnished.

Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

5.2.16 TESTTERMINALBLOCK:

Two Nos. test terminal blocks shall be provided one for testing of relays and other for testing meters. They shall be of switch board type back connected for front of panel mounting. The test blocks shall provide complete isolation of meters, instruments etc. and the arrangement shall be such that testing power could be connected at the test block from any external source or may be taken from the instrument transformers. Provision shall be made for short circuiting current transformers. Suitable sealing arrangement shall be provided in test terminal blocks.

5.2.17 INDICATINGLAMPS:

Indicating lamps shall be provided on the control board to indicate the following:

- i) Visual indication of ON and OFF position of each circuit breaker.
- ii) PT supply indication.

Each lamp body shall be of moulded insulation and shall be able to withstand a high voltage test of appropriate value. All lamps shall be suitable for 240 VAC supply and shall have low power consumption and shall provide a wide angle of illumination of sufficient intensity for comfortable viewing. A glass of appropriate colour shall be screwed into the front of lamp body. The design of indication lamp shall be such as to facilitate replacement of burnt lamps. An engraved label indicating the purpose of the lamp shall be provided with each lamp.

5.2.18 FERRULES:

Ferrules engraved/ printed with the same numbers, of symbols as indicated in the connections and wiring diagram shall be provided on the terminal end so fall wires for identification of circuits for inspection and maintenance. Ferrules shall be of strong and flexible insulating material with glossy finish to prevent adhesion. They shall be engraved/ printed and clearly marked and shall not be effected by dampness. Ferrule numbering shall be in Accordance with IS:375. The same ferrules number shall not be used on wires in different circuits on a panel.

5.2.19 HTTVM:-

3 phase 4 wire A.C. Static H.T. Trivector meter of accuracy class 0.5S for measurement of energy as per latest specification of JVVNL/ AVVNL, shall be provided on each Outdoor VCB Kiosks.

Following makes of HTTVMs are acceptable:

- i) Secure
- ii) L&T
- iii) ABB/ Elster
- iv) Schlumberger
- v) Genus Infra

Any other make being procured by Nigam shall also be acceptable.

5.2.20 All interiors and exteriors of switchgear enclosure, breaker mechanism etc shall be finished and painted to produce a neat, fire resistant and durable surface which would prevent rusting and corrosion. Sheet metal component shall be pre-treated using 7 tank phosphating process consisting of de-greasing, acid pickling, de-rusting, phosphating and passivation including repeated rinsing in between. On completion of the passivation of the components, they shall be preheated and then epoxy powder coated or treated with one coat of primer & zinc chromate and finished with two coats of light gray enamel paint of shade 631 of IS5 and stoved to achieve excellent anti-rusting and scratch resistance properties. The thickness of painting shall be around 60 microns.

5.3 SCHEDULE OF EQUIPMENTS, FITTING & ACCESSORIES:

12 KV 630Amps Vacuum circuit breakers kiosks for outdoor installation:

5.3.1 1No.-12KV 630Amp. Vacuum Circuit Breaker horizontal fixed type with provision of manual tripping by means of push button and emergency shunt tripping.

Electrically operated through 230VAC. A lockable Local/ Remote switch shall be provided, apart from Trip-Neutral-Close (TNC switch) control switch to select local/ remote operation of the switchgear. The breaker control switch shall have Trip-Neutral-Close position spring return sequence locking mechanism. The breaker control switch and selector switch shall be mounted on the front side of cubicle and located at a convenient height for easy operation.

- 5.3.2** 1No.-AC Motor charged spring operated closing mechanism or magnetic actuator type closing mechanism.
- 5.3.3** 1No.-Shunt tripping arrangement/ Coil for operation on over current (load) and earth fault by relays alongwith emergency shunt tripping from remote place in addition to local emergency tripping (Mech.) One additional shunt trip coil, fitted very near to the original coil (which will be unwired) is also required to be provided.
- 5.3.4** 3Nos.- Single phase 12KV Current Transformer ratio 400-200-100/5-5A suitable for metering and protection. The class of accuracy shall be 0.5 for metering and 5P15 for protection. Rated burden (output) shall be 15VA for each secondary winding and it should not be less than suitable for tripping arrangement provided. Instrument security factor for metering core shall not be exceed 5.
- 5.3.5** 6 Nos.-Rigid type bimetallic/ aluminium alloy terminal connector suitable for ACSR (10% Panther and 90% Dog Conductor) for both horizontal/ vertical take-off.
- 5.3.6** 1No.-Mechanical ON/ OFF indicator.
- 5.3.7** 1 No. – Operating handle for independent manual closing mechanism.
- 5.3.8** 1No.-Redindicating lamp for ON indication.
- 5.3.9** 1No.-Green indicating lamp for OFF indication.
- 5.3.10** Spare auxiliary contacts/ switch having minimum 4 NO+4NC
- 5.3.11** 1 No.-Flush mounting pattern 96x96 sq.mm Moving Iron ammeter of class 1.5 accuracy suitable scaled for 5Amps. CT secondary.
- 5.3.12** 1No.-Ammeter selector switch to indicate phase current in all three phases and with OFF position.
- 5.3.13** 1 No.–Numerical 3O/C+E/F relay.
- 5.3.14** 1 No. HT TVM of accuracy class0.5S as per latest specification of JVVNL/ AVVNL.
- 5.3.15** 2 Nos.-240VAC single phase 80 or 100 watt ant condensation heaters with thermostat and switch.
- 5.3.16** 1 No. –Automatic door illumination lamp with switch.
- 5.3.17** 3Nos.-11000/ 110V single phase voltage transformers each having 100VA/ phase burden & class of accuracy 0.5 suitably connected to meters and indicating instruments etc.
- 5.3.18** 1No.-Flush pattern switch board mounting pattern 96x96 sq.mm moving iron AC voltmeter of class1.5 accuracy suitable for 110 V phase to phase secondary suitably scaled.
- 5.3.19** 1 No. –Voltmeter selector switch to indicate phase to phase & phase to neutral voltage of all the three phases.
- 5.3.20** 3 Nos.-Indicating lamps coloured Red, Amber Blue for PTsupply.
- 5.3.21** 2Nos.-Test terminal blocks to test meters and relays with sealing arrangement.
- 5.3.22** 1No.-Blanklable on the front of kiosks at the top.
- 5.3.23** Door lock switch keys for all doors.
- 5.3.24** Pair of base channel for grouting in floor.
- 5.3.25** Arrangement to check healthy trip circuit in all three phases (separate lamps for R phase, Y phase and B phase) be provided.
- 5.3.26** 1set-Self auxiliary plug and socket.
- 5.3.27** 1No.-ground bus system, size 50x6mm copper may be provided and the earthing stud shall be capable of withstanding rated short circuit current and stud design shall be as per IS-133427 or IEC-200.
- 5.3.28** 1No.-Audio-Visual Annunciations.
- 5.3.29** 1No.-Operation counter.
1 No. –Name plate at front and back of each kiosk.
- 5.3.30** 1set-3phase air insulated main copper busbar of 630 amp. Continuous current rating

having maximum current density 1.5Amp./ MM² with minimum cross sectional area 600MM² with PVC insulation or sleeves, STC rating 16KA for 3 sec.

5.3.31 1Set-Power Pack arrangement system as specified in cl.No.5.2.14.

5.3.32 1No.-Spring Charge Indication Lamp.

The busses within the cubical shall be of high conductivity electrolyte grade copper. The Bus bar joints shall be silver plated and bolted in such a manner that initial contact pressure around the square headed high tensile bolt will remain substantially undiminished at all temperature upto rated full load temperature. The Bus support and bushings shall be of epoxy resin cast type. All drop off from main bus to VCB and VCB to bushing terminations shall be suitable for current rating of circuit breaker. All the bus bar shall be sleeved with heat shrinkable sleeves of 12 KV voltage level (Insulated for a service voltage of 12 KV) and bus bar shall be shrouded wherever possible. All the bus bar joints shall be shrouded and where shrouding is not possible, it shall be taped with HV self- amalgamation tape. All the tap off bus bar connections inside panel and PT jumpers shall be sleeved with HT heat shrinkable sleeves. Special care shall be taken in the design of bus bar system to provide for thermal expansion and to minimize the chances of bus fault. Bimetallic washers shall be provided at the joints of two different metal surfaces.

The bus supports and bushings shall be non-hygroscopic non aging glass reinforced polymer.

5.4 MAKE AND TYPE OF BOUGHTOUT ITEMS:

Make / type of each relay, indicating instruments, integrating instruments, control switch for Circuit Breaker/ Trip Transfer, selector switch for Voltmeter/ Ammeter, Semaphore Indicator, indicating lamps, annunciator, Push Button, A.C. Hooter/ Bell, D.C.Hooter, Heater, Link Type Test Terminal Block for testing of TVM, CFL Tube, 2/3 Pin Socket with Switch etc. shall be clearly and invariably indicated in the GTP (Guaranteed Technical Particulars), bill of material and unit price list. Only specific make accessories shall be indicated. The word "EQUIVALENT/ REPUTED MAKE" will not be given for consideration.

The other makes of all bought out items shall be acceptable if it is of "ISI Marked" or type tested for which bidder shall furnish attested Photostat copies of ISI Certificate/ type test reports not older than Five years for the respective make offered, subject to prior approval of AVVNL Ajmer.

Other standard accessories which are not specifically mentioned but are required to be supplied with circuit breaker kiosk of similar type and rating for efficient and trouble-free operation.

5.5 TEMPERATURE RISE:

The max. temperature rise of various parts of the circuit breakers when tested under rated condition shall not exceed the specified values at a peak ambient temperature of 50 deg.C. The breaker may be provided with silver plated contacts if necessary to meet the requirement of IS:13118/ IEC:56 where higher temperature rise is permitted with silver plated contacts. The quantity of silver facing shall be such that after carrying out one tenth of the total number of operations specified for mech. Endurance test, there is a still continuous layer of silver on the contacts. The temperature rise of CTs and PTs shall also not exceed the permissible values as per relevant Indian standards when corrected for max. ambient temperature at site.

6.0 TESTS:

6.1 TEST BEFORE DESPATCH: The 12KV vacuum circuit breakers and accessories shall be subjected to the following tests as per relevant IS/IEC at maker's works before dispatch.

A) ROUTINE TESTS ON EACH UNIT AS PER RELEVANT STANDARDS:

- (i) One minute power frequency voltage with stand dry test on main circuit.
- (ii) Voltage with stand test on control & auxiliary circuits.
- (iii) Measurement of the resistance of main circuit.
- (iv) Mechanical operating test.
- (v) Design and visual checks.

B) The following type tests shall be conducted on the material as per relevant standards:

- (i) Dielectric tests.
 - a) Lightning Impulse Voltage Test.
 - b) One Minute Power Frequency Test (Wet & Dry).
- (ii) Short time withstand current and peak withstand current test.
- (iii) Basic short circuit duties test.
- (iv) Single phase short circuit test.
- (v) Mechanical Operation test as per M-2 class.
- (vi) Out of phase making & breaking test.
- (vii) Capacitive Current Switching Test.
 - a) Cable Charging Test.
 - b) Single Capacitor Bank Current Switching Test.
- (viii) Measurement of resistance of main circuit.
- (ix) Temp. rise test.
- (x) IP-55 Test (For cubicle/ control cabinet).
- (xi) Any other type tests not specified above but covered as per amendment/ latest edition of relevant IS/IEC.

C) The type test reports of Circuit Breakers, Current Transformers, Potential Transformers, Relays, Meters etc. shall be complete in all respect as per relevant IEC/ISS.

6.2 TYPETESTS:

The 12KV vacuum circuit breaker kiosk offered shall be fully type tested as per relevant standards.

6.3 TEST ON BOUGHT OUT ITEMS:

Tests are not required to be performed on bought out equipments/ items like motor, terminal connector, etc. at the works of manufacturer. Furnishing Test Certificate of these items from the original equipment manufacturers shall be deemed to be satisfactory evidence. Inspection of the tests at Sub-contractors works will be arranged by the supplier whenever required.

6.4 ROUTINE/ACCEPTANCETESTS:

- (i) The following acceptance and routine tests shall be got conducted in presence of purchaser's representative as per stipulation of the relevant standards, on each unit.
 - a) One minute power frequency voltage withstand dry test on main circuit.
 - b) Voltage withstand test on control& auxiliary circuits.
 - c) Measurement of the resistance of main circuit.
 - d) Mechanical operating test.

- e) Design and visual checks
- (ii) Inspection & tests on control gear.

In addition to the above tests at 6.4(i) above specified by IEC, the following shall also be performed at manufacturer's works in presence of purchaser's representative after completely assembling the kiosk.

- a) Checking wiring of circuits and their contacts.
- b) Insulation resistance of complete wiring, circuit by circuit with all equipment mounted on the panels.
- c) Checking of operational protective schedule, instruments and meters.
- d) Checking of phase faults between R& Y, Y& B and B& R phases. Kiosk should trip under all three conditions.
- (iii) Temp. rise test on one No. Kiosk in the first offered lot shall also be done in the presence of the purchaser's representative.
- (iv) Any other tests not specified above but covered as per amendment/ latest edition of relevant IS/ IEC.

6.5 TOLERANCE ON TEST RESULTS:

As per relevant standards/ specification.

6.6 TEST SITE:

The purchaser reserves the right to conduct all tests on 12KV circuit breakers after arrival at site and the contractor shall guarantee test certificate figures under actual service conditions.

7.0 INSPECTION:

All the tests (as mentioned at Clause 6.4) and Inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the bidder and purchaser at the time of purchase. The bidder shall afford the inspection officer(s) representing the purchaser all reasonable facilities without charges, to satisfy him that the material is being furnished in accordance with this specification. The purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is a dispute regarding the quality of supply.

The Inspection may be carried out by the purchaser at any stage of manufacture / before dispatch as per relevant standard. Inspection and acceptance of any material under the specification by the purchaser, shall not relieve the bidder of his obligation of furnishing material in accordance with the specification and shall not prevent subsequent rejection if the material is found to be defective. The Bidder shall keep the purchaser informed in advance, about manufacturing programme so that arrangements can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance / routine testing of the bought out items.

The Bidder shall give 15 days advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests.

8. DOCUMENTATION

8.1 All drawings shall conform to International Standards Organization (ISO) 'A', series of drawing sheet/ Indian Standards specification IS:13118/IEC-56. All drawings shall be in ink and suitable for micro filming. All dimensions and data shall be in S.I Units.

8.2 List of drawings and documents

The bidder shall furnish four sets of following drawings along with his offer.

8.2.1 General outline and assembly drawings of the equipment i.e. breaker, CTs, PT set.

8.2.2 Graphs showing the performance of equipments in regard to magnetization characteristics.

8.2.3 **Sectional views showing-**

- i) General Constructional features.
- ii) the materials/ gaskets/ sealings used.
- iii) the insulation, the winding arrangements, method of primary/ secondary winding to the primary/ secondary terminals etc.
- iv) porcelain used and its dimensions along with the mechanical and electrical characteristics.
- d) Arrangement of terminal's and details of connection studs provided.
- e) Name Plate
- f) Schematic drawing
- g) Type test reports in case the equipment has already been type tested.
- h) Test reports, literature, pamphlets of the bough tout items, and raw material.

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

8.4 Approval of drawings/ work by purchaser shall not relieve the supplier of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirement of the latest revision of applicable standards, rules and codes of practices. The equipment shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering and purchaser shall have the power to reject any work or materials which, in his judgment is not in full accordance there with.

9. PACKING AND FORWARDING

9.1 The equipments shall be packed in crates 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 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 lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by supplier without any extracost.

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

- a) Name of the consignee.
- b) Details of consignment
- c) Destination
- d) Total weight of consignment.
- e) Sign showing upper/lower side of the crate.
- f) Handling and unpacking instructions.
- g) Bill of material indicating contents of each package.

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

TECHNICAL SPECIFICATION FOR 36 KV OUTDOOR VACUUM CIRCUIT BREAKERS

1. SCOPE :

This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply, delivery, installation & commissioning (As per Section-III) of 36 KV Outdoor Vacuum Circuit Breakers Complete with all materials and accessories for efficient and trouble free operation.

It is not the intent to specify completely herein all details of the design and construction of equipments. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation upto the Bidder's guarantee in a manner acceptable to the Purchaser, who will interpret the meanings of drawings and specifications and shall have the power to reject any work or material which in his judgment is not in accordance therewith. The offered equipment shall be complete with all components necessary for its effective and trouble free operation along with associated equipments, interlocks, protection schemes etc. Such components shall be deemed to be within the scope of supply, irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

2.0 STANDARDS :

The circuit breaker shall conform to the latest revisions with amendments available at the time of testing of relevant standards, rules and codes, some of which are listed herein for ready reference:-.

| | |
|---|---|
| IS:13118/IS-3427/ IS:10118 (Part-III) – 1982/ IS:2165-1977/ IS:3716-1976/ IEC-62271-100/ IEC-62271-200 (with latest amendments) | Circuit Breaker/ metal enclosed Switchgear and control gear. |
| IS: 3156 | Voltage transformers. |
| IS: 2705 | Current transformers. |
| IS: 3231 | Electrical Relays for power system. |
| IS:1248 | Meters and Instruments |
| IS:14697-1999 | Specification for AC static transformer operated watt hour and VAR hour meters class 0.2 S & 0.5 S. |
| IEC-62053-22-2003 IEC-62052-11-2003 | Specification for AC Static Watt hour Meters, class 0.2 S & 0.5 S. |
| CBIP Technical Report No.88 revised July, 1996 read with amendment issued (April,99, September,99 and also any other amendment thereafter). | Specification for AC Static Electrical Energy Meter. |

- 3.0 Equipment meeting with the requirements of any other authoritative standards, which ensure equal or better quality than the standard mentioned above shall also be acceptable. If the equipment offered by the Bidder conforms to any other standard adopted and the specific standards shall be clearly brought out in relevant schedule. Four copies of such standards with authentic English Translations, shall be furnished alongwith the offer.

4. PRINCIPAL PARAMETERS OF CIRCUIT BREAKERS :

| | | |
|----------|---|---------------------------|
| 4.1 | TYPE AND RATING | 36 KV |
| 4.1.1 | Type | Vacuum Circuit Breaker |
| 4.1.2 | Service | Outdoor |
| 4.1.3 | Pole | 3 |
| 4.1.4 | Rated voltage (nominal/max.) | 33/36 KV |
| 4.1.5 | Rated frequency | 50 Hz |
| 4.1.6 | System Neutral earthing | Effectively grounded. |
| 4.1.7 | INSULTATION LEVEL | |
| 4.1.7.1 | Impulse withstand voltage | 170 KVp |
| 4.1.7.2 | One minute power frequency withstand voltage. | 70 KV rms |
| 4.1.8 | Rated Current | |
| 4.1.8.1 | Continuous at 50 C. | 1250 A |
| 4.1.8.2 | Short time current | 25 kA for 3 Sec. |
| 4.1.9 | Rated Breaking Capacity | |
| 4.1.9.1 | Symmetrical | 25 KA |
| 4.1.9.2 | Asymmetrical | As per relevant standard |
| 4.1.10 | Rated making capacity | 2.5 x 25 KA |
| 4.1.11 | Rated short time with stand current for 3 secs. | 25 KA |
| 4.1.12 | a) Total break time | 3 cycles(Max.) |
| | b) Total closing time | 4 cycles (Max.) |
| 4.1.13 | Creep age distance | 900 mm or more |
| 4.1.14 | Mounting. | Steel Pedestal. |
| 4.1.15 | Operating duty | |
| | For gang operation | O-0.3Sec.-CO-3min-CO |
| 4.1.16 | Operating Mechanism | Motor operated |
| | Spring charged closing Mechanism or magnetic actuator. | |
| 4.1.17 | Auxiliary voltage. | 110 VDC |
| 4.1.17.1 | Spring charging Motor | 230V/415V AC |
| 4.1.17.2 | Heater/Lamp/Socket. | 230V AC |
| 4.1.18 | Terminal Connector | |
| 4.1.18.1 | Type | Bimetallic/ |
| | Aluminum Alloy Type clamp suitable for both horizontal /vertical take off | |
| 4.1.18.2 | Suitable for | 10% Panther and |

| | | |
|---------|---|-----------------------------|
| | ACSR Conductor | 90% Dog Conductor |
| 4.2 | System details | |
| 4.2.1 | H.V. System | |
| | Voltage (Nominal/Max.) | 33 KV /36 KV |
| | Phases | 3 |
| | System Neutral | Effectively earthed. |
| | Fault level | 25 KA rms Symmetrical |
| 4.2.2 | Auxiliary power Supply | |
| 4.2.2.1 | A.C. Supply | |
| | | 1. 415 volts 3 ph 4 W 50 Hz |
| | | 2. 230V 1 Ph 2 W 50 Hz |
| 4.2.2.2 | D.C. Supply | |
| | | 110 V 2 wire. |
| 4.3 | Supply point. | |
| 4.3.1 | Auxiliary power supplies listed above will be made available to each circuit breaker as below : | |
| | AC supply. | Single feeder. |
| | DC supply. | Single feeder. |

4.3.2 Isolating switch fuse unit shall be provided at the circuit breaker for each incoming supply. For DC supply double pole throw switch shall be provided.

5. GENERAL TECHNICAL REQUIREMENTS :

5.1 DESIGN CRITERIA :

The 36 KV Outdoor VCBs shall be conforming to M-2 Class. The equipment will be used in high voltage system having characteristics as listed in the specification. The equipment will be installed outdoor in a hot, humid and tropical atmosphere. All equipment, accessories and wiring shall have tropical protection, involving special treatment of metal and insulation against fungus, insects and corrosion.

The maximum temperature in any part of the equipment at specified rating shall not exceed the permissible limits as stipulated in the relevant standards even at an ambient temperature of 50 Deg.C.

The equipment shall be capable of withstanding the dynamic and thermal stresses of listed short circuit current without any damage or deterioration.

The safety clearances of all live parts of the equipment shall be as per relevant standards.

5.2 SPECIFIC REQUIREMENTS :

5.2.1 The circuit breaker shall be for outdoor installation, three pole vacuum type, having internal isolation without any sequential interlock.

The duty of the circuit breaker shall involve satisfactory interruption of short circuit currents as listed in the specification.

5.2.2 CONSTRUCTIONAL FEATURE :

Each circuit breaker shall comprise three identical poles, complete with a gang operated mechanism for specified duty.

All these poles of circuit breaker shall be linked together electrically and mechanically for specified duty.

The circuit breaker units shall be complete with operating mechanism and other accessories and materials to ensure complete assembly and proper functioning. The following features should be ensured:-

- a) Hinges of door shall be concealed type to avoid rusting and obstructive opening of the door.
- b) The quality of welding shall be good and there should not be any lumps and splatters on the panel”.
- c) All the connecting bus bar and current carrying parts shall be made of copper.
- d) All the gasket shall be of chemically treated neoprene.
- e) Hole & Pin locking (Check nut) arrangement should also be provided while fixing the vacuum interrupter at bottom side.
- f) The vacuum interrupter should be housed in epoxy pole unit and make of Vacuum Interrupter is required to be from BEL, CGL, SIEMENS, ABB or ALSTOM/AREVA/MEGAWIN.

5.2.3 BUS BAR, MAIN CONTACTS AND ARC QUENCHING CHAMBER :

The busses within the cubical shall be of high conductivity electrolyte grade copper. The Bus bar joints shall be silver plated and bolted in such a manner that initial contact pressure around the square headed high tensile bolt will remain substantially undiminished at all temperature upto rated full load temperature. The Bus support and bushings shall be of epoxy resin cast type. All drop off from main bus to VCB and VCB to bushing terminations shall be suitable for current rating of circuit breaker . All the bus bar shall be sleeved with heat shrinkable sleeves of 36 KV voltage level (Insulated for a service voltage of 36 KV) and bus bar shall be shrouded wherever possible. All the bus bar joints shall be shrouded and where shrouding is not possible, it shall be taped with HV self-amalgamation tape. All the tap off bus bar connections inside panel and PT jumpers shall be sleeved with HT heat shrinkable sleeves. Special care shall be taken in the design of bus bar system to provide for thermal expansion and to minimize the chances of bus fault. Bimetallic washers shall be provided at the joints of two different metal surfaces.

The main contacts shall have adequate area and contact pressure for carrying rated continuous and short time current without excessive heating liable to cause pitting and welding.

The tips of the arcing and main contacts shall be heavily silver plated (Min. 40 microns) or made of copper chromium alloy.

The contacts shall be adjustable to allow for wear, shall be easily replaceable and shall have minimum movable parts and adjustments.

The arc quenching device shall be of robust construction and shall not require any critical, adjustment. The devices shall be easily accessible and removable for access to the breaker contacts.

5.2.4 AUXILIARY CONTACTS :

Each breaker shall be provided with eight normally open & eight normally closed electrically separate auxiliary contacts. These shall be in addition to those required for its own operation and indication.

The auxiliary contacts shall be convertible type so that normally open contacts can be converted into normally close contact and vice versa at site.

The auxiliary contacts shall be rated 10A at 240V AC and 4A at 110 V DC.

5.2.5 INTERLOCK :

All electrical and mechanical interlocks which are necessary for safe and satisfactory operation of the circuit breaker shall be furnished.

5.2.6 INSULATOR :

Insulator shall be wet process porcelain, brown glazed and free from all blemishes. Metal parts and hardware shall be hot dip galvanized.

Insulator shall have adequate mechanical strength and rigidity to withstand the duty involved.

When operated at maximum system voltage, there shall be no electrical discharge. Shielding rings, if necessary, shall be provided.

Insulation shall be coordinated with basic impulse level of the system. The creep age distance shall correspond to heavily polluted atmosphere.

The bushing shall not be subjected to direct point loading. They shall be provided with neck around clamps for evenly distributed pressure.

The bushing shall be mounted using suitable clamps and gasket arrangement to provide required degree of protection.

The bushing assembly shall be provided with lock nut and check nut which will be non-magnetic and non-corrosive.

The provision shall be kept on roof bushing assembly to adopt arcing horn.

The lifting arrangement shall not cause any effective loss of creep age distance/ phase to earth clearances as specified in the ISS/IEC.

5.2.7 OPERATING MECHANISM :

Operating mechanism shall be spring operated with anti-pumping and trip free features, complete with shunt trip coils. All three breaker poles shall operate simultaneously. Circuit breakers shall have provision so as to be suitable for three phase auto reclosing. In case of spring closing mechanism, no main spring of the mechanism shall be plated, powder coated or given any other treatment, so that spring property is not lost. The motor shall be universal type suitable for 220/240V. Spring Charge Indication Lamp shall be provided.

The mechanism shall be designed for electrical control from remote as well as local position. In addition to this, local manual trip button shall be provided. Operation counter and mechanical ON-OFF indicator shall be provided.

5.2.8 CONTROL CUBICLE :

A common control cubicle shall be furnished to house electricals, controls, monitoring devices and all other accessories except those which must be located on individual poles. The cubicle shall be IP-55 of gasketed weatherproof construction, fabricated from sheet steel minimum 3 mm thick.

The cubicle shall have front access door with lock and keys, and removable gland plate at the bottom for owner's cable entry. Thermostat controlled space heater, internal illumination lamp 3 pin 5 A socket with individual ON-OFF switches shall be provided in the cubicle.

For local operation following shall be provided :

- a) Local/Remote selector switch.
- b) Trip normal close control switches with pistol grip handle.

All electrical, mechanical connections between the control cubicle and individual poles shall be furnished.

5.2.9 WIRING

Wiring shall be complete in all respects to ensure proper functioning of the control, protection, monitoring and interlocking schemes.

Wiring shall be done with flexible 650V grade, PVC insulated, switch board wires with 2.5 sq.mm stranded copper conductor. Wiring between individual poles and control cubicle shall be routed through G.I. conduits.

Each wire shall be identified at both ends with permanent markers bearing wire numbers as per wiring diagram.

Wire termination shall be done with crimping type connectors with insulating sleeves. Wires shall not be spliced between terminals.

All spare contacts of relays, push buttons, auxiliary switches etc. shall be wired upto terminal blocks in the control cubicle.

5.2.10 TERMINAL BLOCKS :

Terminal blocks shall be 650 V grade, box clamp type ELMEX 10 sq.mm or approved equal. Not more than two wires shall be connected to any terminal. Spare terminals equal in number to 20% of active terminals shall be furnished.

Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

5.2.11 TYPE OF MOUNTING :

The circuit breaker shall be suitable for mounting on fabricated galvanized steel pedestal which shall be supplied along with the breakers. CT mounting bracket will also be supplied along with the breaker and shall be galvanized.

5.2.12 TERMINAL CONNECTORS :

1250 Amp. current rating terminal connectors of the circuit breakers suitable for connecting to ACSR Panther and Dog Conductor shall be supplied along with the breakers. Suitable earth connectors for earthing connections shall also be supplied with the circuit breakers. The terminal connectors shall conform to relevant standard IS-5561.

5.3 FITTING AND ACCESSORIES :

Each circuit breaker shall be furnished complete with fittings and accessories as listed below :

- 5.3.1 Clamp type bimetallic/Aluminum Alloy terminal connectors suitable for ACSR Panther and Dog Conductor suitable both for horizontal & vertical takeoff.
- 5.3.2 Two ground pads suitable for termination of 50 x 6 mm flats.
- 5.3.3 Complete mounting steel pedestal along with CT mounting bracket.
- 5.3.4 Operating mechanism, double tripping coils and closing coil.
- 5.3.5 Auxiliary contacts and relays.
- 5.3.6 Local/remote selector switch, trip normal close control pistol control switch.
- 5.3.7 Manual tripping devices with protective flap for VCB's only mechanical ON-OFF indicator.
- 5.3.8 Operation counter.
- 5.3.9 Weather proof outdoor type control cubicle and pole boxes. Set of switch fuse units for AC and DC supply.
- 5.3.10 Space heater with thermostat and ON-OFF switch.

- 5.3.11 Cubicle illumination lamps with ON-OFF switch.
- 5.3.12 3 Pin 5A socket with ON-OFF switch.
- 5.3.13 Terminal blocks and internal wiring - lot as required.
- 5.3.14 Set of prefabricated pipe, fittings, clamps, hardware, interconnecting wires/cables etc. for connection between control cubicle and pole boxes as may be required to complete.
- 5.3.15 Interconnecting wires, GI conduits and accessories for connection between control cubicle and pole boxes.
- 5.3.16 Other standard accessories which are not specifically mentioned but are required to be supplied with breakers of similar type and rating for efficient and trouble free operation.

5.4 PAINTING & FINISHING

All interiors and exteriors of switchgear enclosure, breaker mechanism etc. shall be finished and painted to produce a neat, fire resistant and durable surface which would prevent rusting and corrosion. Sheet metal component shall be pre-treated using 7 tank phosphating process consisting of de-greasing, acid pickling, de-rusting, phosphating and passivation including repeated rinsing in between. On completion of the passivation of the components, they shall be preheated and then epoxy power coated or treated with one coat of primer & zinc chromate and finished with two coats of light gray enamel paint of shade 631 of IS 5 and stoved to achieve excellent anti-rusting and scratch resistant properties. The thickness of painting shall be around 60 microns.

6.0 TESTS:

6.1 TEST BEFORE DESPATCH : The 36 KV circuit breakers and accessories shall be subjected to the following tests as per relevant IS/IEC before dispatch at manufacturer's works .,

A) ROUTINE TESTS ON EACH UNIT AS PER RELEVANT STANDARDS :

- (i) One minute power frequency voltage withstand dry test on main circuit.
- (ii) Voltage withstand test on control & auxiliary circuits.
- (iii) Measurement of the resistance of main circuit.
- (iv) Mechanical operating test as per M-2 class.
- (v) Design and visual checks.

B) TYPE TESTS CONDUCTED ON ONE UNIT OF EACH RATING

6.2 TYPE TESTS :

The bidder must furnish type test reports along with bid as per the qualification requirement of the Tender Specification.

6.3 TEST ON BOUGHT OUT ITEMS :

Tests are not required to be performed on bought out equipments/items like motor, terminal connector, CTs, PTs, Relays, Meters etc. at the works of manufacturer. Furnishing Test Certificate of these items from the original equipment manufacturers shall be deemed to be satisfactory evidence. Inspection of the tests at Sub-contractors works will be arranged by the supplier whenever required.

6.4 ROUTINE/ACCEPTANCE TESTS :

- (i) The following acceptance and routine tests shall be got conducted in presence of purchaser's representative as per stipulation of the relevant standards, on each unit.

- a) One minute power frequency voltage withstand dry test on main circuit.
- b) Voltage withstand test on control & auxiliary circuits.
- c) Measurement of the resistance of main circuit.
- d) Mechanical operating test as per M-2 class.
- e) Design and visual checks
- f) Any other test not specified above but covered as per amendment/latest edition of relevant IS/IEC.

6.5 TOLERANCE ON TEST RESULTS :

As per relevant standards/specification.

6.6 TEST AT SITE :

The purchaser reserves the right to conduct all tests on 36 KV circuit breakers after arrival at site and the contractor shall guarantee test certificate figures under actual service conditions.

7.0 INSPECTION :

All the tests (as mentioned at Clause 6.4) and Inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the bidder and purchaser at the time of purchase. The bidder shall afford the inspection officer(s) representing the purchaser all reasonable facilities without charges, to satisfy him that the material is being furnished in accordance with this specification. The purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is a dispute regarding the quality of supply.

The Inspection may be carried out by the purchaser at any stage of manufacture/ before dispatch as per relevant standard.

Inspection and acceptance of any material under the specification by the purchaser, shall not relieve the bidder of his obligation of supplying material in accordance with the specification and shall not prevent subsequent rejection if the material is found to be defective. The Bidder shall keep the purchaser informed in advance, about manufacturing programme so that arrangements can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance/ routine testings of the bought out items.

The Bidder shall give 15 days' advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests.

8.0 DOCUMENTATION :

8.1 All drawings shall conform to International Standards Organization (ISO) 'A', series of drawing sheet / specification, Standards specification IEC-56/IS-13118 & relevant standards. All drawings shall be in ink and suitable for micro filming. All dimensions and data shall be in S.I Units.

8.2 List of drawings and documents :

The bidder shall furnish four sets of following drawings along with his offer.

- a) General outline and assembly drawings of the equipment.
- b) Graphs showing the performance of equipments in regard to magnetization characteristics.
- c) Sectional views showing -

- i) General Constructional features.
 - ii) the materials/ gaskets /sealings used.
 - iii) the insulation, the winding arrangements, method of connection of the primary/secondary winding to the primary/ secondary terminals etc.
 - iv) porcelain used and its dimensions along with the mechanical and electrical characteristics.
 - d) arrangement of terminal's and details of connection studs provided.
 - e) Name / Rating Plate
 - f) Schematic Wiring drawing with write up.
 - g) Type test reports in case the equipment has already been type tested.
 - h) Test reports, literature, pamphlets of the bought out items, and raw material.
- All items of equipment included in this specification shall be provided with rating plates as per relevant standards and in addition with following particulars :

- i) Name & Address of Supplier
- ii) Telephone No.
- iii) Fax No.
- iv) Date of Dispatch
- v) Date of Expiry of Warranty
- vi) Name of Purchaser
- vii) AVVNL/TN No.

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

8.4 Approval of drawings/work by purchaser shall not relieve the supplier of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirement of the latest revision of applicable standards, rules and codes of practices. The equipment shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering and purchaser shall have the power to reject any work or materials which, in his judgment is not in full accordance therewith.

TECHNICAL SPECIFICATION FOR SUPPLY OF ISI MARKED PVC INSULATED MULTI-CORE UN-ARMOURED NON-FRLS CONTROL CABLES

1.0 SCOPE:

The specification covers design, manufacturing, testing at the manufacturer's works, inspection, packing and delivery to the site of 1100V grade multi core, each core containing appropriate numbers of strands of annealed bare.

2.0 PVC INSULATED UN-ARMOUREDNON-FRLS CONTROL CABLES:

The cables are required at various 33 KV Grid Sub-Stations for the control and supervision of outdoor / indoor switchgears and power transformers including instrumentation metering, indication and alarm on the control panels and electrical inter-locking between high voltage equipments. With a view to achieve these multifarious requirements, the cables will be laid between individual outdoor equipments and from there to control relay and other allied panels located indoor. The reliability and long life of the control cables is of paramount importance. All the control cables offered against the specification should be suitable for climatic conditions prevailing at site, as indicated in Clause-3.

3.0 STANDARDS FOR UN-ARMOUREDNON-FRLS CONTROL CABLES:

1100V Grade multi core, each core containing seven strands of annealed bare Copper conductor, PVC (Type-A) insulated and PVC sheathed (Type-ST-1), Un-ArmouredNON-FRLS Control cables, shall conform in all respects to the following relevant ISS with latest editions and amendments.

| Sr. No. | Standard Ref. No. | Title |
|---------|--|--|
| 1. | IS-1554/(Pt.-I)/1988 with latest amendment up to date. | PVC insulated (Heavy duty) Electric Cables for working voltage up to and including 1100 Volts. |
| 2. | IS-8130/1984 with latest amendment up to date. | Conductors for insulated Electric Cables and flexible cords. |
| 3. | IS-5831/1984 with latest amendment up to date. | PVC Insulation and sheath of Electric Cables. |
| 4. | IS-3961/(Pt.-II)/1967 with latest amendment up to date | Current ratings for cables: PVC insulated & PVC Sheathed heavy-duty cables. |
| 5. | IS-10418with latest amendment up to date. | Drums for Electric Cables. |
| 6. | IS-10810 with latest amendment up to date. | Methods of tests for cables. |

4.0 GENERAL DESIGN CRITERIA:

The Cables shall normally be laid in masonry / RCC trenches whether inside or outside the control room building in groups in tier formation or otherwise, but at some places the cables may be laid direct in ground or in air. The cable may even be laid in vertical formation and in steep gradients at some locations. The cables shall be physically strong to withstand rough installation hazards and thermal / electrical / physical stresses during operation under specified climatic conditions

5.0 CONSTRUCTIONAL FEATURES:

1100 Volts grade, multi-core, Un-Armoured NON-FRLS, PVC Type-A insulated suitable for maximum rated conductor temp. of 70° Celsius , seven strands Annealed bare copper conductor, PVC sheathed (Type-ST-1), control cables shall conform to the requirements imposed in IS: 1554 (Part- I)/1988 and its latest amendments up to date. The cable shall be suitable for use where combination of ambient temperature and temperature rise due to load results in conductor temperature not exceeding 70°Celsius under normal operation and 160°Celsius under short circuit conditions.

All the control cables shall bear ISI certification marks as per IS: 1554 (Part-I)/1988 with latest amendment up to date. The cables shall have PVC fillers to provide circular cross-section before the inner sheath is applied. The fillers should be suitable for operating temperature of the cable compatible with the insulating material.

5.1 CONDUCTOR:

The conductor shall be stranded (7 wires per core) annealed, non-compacted, un-tinned high conductivity electrolytic copper conforming to class-II of IS: 8130 /1964 & IS: 613 /1964 with latest amendment up to date.

5.2 INSULATION:

The insulation shall be Polyvinyl Chloride compound (PVC) conforming to requirement of Type-A compound of IS: 5831/1984with latest amendment up to date. The insulation shall be applied by pressure extrusion method. The insulation shall be applied in such way that it fits closely on conductor and it shall be possible to remove it without damage to the conductor. The thickness and tolerance on thickness of insulation shall be as per clause 9.2 & 9.3 of IS: 1554 (Part-I)/1988with latest amendment up to date.

5.3 INNER SHEATH:

The inner sheath shall be of non-Hygrosopic, Polyvinyl Chloride compound (PVC) conforming to requirements of IS: 5831/1984 with latest amendment up to date for type ST-1.The inner sheath shall be softer than the insulation. The inner sheath shall be applied by extrusion method& it shall be so applied that it fits closely on laid up cores and it shall be possible to remove it without damage to the insulation. The thickness and tolerance on thickness of inner sheath shall be as per clause 12.3 of IS: 1554 (Part-I)/1988 with latest amendment up to date. The inner sheath shall be of colour of black.

5.4 FILLERS:

The fillers shall be of non-Hygrosopic, Polyvinyl Chloride compound (PVC) conforming to requirements of IS: 5831/1984 with latest amendment up to date. The material of fillers shall be softer than the insulation. It shall be ensured that the shape is as circular as possible. The fillers

should be suitable for operating temperature of the cable compatible with the insulating material.

5.5 OUTER SHEATH:

The outer sheath shall be of Polyvinyl Chloride compound (PVC) conforming to requirements of IS: 5831/1984 with latest amendment up to date for type ST-1. The outer sheath shall be applied by extrusion method. The thickness and tolerance on thickness of outer sheath shall be as per clause 14.4 of IS: 1554 (Part-I)/1988 with latest amendment up to date. The outer sheath shall be embossed at the interval of one meter length as per clause no. 9.0 of this specification.

6.0 COLOUR SCHEME FOR IDENTIFICATION OF CORES:

The Colour of core insulation upto 5 Cores shall be as per clause 10.1 of IS-1554 (Part-I) 1988 and for 6 Cores & above, cores shall be identified by the Colour as per clause 10.1(f) of IS-1554 (Part-I) 1988 & its latest amendment up to date with Grey Colour base and also individual cores of cable containing two or more cores shall be identified by different colouring of PVC insulation in accordance with clause 10.0 of IS: 1554 (Part-I)/1988 with latest amendment up to date. However, the PVC sheath may be black or grey. The colour coatings employed in the formation of the cables for individual cores and sheath shall be indicated in the tender.

7.0 LAYING UP OF CORES:

The cores shall be laid up together with the suitable right hand lay. The interstices shall be filled with non-hygroscopic, PVC material.

8.0 STANDARD LENGTH:

The control cables shall be supplied in standard length of 1000 meters \pm 5% for cables sizes 4CX2.5 Sq. mm. & 2CX2.5 Sq. mm. and shall be supplied in standard length of 500 meters \pm 5% for cables sizes 12CX2.5 Sq. mm and 4CX4 Sq. mm. The quantities of the non-standard drum length to be supplied shall not exceed 5% of the ordered qty. but none of which shall be less than 250 meters. The ordered quantity to be supplied shall be subjected to tolerance of \pm 2% in each size.

9.0 EMBOSSING:

To enable identification of control cable the word AVVNL, manufacturer's name or mark, TN No. & Year of manufacture, Type-PVC, Electric voltage grade and cable size shall be embossed on the outer sheath of cable at the interval of one meter length for which no extra charges shall be paid. The cable should be ISI marked & same should be embossed on the outer sheath of every meter of length of cable.

10.0 MARKING:

- 10.1 The cables shall be wound on non-returnable wooden drums conforming to IS:10418/1982 of suitable size and packed. The ends of the cable shall be sealed by means of non-hygroscopic sealing material. Only one cable length shall be supplied on a drum. The shaft diameter of Drum shall be as per relevant ISS but not less than 50 mm. The cable can also be supplied on M-Steel Drums as per relevant ISS as applicable.
- 10.2 The cable shall carry the following information stenciled / painted on the drum :
- i) Reference to this Indian Standard, for example, Ref IS:1554 (Part-1)
 - ii) Manufacturer's name, Brand name or trade mark.
 - iii) Type of cable and voltage grade.
 - iv) Number of Cores.
 - v) Nominal Cross-sectional area of the conductor.
 - vi) Cable Code.
 - vii) Length of cable on the drum.
 - viii) Approximate gross weight.

- ix) Year of manufacture.
- x) BIS Certification mark.
- xi) Name of the Consignee and full destination.
- xii) AVVNL/TN No.
- xiii) The word suitable for outdoor use & low temperature Conditions.

11 CURRENT RATINGS:

The current ratings of the control cables shall correspond to the values recommended as per IS: 3961 (Part- II)/1967 and its latest amendments up to date.

12.0 LATENT DEFECTS ERRORS & OMISSIONS:

12.1 Any cable or part thereof that may develop defects during performance guarantee period shall be promptly replaced by the supplier free of charge.

12.2 If the operation of the cable after installation during guarantee period proves to be unsatisfactory, the purchaser shall have the right to operate the bank guarantee(s) until defective articles are taken out of service, without loss of injury to the purchaser & correction of latent defects, errors & omissions.

13. TESTS & INSPECTION:

13.1 TYPE TEST:

- i) The material offered, shall be fully type tested as per relevant standard of specification of IS:1554 (Part.1/1988) amended up to date
- ii) The bidder must also clearly indicate various testing facilities available at their works for testing the material as per relevant standards. In case of otherwise particulars of the place where such testing is proposed to be conducted during the course of inspection shall be indicated with the offer.
- iii) However, the purchaser reserves the right to demand repetition of same or all the type tests in presence of purchaser's representative.
- iv) The bidding firms (manufacturers) must have valid BIS license for the offered cable. The bidder shall furnish the details of BIS License granted to them.
The details of type test are as under:
 - a) Test on Conductor
 - 1. Annealing test (if applicable)
 - 2. Conductor resistance test.
 - b) Tests for thickness of insulation and sheath.
 - c) Physical tests for insulation and outer sheath.
 - 1. Tensile strength and elongation at break.
 - 2. Aging in air oven.
 - 3. Shrinkage test.
 - 4. Hot deformation.
 - 5. Loss of mass in air oven.
 - 6. Heat shock test.
 - 7. Thermal stability.
 - d) Insulation resistance test.
 - e) High voltage test (Water immersion test).
 - f) High voltage test at room temperature.
 - g) Flammability tests:

The purchaser reserves the right to get the material tested in any recognized test house and reject the material if not found as per specification.

13.2 ROUTINE TESTS:

All routine tests as stipulated in the relevant IS-1554 (Part-I)/1988 with its latest amendments shall be carried out by the supplier on each lot offered for inspection.

13.3 ACCEPTANCE TESTS:

All the acceptance tests as mentioned in relevant IS-1554 (Part-I)/1988 & its latest amendments up to date shall be carried out on samples from a lot for the purpose of acceptance test in presence of purchaser's representative.

13.4 INSPECTION:

- i) The inspection may be carried out by the purchaser at any stage of manufacturer. Acceptance of any equipment / material under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment/material is found to be defective.
- ii) The acceptance tests as per IS-1554 (Part-I)/1988 shall also be conducted by the manufacturer before dispatch in the presence of our Representative /Inspecting Officer. The mass of Copper, PVC & Filler in sample coils shall also be verified by the Inspecting Officer(s).

Cold bend/ cold impact test (IS:5831/1984) shall constitute the optional tests and shall be conducted on first lot and any from other lot of the offered cables of each size as per Clause No.15.4 of IS-1554 (Part-I)/1988.

- iii) The purchaser reserves the right to insist or witnessing the acceptance / routine tests of the bought out items.
- iv) **The bidder shall furnish Packing list mentioning serial Nos. of Drums, length in each drum, gross weight of drum without lagging alongwith inspection offer duly signed by the authorized representative of the firm.** The purchaser reserves the rights to insist for witnessing the acceptance / routine tests of the bought out items.
- v) At least 5% of total numbers of drums subject to minimum of 2 in any lot put up for inspection shall be selected at random to ascertain the length/ workmanship of cable by the following method :

“At the works of the manufacturer, the cable shall be transferred from one drum to another for checking any manufacturing defects in the cable drums selected for conducting acceptance tests, at the same time measuring its length with the help of the graduated pulley & cyclometer. The difference in the average length thus obtained from the declared length by the supplier in the packing list shall be applied to all the drums if the cable is found short during checking the sample lot(s)”.

- vi) The supplier shall present the latest Calibration Certificate(s) of testing instruments / equipments to be used for the testing of the material covered in the Purchase Order to the authorized inspecting officer / inspecting agency of the purchaser. The testing instruments / meters / apparatus etc. should be got calibrated by the supplier from time to time from Govt. Laboratory or any independent test laboratory / house having valid accreditation from National Accreditation Board for Testing and Calibrating Laboratories

for the testing equipments / original manufacturer having trace ability to NABL / NPL or equivalent.

The calibration certificate(s) should not in any case be older than one year at the time of presenting the same to the inspecting officer / inspecting agency of the purchaser. The testing instruments / equipments should be duly sealed by the Calibrating Agency and mention thereof shall be indicated in the calibration certificate(s). ‘

13.5 VERIFICATION OF LENGTH:

The supplier / manufacturer shall provide all adequate facilities at his works for inspection of at least two numbers of cable drums or five percent of the cable drums offered for inspection, whichever is higher, selected at random by the authorized representative of the purchaser for checking / verification of cable length / manufacturing defects by transferring the cable from one drum to the another empty drum and at the same time measuring the length of the cable so transferred by means of a meter. The difference in the average length thus obtained from the declared length by the supplier in the packing list shall be applied to all the drums if the cable is found short during checking the sample lot(s).

13.6 CALIBRATION CERTIFICATE:

The successful tenderer shall have to furnish the latest calibration certificates of the testing instruments / equipments used for the testing of material / equipment offered to inspecting officer(s) at the time of inspection of material / equipment. The testing instrument/equipment shall be got calibrated by the manufacturer of testing instrument / equipment or from any Govt. / Govt. recognized / NABL accredited testing laboratory. The calibration certificate should not be older than one year at the time of presenting the same to the Inspecting Officer.

13.7 GENERAL:

All aforesaid tests shall be made prior to dispatch in the presence of representative of the purchaser. In case of inspection waiver, test results must be sent in quadruplicate for approval. No material shall be dispatched without prior inspection or approval of test certificate unless otherwise agreed to in writing by the purchaser.

TECHNICAL SPECIFICATION FOR NFC TYPE ANCHOR (DEAD END) & SUSPENSION ASSEMBLIES FOR LT AERIAL BUNCHED XLPE INSULATED ALUMINIUM CONDUCTOR CABLES WITH BARE MESSENGER WIRE AS WELL AS INSULATED MESSENGER WIRE FOR OVER HEAD LINES SUITABLE FOR WORKING VOLTAGE UPTO AND INCLUDING 1100 VOLTS AGAINST .

1.0 SCOPE

This specification covers manufacture, testing before dispatch, supply and delivery F.O.R. Destination of anchor (dead end) & suspension assemblies suitable for LT Aerial Bunched XLPE Insulated Aluminum Conductor Cables with bare messenger as well as Insulated Messenger Wire for LT Overhead lines suitable for working voltage up to & including 1100 Volts.

2.0 REFERENCE STANDARDS:

The design, performance and test requirements shall conform to this specification and the following standards. However in case of any conflict, the requirements of this specification shall prevail.

| S.No. | Standard | Details |
|-------|----------------|---|
| 1 | NFC 33-040 | Suspension Equipments |
| 2 | NFC 33-041 | Anchoring Devices |
| 3 | NFC 33-003 | Corrosion resistance |
| 4 | NFC 20-540 | Climatic Ageing |
| 5 | IS 14255 | LV Aerial Bunched Cables |
| 6 | IS 8130 | Conductors for Insulated cables |
| 7 | IS 7098 Part 1 | XLPE Insulated Cables for working voltages upto 3.3 KV |
| 8 | IS 398 Part IV | aluminum alloy conductors |
| 9 | ASTM A 480 | Stainless Steel |
| 10 | REC 32/1984 | REC Specification for Aerial Bunched cable for L T Line |

The Devices shall also be compatible with the cables of sizes & dimensions as defined in the Cable Specifications for the cables with which they are intended to be used, and this specification.

3.0 THE ABC ACCESSORIES

The Accessories of LT XLPE Insulated Aerial Bunched Cables (ABC) are specified below:

- a) Their design should incorporate specific features to prevent damage to the insulation while meeting the required electrical, mechanical & thermal requirements.
- b) The accessories should provide “Double Insulation” so that a single point failure of insulation will not result in the system tripping.

Table-1

| S.No | Description | Application |
|------|-------------|-------------|
|------|-------------|-------------|

| | | |
|----|--------------------------|--|
| a) | Anchoring Assembly (AA) | For fitting onto a pole for anchoring the end of a length of ABC, or for a major change in direction. The anchoring assembly consists of one wedge type anchoring clamp, one aluminum alloy pole bracket, Stainless Steel strap of 1.5 meter and two buckle for fixing the pole brackets with straps. |
| b) | Suspension Assembly (SA) | For supporting a length of ABC at an intermediate pole in a length, with small angle of deviation. The suspension assembly consists of one wedge type anchoring clamp, one aluminum alloy pole bracket, Stainless Steel strap of 1.5 meter and two buckle for fixing the pole brackets with straps. |
| c) | Service Clamps | To provide the service connections to consumers. |
| d) | Service Pole Brackets | To provide an anchoring point for service clamps |

4.0 Anchoring Clamp for Neutral Messenger:

Anchoring assemblies are used to firmly attach the messenger of ABC to a concrete or steel pole and transmit the mechanical tension.

- at the end of a run
- at a major change in direction of over 30 degrees.

The clamp should consist of an Aluminum alloy corrosion resistant casted body or climatically resistant polymer material, flexible rope sling (“bail”) of stainless steel and self-adjusting plastic wedges which shall anchor/hold the neutral messenger without damaging the insulation, if any.

- There shall be no loosable part in the process of clamping arrangement.
- Slip strength should be not less than 90% of the strength of the messenger.
- Mechanical strength should be not less than slip strength & no permanent deformation more than 10 mm should occur during slip test.

5.0 Anchoring Assembly

Each Anchoring Assembly shall include:

One number pole bracket.

- One number wedge type tension clamp as described above

Anchoring assemblies shall be supplied in sets to ensure compatibility of the materials against corrosion and wear of moving parts.

- The above hardware/ accessories shall be suitable for use with LT Aerial Bunched XLPE Insulated cable conforming to IS: 14255/1995.

5.1 Pole Bracket for Anchoring Assembly

The pole bracket shall be made out of a single piece Aluminum alloy made of gravity die casting and further heat treated to required strength. Extruded aluminum brackets are not allowed due to sharp corners. The brackets shall be suitable for attachment to a pole by two stainless Steel straps of length 0.75 meter and width 20mm \pm 0.2 x 0.7mm \pm 0.05 and buckle as described later in this specification. The pole bracket should be designed with a closed hook; to ensure that Flexible rope (Bail) cannot slip out at any angle. The inner side of the bracket should be min 100 mm from the surface of the pole.

The pole bracket should be tested for the loads not less than slip strength of Clamp with the load applied at an angle of 45° from the normal to the surface of mounting of the bracket :-

Table : 2

| Messenger Conductor Size Range (mm²) | T-Start (1 Minute) (KN) | T-Final <30mm & no-break (KN) |
|--|------------------------------------|---|
| 25 - 70 | 12.0 | 15.0 |

5.2 Flexible Rope(Bail) of Anchor Assembly

- a) The Anchoring assembly shall be supplied with a stainless steel flexible Rope to connect the Tension Clamp to the pole bracket.
- b) The flexible Rope forming part of clamp should be of length to maintain at least 150 mm distance between bracket and body of clamp and shall have sufficient mechanical strength to withstand the mechanical test for the complete assembly tests in this specification, as specified in above Table.
- c) The rope should have sufficient flexibility to ease the torsional movement of the ABC System.
- d) The Rope should be pre-fitted with compression type end fittings which needs to be removable and re-fittable at one side of the clamp and locked at the other end of the anchoring clamp.
- e) A wear resistant moveable saddle should be un-loosably fitted on the Rope to prevent abrasion at the point of fitting into the tension bracket. Saddle to be made of plastic for insulation.
- f) Rope should have sufficient mechanical strength to with stand the mechanical test for the complete assembly tests in this specification.

5.3 Wedge Type Tension Clamp of Anchoring Assembly

- a) Wedge type clamps shall be used for clamping the messenger without damaging the insulation in case of insulated messenger or strands in the cable of bare messenger.
- b) The clamp shall be capable of clamping an uncut messenger so that it can continue without break to the connecting point or next span.
- c) The clamp shall be of aluminum or polymeric body with fully insulating type of mechanical and weather resisting thermoplastic wedges for both bare & insulated messenger. The insulating properties should meet the requirements of voltage test .
- d) No bolts or loose parts are allowed as part of the Clamping system.
- e) One tool is required for fitting of each sub lot/ lot of 1000 sets or part thereof .

- f) The clamp shall be self-tightening and capable of holding without slippage the load specified as below:

Table-3

| Messenger Conductor Size Range (mm ²) | | T start (1Minute) (KN) | T final (KN) |
|---|----------|---------------------------|-----------------|
| Section Area (mm ²) | Dia (mm) | | |
| 25 - 35 | 8 – 11 | 8.0 | 10.0 |

6.0 Testing requirement of Anchoring Assembly (For Insulated or bare messenger)

The following tests are intended to establish design characteristics as per

NFC-33-041:-

| Sr | Test | Type Test | Acceptance Test | Routine Test |
|----|---|-----------|-----------------|--------------|
| a | Visual | | √ | √ |
| b | Dimensional | | √ | √ |
| c | Mechanical & Slip strength | √ | √ | √ |
| d | Voltage | √ | √ | |
| e | Corrosion | √ | | |
| f | Climatic | √ | | |
| g | Mechanical strength of Bracket & SS Strap with Buckle | √ | √ | √ |

6.1 Visual

Design aspects of the anchoring assembly needs to be visually verified as per the descriptions of this specification and criteria defined by the manufacturer in the quality plan and as accepted by customer. Following Mandatory marking should be available.

6.2 Marking

The marking allowing the identification of the samples shall be legible when examined with normal or corrected vision, without magnification.

- a) Manufacturer`s name or logo or trade name
- b) AVVNL/TN No.
- c) Product Reference

6.3 Dimensional

Overall dimensional to be verified against the GA Drawings. All dimensional requirement mentioned in this specification should be verified. The manufacturer may have his own design, provided the design is conforming to the technical requirements of this specification with minimum dimensions as shown in the specifications.

6.4 Mechanical & Slip Strength Test:

No continuous slippage of slippage of neutral messenger nor clamp break down should occur before the value specified in Table-4

After fitting the messenger in the clamp, load should be increased to 90% of breaking load of Messenger held for 1 minute.

6.5 Voltage Test

- Voltage test is carried out on anchor clamps to ensure no damage is caused to the insulated messenger and no separate earthing of pole is required in case of bare messenger.
- A conductive rod of dia. corresponding to the average dia. that can be accommodated in the clamp is fitted into the clamp, protruding by approx. 50mm at each end of the tightening piece
- A power frequency voltage of 6 kV is applied for 1 minute between the rod and conductive part of the clamp or fixation point in absence of conductive part.
- No break down or flashover shall occur (tripping of voltage generator)

6.6 Corrosion test

This test is carried out on the anchoring assembly which is subjected to corrosion test as per NFC 33003 or equivalent IS Standard.

6.7 Climatic Ageing test

This test is carried out anchoring assembly which is subjected to corrosion test as per NFC 20540.

7.0 SUSPENSION ASSEMBLY FOR INSULATED OR BARE NEUTRAL MESSENGER:

Suspension Assembly is used for supporting an ABC by installation on the messenger at an intermediate point of support such as a pole. It can accommodate small angles of deviation upto 30 deg.

The clamp should be designed to hang L T AB cable with bare or insulated neutral messengers. The neutral messengers should be fixed by an adjustable grip device. A movable link should allow longitudinal and transversal movement of the clamp body.

- There should be no loosable part in the process of clamping arrangement.
- The clamp and the link should be made of Polymer to provide an additional Insulation between the cable and the pole to eliminate need for earthing.
- The clamps and movable links should be made of weather and UV resistant polymer.
- Clamps should be fixed to the pole by aluminum bracket. Bracket should be made of corrosion resistant aluminum alloy made out of gravity die casting process and further heat treated to required strength. Extruded aluminum brackets are not allowed due to sharp corners. Brackets should suitable for fixing to pole by means of two S S Strap of 20mm \pm 0.2 x 0.7mm \pm 0.05 mm and SS Buckles.

Each Suspension Assembly shall consist of:

- One number Suspension Bracket.
- One number moveable (articulated) connecting link.
- One number Suspension Clamp.

Suspension Assemblies shall be supplied in sets to ensure compatibility of the materials against corrosion or wear of rotating/moving parts.

- Ultimate tensile strength of the clamp should not be less than 90% of messenger strength in direction perpendicular to the direction of the messenger.
- The above hardware/ accessories shall be suitable for use with LT Aerial Bunched XLPE Insulated cable conforming to IS: 14255/1995.

7.1 Suspension Clamp of Suspension assembly:

- Suspension Clamps are used for locking the messenger of the ABC Bundle without damaging the insulation if any or allowing the messenger to become dismounted from the fitting.
- The suspension clamp shall be made fully of insulating type of mechanically strong and weather resistant plastic.
- The suspension clamp shall be suitable for messenger wire sizes from 16 to 35 sq mm shall be capable of holding the neutral messenger up to the vertical load value mentioned in table 5 below
- Suspension Clamps for bare messengers shall be different from and easily distinguishable from those for insulated messengers
- One tool is required for fitting of each sub lot/ lot of 1000 sets or part thereof .
- There should be no loosable parts in the Suspension clamp.
- The suspension clamp shall be unloosably fitted to the suspension assembly.

Table-5

| Messenger Conductor Size Range (mm ²) | | T start (1Minute) (KN) | T final (1Minute) (KN) |
|--|----------|---------------------------|---------------------------|
| Section Area (mm ²) | Dia (mm) | | |
| 25 - 70 | 6 - 14 | 10 | 12.0 |

7.2 Movable (articulated) link of Suspension assembly.

Movable links are used between the suspension bracket and the suspension clamp to allow a degree of movement and flexibility between the two.

- Movable links should be made fully of insulating type of mechanically strong and weather resistant plastic.
- The movable link shall be unloosably fitted to the suspension assembly.

7.3 Suspension Bracket of Suspension assembly

The Suspension Bracket shall be made from single piece aluminum alloy suitable for attachment to a pole by

- a. Two stainless steel straps of length 0.75 meter and width 20mm ± 0.2 x 0.7mm ± 0.05 mm and S S buckles.

The Suspension Bracket shall be provided with an upper bulge to prevent the clamp from turning over on the Bracket for more than 45° from the horizontal or to within less than 60 mm from the pole. The Suspension Bracket should be so designed to ensure that the Movable link cannot slip out of it.

8.0 TESTING REQUIREMENTS OF SUSPENSION ASSEMBLY

Following tests are intended to establish design characteristics as per NFC 33-040.

| S.No. | Test | Type Test | Acceptance Test | Routine Test |
|-------|---|-----------|-----------------|--------------|
| a | Visual | | √ | √ |
| b | Dimensional | | √ | √ |
| c | Mechanical & Slip strength | √ | √ | √ |
| d | Voltage | √ | √ | |
| e | Corrosion | √ | | |
| f | Climatic | √ | | |
| h | Mechanical strength of Bracket & SS Strap with Buckle | √ | √ | √ |

8.1 Visual

Design aspects of the suspension assembly needs to be visually verified as per the descriptions of this specification and criteria defined by the manufacturer in the quality plan and as accepted by customer. Following Mandatory marking should be available.

8.2 Marking:

Following Mandatory marking should be available:-

- a) Manufacturer`s name or logo or trade name

b) AVVNL/TN NO.

c) Product Reference

8.3 Dimensional

Overall dimensional to be verified against the GA Drawings. All dimensional requirement mentioned in this specification should be verified. The manufacturer may have his own design, provided the design is conforming to the technical requirements of this specification with minimum dimensions as shown in the specifications.

8.4 MECHANICAL AND VOLTAGE TEST

a) Mechanical Strength Test:

No continuous slippage of slippage of neutral messenger nor clamp break down should occur before the value specified in Table-5.

b) Longitudinal Slip test :

There should not be any slip of more than 3 mm in the messenger below 300 N.

c) Voltage Test:

Clamp subjected to a voltage test of 6KV between the conductive parts / fixation and a copper foil which is covered over the maxi allowable cable placed inside the groove of the clamp.

No break down or flashover shall occur (tripping of voltage generator).

8.5 Corrosion Test

This test is carried out on the suspension assembly which is subjected to corrosion test as per NFC 33003 or equivalent IS Standard.

8.6 Climatic Ageing test

This test is carried out suspension assembly which is subjected to corrosion test as per NFC 20540.

9.0 Stainless Steel Strap and Buckles :

The stainless steel strap shall consist of:

- a) Stainless steel strap of size 20mm ± 0.2 x 0.7mm ± 0.05 mm and shall have tensile strength of 7.5KN min., elongation 30% Min, finish 2B, and the stainless steel material shall be of high mechanical strength, corrosion and wear resistant as per ASTM SS 202.

- b) Tensile strength of strap is to be min 7.5KN to be tested on a loop with buckle. Number of loops for mounting the bracket on pole to be allocated as per load requirement for dead-end and suspension clamp specified in this specification.
- c) Min two loops of 0.75 meter each with one buckle to be considered for attaching the brackets to the poles. For dead-end or suspension pole bracket a total of 1.5 meter of SS Strap and two buckle are required.
- d) The SS Strap should be engraved with the name of the Manufacturer, month and year of manufacturing and length at a distance of approximate 250 mm for traceability.
- e) The S S buckle to suit above strap shall be used to tension & fix it. It should have a slot width of not less than 20.5 mm x 1.5 mm.
- f) The Buckle should be made from ASTM SS 304 of thickness not less than 1.2 mm.
- g) S S Strap must be supplied in 50 meter roll in plastic dispenser casing with indication of remaining length.
- h) Buckles should be supplied in plastic bags containing 100 pcs per bag.

10.0 TEST REQUIREMENTS FOR STAINLESS STEEL STRAP AND BUCKLES :

Type tests on SS Straps and Buckles shall consist of Chemical Analysis Test Report of Composition. In addition the SS Strap should have been type tested for Tensile Strength and Ultimate Elongation.

| S. No. | Test | Type Test | Acceptance Test | Routine Test |
|--------|------------------------------------|-----------|-----------------|--------------|
| 1 | Visual | | √ | √ |
| 2 | Dimensional | | √ | √ |
| 3 | Tensile | √ | √ | √ |
| 4 | Chemical and Mechanical Properties | √ | | |

11 Visual

Design Aspects of the Stainless Steel straps needs to be visually verified as per the descriptions of this specification and criteria defined by the manufacturer in the quality plan and as accepted by customer. Following Mandatory marking should be available.

- a) Manufacturer`s name or logo or trade name
 b) AVVNL/TN NO.
 c) Product Reference

11.1 Mechanical & Voltage Tests :**a) Mechanical Strength Test:**

One loop of SS strap with a length of 0.75 meter and strapped with a buckle should withstand a min load of 7.5 kN.

TECHNICAL SPECIFICATION FOR SUPPLY OF (A) 33 KV LINE DP (B) 1.8 METRE LONG MS CHANNEL BRACKET WITH CLAMP (C) 1.4 METRE LONG MS CHANNEL BRACKET WITH CLAMP (Galvanized)**1. SCOPE**

This specification covers fabrication, testing & delivery of fabricated steel items as a complete package, complete in all respect as per GTP/Drawings (to be provided by the purchaser to the successful bidder).

2. STANDARDS :

All materials and equipments shall comply in all respect with the requirements of the latest edition of the relevant Indian Standard Specification(s) except as modified in this specification. Where the relevant ISS is not available, the material / equipment should comply the latest BSS. All the items should be made / fabricated/tested from steel sections conforming to IS:2062 (latest amended).

3. MARKING

Each individual structure / section shall carry a code number conforming to component number given to it in the drawing / Bill of material. The code number of approved size shall be stamped with a metal dye of 16 mm size on the member and shall be legible. The name of manufacturers in suitable code and the word “AVVNL” & “TN No” shall also be stamped / punched on each individual section with metal dye of not less than 16 mm size.

If the above marking is not found on the material received in the stores, the receipted challan shall not be given by the concerned stores. The challan shall only be issued after verification of material by the Store officer.

3. INSPECTION, TESTING & CHECKING :

The finished product before acceptance shall be subject to inspection in respect of workmanship, checking of dimension/weight & testing as per requirement of relevant IS:2062 (latest amended), approved drawings and bill of material, at the suppliers works if not supported by test certificates of main producers viz. SAIL/TISCO/RINL. The certificate for type test (chemical composition & mechanical properties test) issued by prime producer(s) shall be furnished along with the inspection call to the SE(Proc.), otherwise testing shall be arranged at independent Lab on the cost of supplier. The certificate and relevant invoices shall be in the name of the firm on whom the order is placed by the Nigam. **In case bidder use the steel sections manufactured by prime producers then the inspecting officer shall verify and record in the inspection report regarding stamping and mark of prime producers.** The certificate(s) in the name of other parties/ sources shall not be accepted and in such cases the tests for chemical and mechanical properties shall have to be arranged in the presence of inspecting officer(s) at recognized lab.

The supplier shall present the latest Calibration Certificate(s) of testing instruments/ equipments to be used for the testing of the material covered in the purchase order to the authorized inspecting officer/inspecting agency of the purchaser. The testing instruments/ meters/ apparatus etc. should be got calibrated by the supplier from time to time from independent test laboratory/ house having valid accreditation from National/ Accreditation Board for testing and calibrating laboratories for testing equipments/ original manufacturer having trace ability to NABL/NPL or equivalent.

The calibration certificate(s) should not in any case be older than one year at the time of presenting the same to the inspecting officer/inspecting agency of the purchaser. The testing instruments/equipments should be duly sealed by the Calibrating agency and be indicated in the calibration certificate(s).

The following facilities are to be provided by the supplier at his own cost to the inspecting officer of AVVNL.

- (a) Suitable accommodation.
- (b) Local conveyance between arrival point, place of stay, works and departure point.
- (c) The supplier shall assist in arranging return ticket and reservation on the request of the inspecting officer for which the payment shall be made by the inspecting officer. In case of joint inspection, single or shared double room accommodation shall be provided.

5. TESTS

Test before dispatch:- The various steel section/structure before dispatch shall be subject to following test as per IS:2062(latest amendment) at the manufacturer's works

Routine test/acceptance test

- i. Dimensional checking and visual inspection
- ii Weight checking
- iii Chemical composition test
- iv Mechanical property test
- v Galvanization test

6. TOLERANCE IN DIMENSIONS :

The tolerance(s) shall be permissible as per IS: 1852: (latest amended). Further the following tolerance(s) on fabricated items will also be allowed.

- | | |
|--|------------------|
| i) Tolerance in overall length | $\pm 3\text{mm}$ |
| ii) Tolerance in edge dimensions (Centre of hole to end) | $\pm 2\text{mm}$ |
| iii) Tolerance in hole Centre | $\pm 2\text{mm}$ |
| iv) Circular holes | No tolerance |
| v) Weight Tolerance | +2% to (-) 4% |

7. GUARANTEED TECHNICAL PARTICULARS :

The bidder shall furnish the guaranteed technical particulars of the. Any item of the GTP left unfilled or simply written as per ISS etc. shall be considered as incomplete GTP and such tender is liable to be rejected.

8. CRITERIA FOR ACCEPTANCE

The inspected material should be strictly in accordance to the GTP of the specification otherwise the material shall be treated as rejected and shall not be accepted.

9. WEIGHT

The weight of structure shall mean the weight of structures calculated by using standard sectional weights of all steel structural members of the sizes indicated in the fabrication drawings and/or

subsequently revised drawings and bill of material without taking into consideration the reduction in weight due to drilling of bolt-holes, skew cuts, chamfering etc. or the increase in weight due to galvanization.

The material shall be acceptable if found within permissible tolerance limit i.e. +2% and (-)4%.

TECHNICAL SPECIFICATION FOR SUPPLY OF GALVANISED M.S.BOLTS & NUTS OF ASSORTED SIZE

1. SCOPE

The specification covers the manufacture, design, inspection, testing before dispatch, marking, packing and delivery at the consignees headquarter of M.S. Bolts & Nuts for 33 KV & 11 KV Sub-transmission line/sub-station, and operation & maintenance work.

2. STANDARDS

The relevant Indian Standard Specification(latest amended) to which the material shall conform are as follows:-

| S.No. | Particulars | For M.S. Bolts & Nuts |
|-------|----------------------|--|
| 1 | Grade | Grade "C" as specified in IS-1367(Part-2)/2002. |
| 2 | Dimension | Nominal dia-16 mm length of bolt(IS-1363 Pt-I-1992 40,100,250,300 mm Length of Nut-15 mm (IS-1363-Part-III/1992 (with latest amendments) |
| 3 | Raw material | Low or medium carbon steel. |
| 4 | Tolerance | As per (IS:1367 Part-II)/ |
| 5 | Chemical composition | For Bolt:IS:1367 Part(Pt-III/1991) For Nut: IS:1367 (Pt.VI)/1980 |
| 6 | Testing | For Bolt:IS:1367 Part(Pt-III/1991) For Nut: IS:1367 (Pt.VI /1980) |
| 7 | Sampling | IS:2614-1969 for Bolts & Nuts |

The M.S. Bolts & Nuts shall be purchased from the bidder who have valid ISI license. The bidder should furnish the copy of valid BIS License with the bid otherwise their offer shall be ignored.

3. FINANCIAL RESOURCES AND EXPERIENCE

The bidder shall furnish the details regarding his previous experience in performing similar comparable work, the technical strength and manufacturing facilities available and also financial capability along with the tender. The bidder is also required to furnish the following information.

- a. Standing of the firm as manufacturer/supplier
- b. Approximate qty., manufacture/supplied so far at his works on monthly basis.

c. Testing facilities available at his works

4. WORKMANSHIP

The characteristic and properties of finished product required are as detailed below:-

For Bolts & Nuts: (Properties class)

- i) Properties class for bolts required. : 4.6 as specified in IS:1367-Part-II
 ii) Properties class for nuts required : 5 as specified in IS:1367-Part-III/1980

CHEMICAL COMPOSITION

i) For Bolts: (IS-1367 Part-III) 1991

| | |
|---------------|------|
| Carbon % max. | 0.55 |
| Phosphorous % | 0.05 |
| Sulphur % | 0.06 |

ii) For Nuts:

| | |
|---------------|------|
| Carbon % max. | 0.50 |
| Phosphorous % | 0.12 |
| Sulphur % | 0.34 |

MECHANICAL PROPERTIES:

i) For Hexagonal Bolts:(IS-1367 Part-III)1991

- a) Tensile strength(to be arranged on size 150 mm & above) : N/mm sq. 400 (min)
 b) Stress under proof load. : N/mm sq. 225 (min)
 c) Brinell Hardness : HB 114(min) to 238 max.
 d) Rockwell hardness : HRB-Max. 67(min.) to 99.5 max.
 e) Vickers harness : HV 120 (min) to 250 max.
 f) Elongation after fracture : 3 Min. 22%
 g) Strength under wedge loading
 (to be arranged on size above 40 mm) : N/mm sq. 400 (min)
 h) Head soundness : No fracture

ii) For Hexagonal Nuts(IS:1367 Part-VI/1980 Table4)

- a) Proof stress. : N/mm sq. 610 (min)

b) Vicker Hardness

: HV-Min. 130 HV-Max. 302

5. ISI CERTIFICATION AND TYPE TEST CERTIFICATE

The supplier must hold the license of ISI mark. If supplier do not have ISI mark license at the time of submission of tender documents, the same must be submitted before commencement of supplies, otherwise supplies shall not be accepted. Consequences on this account shall be to the suppliers account. .

The bidder shall furnish valid and authenticated type test certificates from a Govt. approved / Govt. Recognized / NABL Accredited laboratory / ILAC i.e. International Accreditation Corporation (in case of foreign laboratory) of similar rating and design of tendered material / equipment. Such type test certificates should not be older than 3 years as on the date of bid opening. For this purpose date of conducting type test will be considered.

The type test certificate by in house laboratory of bidding firms even if it is Govt. approved / Govt. Recognized / NABL Accredited laboratory / ILAC accredited, shall not be accepted, in case of their own bid. This will not apply if bidding firm is Govt. Company / Public sector undertaking.

The bidder should furnish documentary evidence in support of laboratory whose type test have been furnished, that the said laboratory is a Govt. / Govt. approved / Govt. Recognized / NABL Accredited laboratory / ILAC accredited (in case of foreign laboratory). The type test certificate shall be furnished either in original or copy duly attested by Notary.

TYPE TESTS

The following tests shall constitute the type tests and shall be carried out as per relevant IS:1367 Part-III.

- 1) Chemical Composition Test
- 2) Test for Mechanical Properties for Hexagonal Bolts
 - a) Tensile strength
 - b) Yield stress
 - c) Stress under proof load
 - d) Brinell Hardness
 - e) Rockwell Hardness
 - f) Vickers Hardness
 - g) Elongation after Fracture
 - h) Strength under Wedge loading
 - i) Head soundness
- 3) Test for Mechanical Properties for Hexagonal Nuts.
 - a) Proof Stress
 - b) Vickers Hardness

ROUTINE/ACCEPTANCE TEST

The following tests shall be got conducted in presence of purchasers representative as per relevant IS:1367 Part-III/1991 with latest amendment for Bolts and IS:1367 Part-VI/1980 with latest amendment for Nuts on the samples taken from the offered lot material for the purpose of acceptance of that lot of material.

- 1) Chemical Composition Test.
- 2) Test for Mechanical properties for Hexagonal Bolts:

- a) Tensile strength
 - b) Yield stress
 - c) Stress under proof load
 - d) Brinell Hardness
 - e) Rockwell Hardness
 - f) Vickers Hardness
 - g) Elongation after Fracture
 - h) Strength under wedge loading
 - i) Head soundness
- 3) Test for Mechanical Properties for Hexagonal Nuts:
- a) Proof stress
 - b) Vickers Hardness

6. MARKING

The bolts shall be marked with the following symbols on the top surface of the bolt head, either embossed or Indented, as given below:-

- (a) The Manufacturer's identification symbol
- (b) Property class
- (c) The material shall be marked as per the requirement of IS-1367 (Pt.XVIII)/ 1979 for Bolts & Nuts.

7. PACKING AND FORWARDING

The packing of material shall be made in two bags one HDP bag (inner) and one gunny bag (outer) or in double gunny bag, containing 50 Kg weight of Bolts & Nuts(Net wt.). The packing should be capable to bear transportation hazards. The packing shall be such as to protect the material from the atmospheric effect like rains, humidity etc. The packing shall bear the marking as under:-

- a) Certification regarding ISI
- b) Particulars of material(s)
- c) Quantity
- d) Manufacturer's identification mark
- e) Complete dispatch details like name of the consignee and destination etc.

8. TESTING OF MATERIAL AT CTL

The material received in stores shall be subject to test checking at CTL of Nigam before final acceptance of material. The procedure for the same shall be as under:-

(i) Sampling:-

5 samples out of 1 MT Nuts and Bolts of assorted size or part thereof from each inspected lot received in stores shall be selected for test checking of material and shall be got tested. The sample selection shall be done as soon as material is received in stores without the presence of representative of supplier. However testing of sample(s) at CTL shall be carried out in presence of representative of supplier after identification of sample by supplier's representative.

(ii) Tests

The following tests shall be carried out on the above items:-

- (a) Visual examination
- (b) Verification of dimension as per specification/ GTP/IS.

Testing shall be got done at the test laboratory of the Nigam i.e. CTL. For witnessing of the testing clear 7 days' notice shall be given to the supplier stating date, time and place where the test is to be conducted. In case the supplier do not attend for witnessing the testing, the testing shall be proceeded and completed and action taken as per the contract.

9. CRITERIA FOR ACCEPTANCE

The material received in the stores shall finally be accepted provided the selected samples passes the test in CTL. The sample(s) shall be subject to verification of dimension as per specification/GTP and will be accepted as per tolerances specified in specification/ relevant IS: The material will be accepted as per GTP/IS.

The Executive Engineer (CTL) shall send copies of test reports to the purchaser, consignees and the supplier.

TECHNICAL SPECIFICATION FOR SUPPLY OF GALVANISED M.S.ROD TYPE EARTHING SET WITH CLAMPS AND G.I. WIRE

1. SCOPE

This specification covers design, manufacture, inspection and testing before dispatch, supply and delivery at consignees headquarter of Galvanized M.S.Rod type earthing sets with clamps and G.I. wire. The earthing sets shall be used to protect the 33 KV, 11 KV & LT lines and sub-stations from faulty currents.

2. STANDARDS

The relevant ISS: to which this material shall conform is indicated as below:-

For fabricated material

- (i) Raw material test (Manufacturer's Raw material test certificate as per ISS: 2062- Grade 'A')
- (ii) Galvanization test as per relevant IS:2633.
- (iii) Checking/verification of Dimension etc. as per approved drawing.
- (iv) Sampling for workmanship and dimension checking 3% of each lot and as per ISS- 4711-1976.

For Galvanized steel wire:

- (i) As per IS: 280(latest addition)
- (ii) Testing as per IS:7887 Grade-III

3. MARKING

Each bundle of earthing sets shall be legibly marked with the physical condition, weight, date of manufacture, trade mark or the name of manufacturer. The material which is inspected and cleared for dispatch shall be sealed with the AVVNL seal.

4. PACKING AND FORWARDING

The Galvanized M.S.Rod type earthing sets shall be supplied in bundles (containing all items) and shall be suitably bound and fastened compactly and shall have a maximum weight of 400 Kgs. The bundles will be suitably protected by wrapping round by hession cloth/polythene cover to avoid damage in transit and corrosion

5. TEST CHECKING OF MATERIAL

The material received in stores shall be subject to test checking in the test laboratory of Nigam (CTL) before final acceptance of material. The procedure for the same shall be as under:-

(i) One sample out of each sub-lot/lot of 2000 sets or part thereof from each inspected lot received in stores shall be selected for test checking of material and shall be got tested. The sample selection shall be done as soon as material is received in stores without the presence of representative of supplier. However testing of sample(s) at CTL shall be carried out in presence of representative of supplier after identification of sample by supplier's representative.

(ii) Tests

The following tests shall be carried out on the selected samples at CTL .

- (i) Visual examination
- (ii) Verification of dimension as per specification/ GTP/approved drawings.
- (iii) Galvanization uniformity test
- (iv) Weighment of selected sample

6. CRITERIA FOR ACCEPTANCE

(A) Verification of dimension.

The sample(s) shall be subjected to verification of dimension checkup as per specification/GTP/approved drawings and will be accepted as per tolerances specified in specification/ relevant IS: The material will be accepted to any extent if tolerances are in positive side. If tolerances are in negative side then the material shall be accepted to the extent as specified in IS, without any deduction. If the dimensions are in negative side beyond the specified tolerances in IS then it will be accepted to the extent double the negative side tolerance as specified in IS but with following deductions:-

(a) for M.S.Rod:- 2% of the cost of material

(b) Other parts :- 1% of the cost of material

If the dimensions are beyond double the permissible negative tolerance then material shall be rejected and the supplier shall replace at his own cost.

(B) Galvanization (Uniformity) test

- (i) The sample shall be first tested for (n-2) number of dips where (n) is specified number of dips in the contract. If the sample(s) does not pass the uniformity of galvanization test for (n-2) dips, the **material shall be rejected** and the material relating to relevant lot/sub-lot to which sample(s) pertains shall have to be replaced by the supplier free of cost.
- (ii) If the sample(s) has passed the uniformity of galvanization test for (n-2) dips, then it shall be tested for (n-1) dips. If the sample has not passed the uniformity of Galvanization Test with (n-1), then material pertaining to relevant lot/sub-lot shall be accepted with a **deduction @ 10% of cost of material.**
- (iii) If the sample(s) has passed the uniformity of Galvanization Test with (n-1) dips, then sample shall be tested for last one dip of one minute to complete the test for 'n' dips. If the sample does not pass the uniformity test with specified number of dips i.e. 'n' dips, then material pertaining to relevant lot/sub-lot shall be accepted with a **deduction @ 5% of cost of material.**

BILL OF MATERIAL

The bill of material for galvanized M.S.Rod type earthing set with clamps and wire as under:-

| S.No. | Particulars | Unit | Quantity |
|-------|--|------|----------|
| 1 | Galvanized M.S. Rod 20 mm dia electrodes having 3 Meter length | No. | 1 |

| | | | |
|---|---|------------------------|---|
| 2 | Galvanized Earthing clamp of M.S.Flat of size 50x6 mm 220 mm length. One welded with earth electrode and loose to be bolted | Set (Two Pieces) | 2 |
| 3 | Galvanized Bolts, Nuts and Spring washers. | No. | 2 |
| 4 | G.I.Wire Size 8 SWG of 15 Meter length | No. | 1 |

TECHNICAL SPECIFICATION FOR SUPPLY OF HOT DIP GALVANISED STEEL STAY WIRE

1. SCOPE

This specification covers, manufacture, design, inspection ,testing before dispatch & delivery at consignees head quarter of following sizes of hot dip heavily galvanized stranded steel stay wire, complete in all respect as per GTP/ISS

- i) Hot dip galvanized steel stay wire of 550-900 N/mmQuality confirming to IS-2141/2000 in all respectIncluding chemical composition (Heavily coated Hard quality) of dia 7/3.15 mm(7/10 SWG)

2. STANDARDS

The finished material shall comply in all respect with the requirement of the latest edition of the relevant ISS as mentioned below:-

- (i) The hot dip galvanized stranded steel stay wire (heavily coated) shall comply with the ISS:2141/2000, 4826/1979 and 6594/1977 with latest amendments thereof, if any in all respects, except herein otherwise stated, corresponding to grade-4 550-900 N/mm sq. minimum tensile strength quality. The galvanization coating of galvanized steel wire and technical supply conditions shall conform to IS:4826/1979 and IS:6594/1977 or latest amendment thereof if any.
- (ii) Goods meeting other authoritative standards which ensure an equal or higher quality than the standards mentioned above will also be accepted.
- (iii) The galvanized stranded steel stay wire shall be capable of withstanding the normal handling necessary for transportation and erection.

3. WORKMANSHIP:

The wire shall be manufactured from steel made by any suitable process(es) as mentioned in IS:2141/2000 & 7887/1975 and shall not contain sulphur and phosphorus exceeding 0.060 percent each.

Each coil shall be warranted to contain the joints only as permitted under relevant IS:2141/2000.

The galvanized stranded steel stay wire shall be well and clearly drawn to the dimension specified. The wire shall be free from scale, irregularities, imperfections, flaws splits and other defects and shall be uniformly galvanized having smooth and even zinc coating. The requirement for chemical composition of the wires shall conform to the value as specified in IS/7887/1975 and IS:280/1978.

4. ISI CERTIFICATION

The supplier must hold the license of ISI mark. If supplier do not have ISI mark license at the time of submission of tender documents, the same must be submitted by the bidder up to the official working hours of one working day prior to the schedule / notified date of opening of price bid.

(A) TEST BEFORE DESPATCH: The stay wire shall be subject to the following tests as per ISS at manufacturer's works before dispatch,.

ROUTINE/ACCEPTANCE TEST:- The following tests on selected samples as per relevant standard shall be got conducted in presence of purchaser's representative.

- i) Tensile and Elongation test
- ii) Adhesion and wrap test
- iii) Zinc uniformity and coating test
- iv) Chemical analysis test
- v) Dimension and weighment checkup of sample coils.
- vi) Lay ratio

(B) SAMPLING PLAN:

As per the provisions of IS:2141/2000.

(C) TOLERANCE ON TEST RESULTS

- i) Weight of the coil – 40-60 Kg per coil.
- ii) Dia of wire $\pm 2.5\%$ of wire dia with a minimum of 0.025 mm
- iii) Lay length -12 to 18 times strand dia
- iv) Tensile and elongation test –As prescribed in IS:2141/2000.
- v) Zinc uniformity and coating test – As per IS:4826
- vi) Chemical composition test IS:7887

5. MARKING

Each coil of wire shall be legibly marked with the physical condition, size of wire, weight, date of manufacture trade mark or the name of manufacturer. The material which is inspected and cleared for dispatch shall be sealed with the Nigam's seal.

6. PACKING AND FORWARDING:

The galvanized steel stay wire shall be supplied in coils. Each coil of GSS wire shall have single continuous length and shall be suitably bound and fastened compactly and shall weigh 40 kgs to 60 kgs. The coils will be suitably protected by wrapping round by hessian cloth/polythene cover to avoid damage in transit and corrosion. Each coil shall be marked as mentioned above.

7. TYPE TEST / CHECKING OF MATERIAL AT STORES

The material received in the stores shall be subject to test checking at CTL of Nigam before final acceptance of the material. The procedure for the CTL test shall be as under :

SAMPLING

One sample out of each lot/sub-lot of 400 Nos coils or part thereof from each inspected lot received in stores shall be selected subject to maximum 7 samples for test checking of material and shall be got tested at the CTL of AVVNL. The sample selection shall be done in the presence of supplier or his authorized representative for which advance notice shall be given to the supplier.

TESTS AT CTL

The following tests shall be carried out on the selected samples of G.S.Stay wire as per relevant standards:-

- (a) Uniformity of galvanization test
- (b) Tensile test
- (c) Dimensional check

For witness the test, advance notice to the supplier shall be given by CTL, stating date, time. In case the supplier do not attend for witnessing the testing, the testing shall be proceeded and completed and action shall be taken as per the contract.

The test reports shall be furnished to the purchaser, consignee and supplier.

8. CRITERIA FOR ACCEPTANCE OF ABOVE TEST

The inspected material should be strictly in accordance to the relevant ISS / GTP of the specification, however, the material shall be accepted on the basis of test results found/observed during test at CTL as mentioned below.

- (a) For uniformity of galvanization test.
 - (i) The sample shall be first tested for (n-1) number of dips where n is specified No. of dips of one minute in the contract. If the sample does not pass the uniformity of galvanization test for (n-1) dips, the material shall be rejected and the relevant lot/sub-lot to which the sample pertains shall have to be replaced by the supplier free of cost.
 - (ii) If the material has passed the uniformity of galvanization test for (n-1) dips then it shall be tested for last one dip of one minutes to complete the test for 'n' dips. If the sample does not pass the uniformity of Galvanization Test with 'n' then material pertaining to relevant lot/sub-lot shall be accepted with a deduction @ 5% of cost of material
 - (iii) If the sample(s) have passed the Test with number of dips as specified in the contract (n) , then material pertaining to relevant lot/sub-lot shall be accepted.
- b) Tensile test:-If the material fails in tensile test the same shall stands rejected.
- c) Dimensional check:- If the material fails in dimensional check the same shall stands rejected.

TECHNICAL SPECIFICATION FOR SUPPLY OF G.S WIRE SIZE 6 SWG AND 8 SWG**1. SCOPE**

This specification covers design, manufacture, inspection, testing before dispatch & delivery at consignee's headquarter of following sizes of hot dip heavily galvanized steel wire, complete in all respect as per GTP/ISS

Hot dip galvanized steel wire of 550-900 N/mm

- (i) Quality confirming to IS-280/1978 (latest amended) in all respect including chemical composition (Heavily coated Hard quality) of dia 4 mm
- ii) Hot dip galvanized steel wire of 550-900 N/mm
Quality confirming to IS-280/1978 (latest amended) in all respect including chemical composition (Heavily coated Hard quality) of dia 5 mm

2. STANDARDS

- i) The hot dip galvanized steel wire (heavily coated) shall comply with the ISS:280/1978, with latest amendments thereof, if any, corresponding to grade-4, 550-900 N/mm sq. minimum tensile strength quality in all respects, except herein otherwise stated.
- ii) The galvanization coating of galvanized steel wire and technical supply conditions shall conform to IS: 4826/1979 and IS:6594/1977 or latest amendment thereof if any.
- iii) Goods meeting other authoritative standards which ensure an equal or higher quality than the standards mentioned above will also be accepted.
- iv) The galvanized stranded steel wire shall be capable of withstanding the normal handling necessary for transportation and erection.

1. ISI CERTIFICATION AND TYPE TEST CERTIFICATE

The supplier must hold the license of ISI mark. If supplier do not have ISI mark license at the time of submission of tender documents, the same must be submitted by the bidder up to the official working hours of one working day prior to the schedule / notified date of opening of price bid.

(A) TEST BEFORE DESPATCH: The G.S wire shall be subject to the following tests as per ISS at manufacturer's works before dispatch,.

ROUTINE TEST/ACCEPTANCE:- The following tests as per relevant standard shall be got conducted in presence of purchaser's representative.

- (i) Tensile and Elongation test
- (ii) Adhesion and wrap test
- (iii) Zinc uniformity and coating test
- (iv) Chemical analysis test
- (v) Dimension and weight checkup of sample coils.
- (vi) Lay ratio

(B) SAMPLING PLAN: As per the provisions of IS:280/1978.

(C) TOLERANCE ON TEST RESULTS as per IS:280/1978

- (i) Weight of the coil – 40-60 Kg per coil.
- (ii) Dia of wire
- (iii) Lay length, wrap test
- (iv) Tensile and elongation test
- (v) Zinc uniformity and coating test
- (vi) Chemical composition test

4. MARKING

Each coil of wire shall be legibly marked with the physical condition, size of wire, weight, date of manufacture trade mark or the name of manufacturer. The material which is inspected and cleared for dispatch shall be sealed with the Nigam's seal.

5. PACKING AND FORWARDING:

The galvanized steel wire shall be supplied in coils. Each coil of GS wire shall have single continuous length and shall be suitably bound and fastened compactly and shall weigh 40 kgs to 60 kgs. The coils will be suitably protected by wrapping round by hessian cloth/polythene cover to avoid damage in transit and corrosion. Each coil shall be marked as mentioned above.

6. TYPE TEST / CHECKING OF MATERIAL

The material received in the stores shall be subject to test checking at CTL of Nigam before final acceptance of the material. The procedure for the CTL test shall be as under :

SAMPLING

One sample out of each lot/sub-lot of 400 Nos coils or part thereof from each inspected lot received in stores shall be selected subject to maximum 7 samples for test checking of material and shall be got tested at the CTL of AVVNL. The sample selection shall be done in the presence of supplier or his authorized representative for which advance notice shall be given to the supplier.

TESTS AT CTL

The following tests shall be carried out on the selected samples of G.S. wire as per relevant standards:-

- (a) Uniformity of galvanization test
- (b) Tensile test
- (c) Dimensional check

For witness the test, advance notice to the supplier shall be given by CTL, stating date, time. In case the supplier do not attend for witnessing the testing, the testing shall be proceeded and completed and action shall be taken as per the contract.

The test reports shall be furnished to the purchaser, consignee and supplier.

TECHNICAL SPECIFICATION OF 11 KV CTPT METERING SETS

3.01 SCOPE:

This specification covers the design, manufacture, assembly, testing and delivery of three phase four wire 11 KV/ 110V oil cooled outdoor type combined CTPT units for feeder metering & Indoor type combined CT-PT unit for consumer metering purpose having 1 No. Three phase potential transformer and 3 Nos. single phase paper impregnated oil emerged current transformers for different phases in common tank equipped with weather proof bushing for outdoor use as per technical data incorporated in this specification.

3.02 APPLICABLE STANDARDS:

Unless otherwise modified in this specification, 11 KV CTPT Metering Sets shall comply with the following Indian Standard Specification (latest version):

IS:2705-1992 Specification for current transformers.

IS:3156-1992 Specification for voltage transformers.

IS:5621-1980 Specification for Insulators/Bushing

IS:2099-1986 Specification for insulators/ bushing

IS:3347-1986 Specification for Insulators/bushing

IS:335-1983 Specification for new insulating oil

IS : 5561 Specification for terminal connectors.

Equipments conforming to any other international standard(s) which ensure(s) equal or better quality than the standard(s) mentioned above will also be acceptable and in such case(s) the copy of standards (English version) adopted should be provided.

3.03 11 KV CTPT Metering Sets:

- A) 11 KV Single Phase Current Transformer (3 Nos. for R Y & B phases). The 11 KV current Transformer shall be paper impregnate oil immersed type, single phase 50 HZ conforming to IS:2705/1992 with latest amendment in all respect except where ever modified in this specification.

The 11 KV current Transformer shall have the following technical characteristics/ parameters.

| Sr.No | Particulars | Parameters |
|-------|--|--------------------------|
| i) | Normal system voltage (KV rms) | 11 |
| ii) | Highest system voltage (KV rms) | 12 |
| iii) | Frequency 50 Hz | |
| iv) | Impulse withstand voltage | 95 KV (Peak) |
| v) i) | One minute power frequency dry withstand voltage (on assembled CTPT set) | |
| a) | primary (KV r.m.s.) | 28 |
| b) | secondary (KV r.m.s.) | 3 |
| ii) | One minute frequency wet withstand voltage (KV Peak) (On assembled CT-PT) | Root 2x28 Rms |
| vi) | Transformation ratio (CT Ratio) | |
| a) | For Consumer Metering | 100/5 A, 50/5 A & 15/5 A |
| b) | For Feeder Metering | 200/5 A |

| | | |
|-------|--|---------------------|
| vii) | Rated output (VA burden) | 10 VA |
| viii) | Class of accuracy | 0.5S |
| ix) | Rated continuous thermal current 1.2 times of rated primary current | |
| x) | Short time thermal current rating 6.4 KA for one second for CT ratio 15/5 A, 18 KA for one second for CT Ratio 50/5 A & 100/5 A 18 KA for 3 seconds for CT ratio 200/5 A | |
| xi) | Rated dynamic current 2.5 times of short time thermal current rating. | |
| xii) | Number of cores | One |
| xii) | Instrument security factor | Not exceeding 5 |
| xiii) | Max. ratio error | As per IS:2705/1992 |
| xiv) | Max. phase angle error | As per IS:2705/1992 |
| xv) | Max. temp. rise over max. ambient temp. of 50 deg. C at rated continuous thermal current at rated frequency and with rated burden. | As per IS:2705/1992 |

B) 11 KV Voltage Transformer:

11 KV voltage Transformer will be used along with CTs of description stated above. This shall be paper impregnate oil immersed type conforming in all respect to the Indian Standards specification IS:3156/1992 with latest amendment except where modified in this specification.

The 11 KV voltage transformer shall have the following ratings/ technical parameters:

| Sr.No | Particulars | Parameters |
|-------|--|---------------------------|
| i) | Nominal system voltage (KV rms) | 11 |
| Ii) | Highest system voltage (KV rms) | 12 |
| Iii) | Nos. of phases Three | |
| iv) | Impulse withstand voltage (KVP) (on assembled CTPT set) | 95 |
| v) a) | One minute power frequency dry withstand voltage (on assembled CT-PT set) | |
| i) | primary (KV r.m.s.) | 28 |
| ii) | secondary (KV r.m.s.) | 3 |
| b) | One minute frequency wet withstand voltage (KV Peak) (On assembled CT-PT set) | Roots 2x28 rms |
| vii) | Transformation ratio (PT Ratio) | 11 KV/ 110V |
| viii) | Rated output (VA burden) | 30 VA per phase |
| ix) | Class of accuracy | 0.5 (As per IS:3156/1992) |
| x) | Winding connection Star/Star with HT neutral earthed. | |
| xi) | Rated voltage factor and time 1.2 continuous and 1.9 for 30 seconds. | |
| xii) | Temp. rise over max. ambient temp. Within limits of | IS:3156/1992 |
| xiii) | Max. Phase angle error Within limits of | IS:3156/1992 |
| xiv) | Ratio error (Max.) Within limits of | IS:3156/1992 |

3.04 GENERAL TECHNICAL DESCRIPTION OF 11 KV CT-PT METERING SETS:

- i) The CT PT Metering set shall comply to the latest standards mentioned in the specification and guaranteed technical particulars.
- ii) High voltage winding of 11 KV instrument transformers shall have paper insulation impregnated with oil under vacuum. The paper used for insulation shall be of high insulation grade. The process of impregnation shall be detailed out in the tender.
- iii) The core material of CT-PT sets shall be of high grade, non-ageing, electrical silicon steel having low hysteresis loss and high permeability to ensure

- accuracy at both normal and over current/ voltage.
- iv) The instrument transformers shall be contained in a fully weather proof, outdoor type, platform mounting and also suitable for pole mounting type tank with 6 Nos. of 12 KV class weather proof bushing for incoming and outgoing connections.
 - v) The thickness of MS sheet used for fabrication of tank shall be minimum 3.15 MM for sides and bottom and 5 MM for top cover .
 - vi) The 11 KV CT-PT set should have compact construction and the general arrangement Dimensional drawing, mounting arrangement shall be got approved before commencement of supplies.
 - vii) The external surfaces of tanks of CT-PT sets shall be painted with one coat of primer and two coats of synthetic enamel paint of shade No.631 of IS:5. The internal surfaces of the tank shall be painted with two coats of a suitable heat resistant oil insoluble paint.
 - viii) The metering sets shall be supplied with first filling of insulating oil conforming to IS:335 (with latest amendment).
 - ix) The bushings used in the CT-PT sets shall confirm to IS:2099, IS:5621 and IS:3347 (latest amendments). These shall be suitable for operation in heavily polluted atmosphere with creepage distance of 25 MM/KV.
 - x) The minimum clearance between phases and phase to earth as specified in the relevant ISS should be maintained.
 - xi) The paper impregnated oil immersed type instrument transformers shall be complete with all fittings and accessories mentioned at Clause No. 3.06 of this specification.
 - xii) The 11 KV CT-PT sets shall be hermetically sealed type (should not communicate with atmospheric air) in construction without any oil conservator. The quality and work-man-ship shall be of high standard.
 - xiii) For load shedding single phasing is adopted in the 11 KV system. The offered 11 KV CT-PT set shall be suitable for working under such abnormal operation condition.
 - xiv) CT-PT sets shall be used for 3 phase 4 wire KWH metering. As such 11 KV CT PT sets shall have 3 Nos. CTs.
 - xv) The 11 KV CT PT sets shall have one No. of Three Phase Potential Transformer. The primary winding of single phase PT shall be connected in star formation in the tank with common external neutral.
 - xvi) The neutral of primary PT winding shall be floating. The neutral of PT Secondary winding shall be earthed.**
 - xvii) The secondary winding neutral of PT and secondary terminals of CTs and PTs shall be brought out in one single secondary terminal box through 3 KV bushings. The terminals shall be marked as per ISS and supporting marking plate with earth terminal shall be provided. The secondary terminal box compartment shall be divided in two portions - One portion containing secondary of all CTs and the other portion shall contain all secondary Connections with neutral and one body earthed. The whole compartment shall be covered by one bolted cover with sealing arrangement. At least two bolts at diagonally opposite corners of secondary terminal box shall be suitable for sealing arrangement. All other bolted covers and inspection windows covers, where provided shall also have sealing bolts for sealing purpose. Suitably shorting links shall be provided for individual CT shorting and PT secondary neutral.
 - xviii) The secondary terminal box shall have cable gland/ flange suitable to receive two Nos. control cable of size 6 core X 4 sq.mm. and 4 core x 2.5 sq. mm at

- the bottom of the secondary box for metering connections to secondary winding of 11 KV CT-PT circuits respectively.
- xix) The 11 KV CT PT Set shall have 3 Nos. incoming and 3 Nos. outgoing outdoor type bushing. The 11 KV CT-PT Sets shall have 6 Nos. bimetallic terminal connectors suitable for Dog Conductor for ratio 200/5 Amp. These should be type tested from CPRI/ NABL accredited Labs. These test reports should not be older than 5 years for Short Circuit Test. The dimension & drawing shall be furnished along with tender duly signed and sealed by testing authority. Inspecting officer shall verify the original type test reports at the time of inspection for terminal connectors & bushings.
- xx) No oil drain plug at the bottom of the CT-PT Sets be provided.
- xxi) Embossing/ punching with minimum height of 10mm of Sr. No., ratio & TN No. be done on the tank of the CT-PT Sets.
- xxii) Manufacturer's name in short should be embossed/ punched.
- xxiii) CT Ratio should be painted on tank body so that it should be visible clearly.
- xxiv) The under base of CT-PT Sets of 11 KV shall be provided with 2 Nos. 75x40x6mm channels as shown in the figures detailed in Annexure –I to make them suitable for fixing to a plate form or plinth. These channels shall be provided through continuous welding with tank of the CT-PT Sets.
- xxv) For feeder metering CT-PT sets i.e. rating of 200/5 A Amp. HV Metal parts (Primary terminal) shall be of 20 mm dia and made of copper. The primary terminal shall be along the entire length of bushing. However brass may be used for consumer metering CT-PT sets for which HV Metal parts (Primary terminal) shall be of 16 mm dia.
- xxvi) The equipment shall be suitable to withstand for loading conditions when supply for one phase is disconnected from primary side.
- xxvii) Bushing rod of 20 mm dia made of copper shall be used for 11KV CT-PT Sets for feeder metering.
- xxviii) 2 Nos., 5/8" dia, 3" length earthing bolts with 2 nuts, 2 flat & 2 Nos. Spring washers shall be provided with each CT-PT Set.
- iv) Spring loaded pressure release device shall be provided on each 11KV CT-PT Set for releasing of accumulated gases.
- xxx) The CT-PT Set (for outdoor installation) top shall be taper / slanting with minimum slant of 10 mm.
- xxxi) The following sealing arrangement for providing seals on each 33 KV CT-PT set shall be made by the manufacturer.
- i) 4 Nos. holes of 2.5 mm dia on each bushing clamp bolts of 6 nos. HT bushings for providing two polycarbonate seals at diagonally opposite bolts of each bushing clamp in M&P lab after successful testing as required.
 - ii) 4 Nos. holes of 2.5 mm dia on the bolts provided at four corners of top cover for providing two polycarbonate seals at diagonally opposite corner of CT-PT set by the inspecting officer after successful testing and providing polycarbonate seals in M&P lab after successful testing as required.
 - iii) 4 nos. sealing holes on the name plate (R&D plate so that our inspecting officer may provide numbered seal on one side of the plate covering top & bottom holes whereas on the remaining two holes of other side, the one numbered seal will be provided by MT Lab after successful testing.

3.05 FITTING AND ACCESSORIES:

The outdoor platform/ pole mounting type metering equipments shall be complete with tank, fittings and accessories as detailed below:

- 1 No. Electrically welded sheet steel tank/ enclosure for accommodating above instrument transformers with suitable bolted cover.
- 6 Nos. Outdoor single terminal porcelain bushing of reputed make without arcing horns. 3Nos. for incoming and 3 Nos. for outgoing.
- 1 No. Secondary terminal box. The terminal box opening door/cover shall have suitable sealing arrangement. The necessary gland/ socket shall be in the scope of supply.
- 1 No. Oil filling hole with cap/plug.
- 1 No. Toughened prismatic oil level indicator with min. oil level marking.
- 2 No. Lifting lugs for lifting the complete CT-PT unit.
- 2 Nos. Earthing terminals.
- 1 Set Under base channels with suitable fixing holes for mounting on plat-form/poles.
- 1 Set Detachable collar assembly.
- 1 No. Rating and diagram plate.
- 6** Nos. Bimetallic Terminal Connectors. [For each 11 KV CT-PT Set of ratio 200/5 Amp.]

3.06 BUSHING:

The bushing shall conform to IS:5621-1980 and IS:2099-1986 and its subsequent amendment, if any, the bushing shall be of standard make. The make and catalogue No.of bushing shall be clearly stated in the guaranteed technical particulars. The type tests certificates of bushings not older than five years shall also be furnished along with tenders. The bushing rods and nuts shall be made of material as per cl.3.05 (xxv).The dimensions of 12 KV class bushings and their related parts shall conform to the relevant Indian Standards as detailed below:

| | |
|---------------|---|
| Voltage class | Indian Standard |
| 12 KV | For porcelain parts IS:3347 |
| Bushing | (Part-III) Sec.I-1972 or the latest version thereof |
| | For metal parts |
| | IS:3347 (Part-III) Sec.II-1967). |

The minimum electrical clearance of 255 mm between phases shall be obtained with the bushings mounted and phase to earth clearance should be maintained as specified in relevant IS/ Indian Electricity rules.

On the bushings clamp bolt of CT-PT Sets two holes on two bolts of size 2.5mm (total 12 holes on 12 bolts) at diagonally opposite sides be provided to enable metering wing to seal these bolts after successful testing in Meter Labs.

3.07 GUARANTEED TECHNICAL PARTICULARS, DRAWINGS AND QUALITY ASSURANCE PLAN:

Guaranteed Technical Particulars in the Performa enclosed with this specification shall be furnished along with the detailed general arrangement dimensional drawings mounting arrangements, connection diagrams and quality assurance plan etc. Particulars which are subject to guarantee shall be clearly marked in GTP appended at Schedule-V.

3.08 INSTRUCTION MANUALS:

The successful tenders shall have to supply required number of operation and maintenance instruction manuals along with the requisite sets of approved drawings of the equipments covered under this specification. One set of above manuals and drawings shall also be sent along with the delivery of 11 KV CT PT unit to the consignee.

3.9 INSPECTION, TESTING AND CHECKING:

- 3.9.1 In the event of order, the supplier shall have to get type tests conducted as per requirement of relevant standards/ specification on one sample of lowest ratio out of first offered lot for inspection comprising of minimum 25% of ordered quantity of lowest ratio in presence of AVVNL inspecting officer without any extra cost. The Impulse test shall be carried out on all the three phases and short circuit test on any one phase selected by the witnessing officer. For this supplier shall make arrangement for type testing to be got conducted from any NABL accredited laboratory and arrange transportation of sample selected from first offered lot for inspection to testing lab & from testing lab to supplier's works. The supplier shall offer the type tested CT-PT set after its re-assembling in subsequent lot. The supplies shall only be accepted & payment against supplies shall be released only after receipt of successful type testing for all type tests on sample.
- 3.9.2 Routine tests as per relevant standard along with accuracy test of CT as per IS:2705 (Pt-II)-1992 and that of PT IS:3156 (Pt. II)-1992 shall be carried out on each equipment covered by this specification in the presence of purchaser's representative. All test reports shall be submitted and got approved from the purchaser before dispatch of the equipment.
- 3.9.3 The supplier shall simulate single phase condition in their laboratory for testing one 11 KV CT-PT set of any ratio from each lot offered for inspection under such condition for 24 hours. The errors of PT shall be measured before and after application of single phasing condition for at least 24 hours and results shall be within permissible limits of specified accuracy class. This test shall be done as acceptance test.
- 3.9.4 One CT-PT set of each ratio in each offered lot should be subjected to temperature rise test. The test shall be carried out simultaneously application of rated current (1.2 lb) and rated voltage (12 KV) and also ISF test, at firm's works free of cost.
- 3.9.5 During routine/ acceptance test, errors for CTs shall be conducted at 1 %, 5%, 20%, 100% and 120% of rated current and in case of PT at 80%, 100% and 120% of rated voltage.
- 3.9.6 Algebraic summation of errors of standard CTs/PTs to the errors observed on CTs/PTs under test should be made to get final errors on specified percentage current/ voltage/ burden. If class of accuracy of standard CT-PT is less than 10 times of the accuracy of CT-PT set under test.
- 3.9.7 Leak test :- One CT-PT set of each rating in each offered lot should be subjected to 'Leak Test' through Nitrogen gas for a pressure of 10 PSI (Pound sq. inch) for half an hour and pressure shall not drop more than 2 PSI. There should be no leakage observed at any part of CT-PT set.
- 3.9.8 One CT-PT set of each rating in each offered lot shall be opened for verifying the diameter and cross sectional area of primary coil conductors including verification of GTP. The verification of diameter & cross sectional area of primary coil conductor of the CT-PT Set shall be verified for any ratio at stores also. If CT-PT set fails in above verification at stores, entire lot shall be rejected and the supplier shall lift the rejected lot. In case it founds within specific limits, the supplier at his own cost shall reassemble/replace the physically opened CT-PT set at works/stores.
- 3.9.9 One sample of oil shall be selected for each ratio and shall be tested for Breakdown voltage b) Tan delta at 90 Deg.C. The oil supplied with CT PT set shall be of EHV grade Transformer oil suitable for insulation and coding of the electric transformers

- of extra high voltage and shall conform to IS 335 (with latest amendments) If CT-PT set fails in any of the above tests/verification at works, entire lot shall be rejected.
- 3.9.10 during the inspection at firm's works, inspecting officer / agency shall provide polycarbonate seals on each CT-PT set as under -
- i) One polycarbonate seal on one side of the plate covering top & bottom holes.
 - ii) Two polycarbonate seal at diagonally opposite corner of top cover of CT-PT set.
- 3.10 TYPE TEST:**
- 3.10.1 Certified copies of all type tests as per IS-2705-1992, IS:3156-1992 with latest amendments listed below obtained from any accredited CPRI/NABL accredited test laboratory on similar equipments included in this specification shall be furnished)
- i) Short Time Current Test.
 - ii) Lightning Impulse voltage withstand Test.
 - iii) Temperature Rise Test.
 - iv) Wet Power Frequency Voltage Withstand Test.
 - v) Determination of Errors according to the requirement of the appropriate Accuracy Class.
 -
 - vi) Instrument Security Factor Test.
- 3.10.2 The bidder shall submit all Type Test reports for lowest ratio of offered CTPT sets along with tender
- 3.10.3 Bidder shall furnish the calculations of short time thermal current of all ratios of offered CT PT sets, on the basis of cross-sectional area of primary conductor of Type tested CT PT set.
- 3.10.4 The purchaser shall have right to get conducted type test during currency of the contract on the sets received in the Stores at purchaser's cost. In case of failure in type tests, following provisions shall be applicable: -

3.11 NAME PLATE AND MARKING:

- a) The equipment shall have a non-detachable type name plate which should be clearly visible and effectively secured against removal having markings as per requirement of IS. In addition, Sr.No., Ratio and date of dispatch shall have to be graved on bushing side of tank with letters of suitable depth & 25 mm height filled with red colour.
- b) The- main and load are to be stenciled on top cover on main and load side respectively.

3.12 MAINTENANCE AND GUARANTEE:

Performance guarantee of the equipment shall be for the period of 36 months from the date of receipt in stores. The month & year of expiry of guarantee period shall be marked on the name plate. Equipment failed within such guarantee period shall have to be replaced /repaired free of cost within 45 days of intimation. Bidder shall furnish successful routine test reports of the equipment. If purchaser desires inspection prior to dispatch, an inspecting officer shall be nominated for verification for the test reports. Failed equipment (s) shall only be lifted after receipt of replacement for the same. Transportation for lifting

TECHNICAL SPECIFICATION FOR SUPPLY OF 33 KV HORN GAP FUSE SETS WITH POST 2X24 KV INSULATORS & 11 KV HORN GAP FUSE SETS WITH 1X24 KV POST INSULATORS

1.0 SCOPE :

This specification covers the design, manufacture, testing before dispatch, packing & forwarding and delivery of 33 KV Horn Gap Fuses and 11 kV Horn Gap Fuses (including hardwares and post insulators). The Horn Gap Fuses shall be required for protection of lines and distribution Transformers at various sites of Ajmer Discom, the details of principal parameters/various parts of horn gap fuses are indicated in subsequent clauses hereunder.

It is not the intent to specify completely herein all details of the design and construction of equipments. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation upto the Bidder's guarantee in a manner acceptable to the Purchaser, who will interpret the meanings of drawings and specifications and shall have the power to reject any work or material which in his judgment is not in accordance therewith. The offered equipment shall be complete with all components necessary for its effective and trouble free operation along with associated equipments, interlocks, protection schemes etc. Such components shall be deemed to be within the scope of supply, irrespective of whether those are specially brought out in this specification and/or the commercial order or not.

2.0 PRINCIPAL PARAMETERS :

2.1 The equipment i.e. horn gap fuse unit covered in this specification shall be a complete unit with 2 x 24 KV Post Insulator type E-32 for use on 33 kV system and 1X24 KV Post Insulator type E-32 for use on 11 kV system. The ratings of 33 kV & 11 KV Horn Gap Fuses with post insulators shall be as under :

| PARTICULARS/ RATINGS HG FUSES | Specified values (33 KV H.G.) | Specified values (11 KV H.G.) |
|--|--|--|
| a) Nominal system voltage kV (rms) | 33 | 11 |
| b) Rated voltage kV(rms) | 36 | 12 |
| c) Rated frequency(Hz) | 50 | 50 |
| d) One minute power frequency withstand voltage kV(rms) (To earth & between poles). | 70 | 55 |
| e) Impulse withstand voltage kV peak).(To earth & between poles). | 170 | 125 |
| f) Permissible temperature rise above ambient temp. (50 deg cent.) | 40 deg. Cent. 200 | 40 deg. Cent. |
| g) Rated Current (Amp) | | 100 |

2.2 The minimum mechanical & electrical values/ characteristics of 24kV Post Insulators shall be as follows :

| S. No. | Particulars | Specified values |
|--------|--|---|
| 1. | Torsional Strength | 680mm |
| 2. | Cantilever Strength | 9000 N |
| 3. | Tensile Strength | 30000 N |
| 4. | Compression Strength | 40000 N |
| 5 | Highest system voltage (kV rms) | 24 |
| 6. | Dry & wet power frequency withstand test voltage for one minute(kV rms) | 55 |
| 7. | Impulse withstand test | 125 (KV Peak) |
| 8. | Visible discharge test | 18 (KV rms) |
| 9. | Power frequency puncture withstand test voltage (kV rms) | 1.3 times the actual dry flash-over voltage of the unit. |

2.3 DIMENSIONAL CHARACTERISTICS OF POST INSULATORS :

| S.No. | Particulars. | 2X24 kV (33 KV HG fuse) | 1X24 KV (11KV HG Fuse) |
|-------|---|-----------------------------|----------------------------|
| 1. | Nominal system voltage. | 33 kV | 11 KV |
| 2. | No. of units | Two | One |
| 3. | Total height of | | |
| | i) unit | 254 mm | 254mm |
| | ii) Stack | 508 mm | |
| 4. | Diameter of Insulating part (max.) | 210 mm | 210mm |
| 5. | Minimum total creepage distance of each unit | 430 mm | 430mm |
| 6. | Top fitting pitch circle diameter | 76 mm | 76mm |
| 7. | Bottom fitting pitch circle diameter | 76 mm | 76mm |

2.4 One set of Horn Gap Fuse Shall consist of three single phase units of Horn Gap Fuses.

3.0 GENERAL TECHNICAL REQUIREMENTS :

HORN GAP FUSES :

3.1 The hardwares of horn gap fuses shall be designed and manufactured as per IS. The horn gap fuse sets are to be used for protection of lines and distribution transformers. The bill of material to complete one set (i.e. for Three phases) shall be as per requirement.

3.2 The hardware of Horn Gap Fuses shall be constructed out of the best quality of material suitable for weather conditions prevailing in Rajasthan. The workmanship shall be in accordance with the modern engineering practice. All ferrous parts shall be given an anticorrosive finish. The other parts shall be substantially non corrosive. The details of various specific parts for manufacture are as under :

(1) BASE CHANNEL :

The base channel shall be of size 125mmX60mmx542 mm Long(for 33 KV HG Fuse sets) and 75X40x542 mm Long (for 11 KV HG Fuse sets) of Hot Dip Galvanized mild steel conforming to ISLC 75 of Tata Reference Book 1970 in case of 33 KV Horn Gap Fuses. The base channel should have holes for mounting post insulators.

(2) HORN STOOL :

Two numbers of Horn Stools of Hot Dip Galvanized MS flat of size 50 x 6 mm will be used. The Horn Stool shall be fixed on the top of the post insulators with the help of electro galvanized bolts and spring washers. The Horn Stool must be rigid and strong enough for fixing the horn over the top of horn stool. Over the top of the horn stool, the horn will be fixed.

(3) ARCING HORN :

Two numbers arcing horns of 12 mmdia of Hot Dip Galvanized M.S. round rod will be used. It will be aluminum painted. The base of arching horns should be projecting to 25 mm. It shall be fitted on horn stool with the help of horn clamps, nuts, bolts and spring washers. The length of the horn/height should be maintained. The horn should have a hole & fixing brass thumb screw with fly nut and flat washer to tie and tighten with the fuse wire.

(4) BRASS THUMB SCREW :

There shall be one tapped hole on each arcing horn. The brass thumb screw will be fixed in the tapped hole provided in each arcing horn. The fuse wire is to be tied with brass thumb screw and tightened with help of fly nut (Brass) and flat washer (Brass). The length of brass thumb screw will be fully threaded and screwed up to the whole depth of the horn. The design must be such that the changing of fuse wire is convenient. There is no loose connection/contact and there should not be any possibility of thumb/jamming on account of arcing when fuse is blown off.

(5) HORN CLAMPING ARRANGEMENT :

There shall be two M.S. Horn clamp of size 50x105x6 mm fixed on horn stool with the help of bolts and nuts, spring washers for fixing the arching horns and clamping the conductor. The lower part of the clamping for holding the required conductor shall be of size 50x50x6 mm. This shall be made from M.S. sheet. The clamp for 33 KV horn gap fuse shall be suitable for ACSR "DOG".

(6) EARTHING TERMINAL :

One number earthing terminal shall be provided on the flange portion of base channel. The M.S bolt of 12 mm dia and 25 mm long shall be used with flat washer for this purpose.

(7) BOLTS, NUTS AND WASHERS :

All the bolts, nuts and washers shall be electro-galvanized. However the thumb screw and its connecting fly nut and flat washer, to be used to fix fuse wire, will be of brass only. The size of various bolts, nuts and washers which are in the scope of supply are as below :

| S.NO. | SIZE OF BOLTS, NUTS AND WASHERS. | TO BE UTILISED FOR | qty.for 1 unit of 33 KV | qty. for 1 unit of 11 KV |
|-------|---|--|-------------------------------|--------------------------------|
| 1. | Bolt size 12mm dia, 25mm long with flat washer & nut. | Earthing terminal | 4 Nos. | 4 Nos |
| 2. | Bolt size 12mm dia, 38mm long with nuts & spring washer. | For fixing post insulators on base. | 8 Nos. | 8 Nos |
| 3. | Bolt size 12 mmdia, 25mm long with nuts spring washers. | For fixing horn stool above the post insulators. | 4 Nos | 4 Nos |
| 4. | Bolt size 5/6 dia 1.25" long with nuts and spring washers. | For fixing arcing horn on horn stool and clamping | 16 Nos. | 16 Nos |
| 5. | Brass thumb screw (6mm dia. 30mm long) with Brass fly nut (30mm wing dia) flat washer (1mm thick, 20mm outer dia and internal dia. such as to accommodate the 6mm dia brass screw). | For fixing fuse wire on the arcing horn. | 2 Nos. | 2 Nos. |

4.0 POST INSULATORS :

- 4.1 The 24 kV post insulators units shall be pedestal post type (conforming to IS-5350 Part-III and IS-2544). The insulators shall be constructed out of the best quality of material suitable for weather conditions prevailing in Rajasthan. The workmanship shall be of the highest grade and the entire manufacture shall be in accordance with the modern Engineering practices.
- 4.2 Where Porcelain Insulators are offered, the insulator shall be made of homogeneous and vitreous porcelain of high mechanical and die-electric strength. It shall have sufficient mechanical strength to sustain electrical and mechanical loading on account of wind load, short circuit forces etc. Glazing of the porcelain shall be of uniform brown or dark brown colour with a smooth surface arranged to shed away rain water. The porcelain shall be free from laminations and other flaws or

imperfections that might affect the mechanical or dielectric quality. It shall be thoroughly vitrified, tough and impervious to moisture. The porcelain and metal parts shall be assembled in such a manner and with such material that any thermal differential expansion between the metal and porcelain parts throughout the range of temperature specified in this specification shall not loosen the parts or create undue internal stresses which may affect the mechanical or electrical strength or rigidity of the unit as a whole or stack of two units. The assembly shall not have excessive concentration of electrical stresses in any section or across leakage surfaces. Cement used in the construction of post insulators shall not cause fracture by expansion or loosening by construction and proper care shall be taken to locate correctly the individual parts during cementing. The cement used shall not give rise to chemical reaction with metal fittings and its thickness shall be uniform. The insulator shall be suitable for water washing by rain or artificial means in service condition. Profile of the insulator shall also conform to the relevant IS.

- 4.3 Cap to be provided on top of the insulator shall be of malleable steel casting or of aluminum alloy. It shall be machine finished and hot dip galvanized in case of malleable steel casting. The cap of 24 kV Post Insulators shall have four numbers of tapped holes spaced on a pitch circle diameter of 76mm. The threads of the tapped holes in the post insulator metal fittings shall be cut after giving anti-corrosion protection and shall be protected against rust by greasing or other similar means, all other threads shall be cut before giving anticorrosion protection and shall conform to IS:4218 or latest version thereof. The tapped holes shall be suitable for bolts with threads having anticorrosive protection. The effective depth of threads shall not be less than the nominal diameter of the bolt. The cap shall be so designed that it shall be free from visible corona.
- 4.4 The casting shall be free from blow holes, cracks and such other defects.
- 4.5 All the ferrous metal parts shall be given an anticorrosive finish and shall be hot dip galvanized smoothly as per IS:3638 (as amended upto date), IS:2633 or any other equivalent authoritative standard. The other parts shall be substantially non corrosive. The material shall be galvanized only after shop operations upon it have been completed. The metal parts before galvanizing should be thoroughly cleaned of any paint, grease, rust, scales or alkali or any foreign deposit which are likely to come in the way of galvanizing process. The coating on the metal parts shall withstand minimum four one minute dips in copper sulphate solution as per the relevant IEC/IS.
- 4.6 The insulator unit shall be assembled in a suitable jig to ensure correct positioning of the top and bottom metal fittings relative to one another. The faces of the metal fittings shall be parallel and at right angles to the axis of the insulator and the corresponding holes in the top and the bottom metal fittings shall be in a vertical plane containing the axis of the insulator.
- 4.7 It shall be the sole responsibility of the Supplier to carry out thorough inspection and quality checks on the insulators at the insulator supplier's works, before offering the insulators for Purchaser's inspection.
- 4.8 Two Nos. of 2 x 24 kV Post Insulator shall be provided on each pole of 33 kV Horn Gap Fuse set (Total six Nos. of 2 x 24 kV Post Insulator for three phases (Poles) of one set of H.G.) Two Nos. of 1 x 24 kV Post Insulator shall be provided on each pole of 11 kV

Horn Gap Fuse set . (Total six Nos. of 1 x 24 kV Post Insulator for three phases (Poles) of one set of H.G.)

- 4.9 The porcelain and hardware surface coming in contact with cement shall be coated with bituminous paint for cushioning to relieve mechanical stress caused by temperature variation and cement expansion.
- 4.10 The post insulators shall conform to IS:5350. The total creepage distance of 24 kV post insulator as individual unit shall be minimum 430 mm.
- 4.11 Following makes of the Post Insulators shall be acceptable for the supply of Horn gap Fuse Set
- i) M/s.Jaipur Glass & Potteries, Jaipur.
 - ii) M/s.India Potteries, Kolkata.
 - iii) M/s.BikanerCeramics, Bikaner.
 - iv) M/s.CJI Porcelain, Khurja.
 - v) M/s.VishalMelleable, Ankeleshwar.
 - vi) M/s.AlliedCeramics Pvt. Ltd., Kolkata.
 - vii) M/s.WSI, Chennai.
 - viii) M/s.IEC, Bhopal.
 - ix) M/s.MIL, Allahabad.
 - x) M/s.Jay Shree Insulators, Vadodara.
 - xi) M/s.Birla NGK Insulators Pvt. Ltd., Halol.
 - xii) M/s.MIL, Abu Road.
 - xiii) M/s.Sarvana Insulators Ltd., KurinjiPadi, DistCuddalore, (Tamilnadu).
 - xiv) M/s B.H.E.L.

4.12 Besides above, the Post Insulators manufactured by the vendors approved by the Power Grid Corporation of India Ltd (PGCIL) and National Thermal Power Corporation (NTPC) shall also be acceptable.

5.0 TESTS :

5.1 TEST BEFORE DESPATCH :

The parts of H.G. Fuses i.e. Hardwares and post insulators shall be subject to under mentioned tests separately at respective manufacturer's works before dispatch as per relevant standards.

INSULATORS :

A) Routine test

- i) Visual examination
- ii) Routine electrical test
- iii) Routine mechanical test

B) TYPE TESTS

- i) Visual examination

- ii) Verification of dimensions
- iii) Visible discharge test
- iv) Impulse voltage withstand test.
- v) Dry power-frequency voltage withstand test.
- vi) Wet power frequency voltage withstand test.
- vii) Temperature cycle test.
- viii) Mechanical strength :
 - a) Bending Test
 - b) Torsion Test.
 - c) Tensile or compressive test.
- ix) Puncture test.
- x) Porosity test.
- xi) Galvanizing test.

C) Acceptance Tests :

- i) Verification of dimensions
- ii) Temperature cycle test
- iii) Mechanical strength test
- iv) Puncture test
- v) Porosity test
- vi) Galvanizing test

TEST ON HORN GAP FUSE UNIT COMPLETE WITH INSULATORS AND HARDWARES

A TYPETEST (S) :

- i) Visual examination
- ii) Dimensional checkup
- iii) Temperature rise test
- iv) Power frequency H.V. Test, with inter phase distance as 1000 mm.(for 33 KV HG fuse set) and with inter phase distance as 600 mm.(for 11 KV HG fuse set)
- v) Impulse test. with inter phase distance as 1000 mm.(for 33 KV HG fuse set) and with inter phase distance as 600 mm.(for 11 KV HG fuse set)

B ACCEPTANCE TESTS :

- i) Visual examination
- ii) Dimensional checkup
- iii) Temperature Rise Test
On one sample per lot

5.2 TEST ON BOUGHT OUT ITEMS :

Tests are not required to be performed on small bought out parts like Nuts, Bolts & Washers etc. at the works of manufacturer. Furnishing of test certificates from original manufacturer(s) shall be deemed to be satisfactory evidence. Inspection of the tests at sub contractor's works will be arranged by the supplier whenever required.

5.3 ACCEPTANCE & ROUTINE TESTS :

- 5.3.1 All acceptance & routine tests as stipulated at clause No.6.1 shall be carried out in presence of purchaser's representative at manufacturer's works of Insulators and Hardwares separately before dispatch.
- 5.3.2 Immediately after finalization of the programme of type/acceptance, routine testing, the supplier shall give sufficient advance intimation to the purchaser to enable him to depute his representative for witnessing the tests.

The test samples after having withstood the routine tests shall be subjected to the following Acceptance tests in the order indicated below :

On Insulators

- i) Verification of dimensions as per approved drawing / ISS.
- ii) Temperature cycle test.
- iii) Mechanical strength test.
- iv) Puncture test.
- v) Porosity test
- vi) Galvanizing test

On Hardwares of Horn Gap Fuse sets

- i) Visual examination
- ii) Dimensional checkup
- iii) Temperature Rise Test (only on one unit per lot)

Fitment of Horn gap Fuse hardwares with Insulator test

One percent of insulators inspected shall be brought at the contractor works for checking of fitment with hardware.

- 5.3.3 For conducting acceptance tests on post insulators the number of post insulators or post insulators unit shall be selected as under:-

| Lot size | number of post insulators unit to be selected |
|----------------|---|
| Upto 800 | 6 |
| 801 to 1300 | 8 |
| 1301 to 3200 | 10 |
| 3201 to 8000 | 14 |
| 8001 and above | 20 |

- 5.3.4 10% samples will be selected from offered lot of complete Horn Gap Fuse sets Hardwares for conducting acceptance tests on the same except fitment test which shall be carried out on one percent of offered lot.

6.00 TYPE TEST CERTIFICATE:

- a) The bidder shall furnish valid and authenticated type test certificate from a Govt. approved/ a Govt. recognized/ NABL accredited laboratory/ ILAC i.e. International Laboratory Accredited laboratory / ILAC i.e. International Laboratory Accreditation Cooperation (In case of foreign laboratory) of similar rating and design. Such type test certificates should not be older than three years as on the date of bid opening. For this purpose date of conducting type tests will be considered.
- b) The type test certificates by inhouse laboratory of tendering firm even if it is a Govt. approved/ Govt. recognized/ NABL accredited/ ILAC accredited, shall not be accepted, in case of their own tender. This will not apply if tendering firm is Govt. Company/ Public Sector Undertaking.
- c) The bidder should furnish documentary evidence in support of the laboratory whose type test have been furnished, that the said laboratory is a Govt./ a Govt. approved/ a Govt. recognized/ NABL accredited laboratory/ ILAC accredited (in case of foreign laboratory)
- d) The type test certificates shall be furnished either in original or duly attested by notary.
- e) The bids of only those bidders shall be considered to be meeting the type test criteria who furnishes complete type test certificates with the bid as per above provision.

7. Calibration Certificates:

The supplier shall present the latest calibration certificate(s) of testing instruments / equipments to be used for the testing of the materials covered in the purchase order to the authorized inspecting officer/ inspecting agency of the purchaser. The testing instruments / meters/ apparatus etc. should be got calibrated by the supplier from time to time from independent laboratory accredited from NABL or the manufacturer of the testing instruments having traceability to NPL or NABL accredited laboratory. The calibration certificates should not in any case be older than one year at the time of presenting the same to the inspecting officer/ inspecting agency of the purchaser. The testing instruments / equipments should be duly sealed by the calibrating agency and mention thereof shall be indicated in the calibration certificates(s).

8.0 DRAWING :

- 8.1 The one set of following drawings/documents of the equipment covered by this specification shall be furnished by the Bidder along with their offer:-
 - i) Outline dimensional drawings of Horn Gap Fuse Set with insulator and list mentioning bill of material with complete details regarding metal hardware fittings.
 - ii) Assembly drawings showing complete details of all parts and separating mechanism and mass of main component part.
 - iii) Drawings showing dimension of upper and lower metal parts along with PCD of post insulator.
 - iv) Descriptive literature and manufacturing data on insulator shall be furnished.
 - v) Type test reports vi) Test reports, literature, pamphlets of the bought out items and raw materials.

vii) Detailed views of the insulator stacks & metallic and hardware unit.

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

8.3 Approval of drawings/work by Purchaser shall not relieve the Supplier of his responsibility and liability for ensuring correctness and correct interpretation of the latest revision of applicable standards, rules and codes of practices.

9.0 PACKING AND FORWARDING :

9.1 Each Horn Gap Fuse Set Hardwares shall be legibly and indelibly marked to show the following :

a) Name or trade mark of manufacturer.

The Post Insulators shall be legibly and indelibly marked to show the following :

a) Name or trade mark of manufacturer.

b) AVVNL/TN

Such marking on porcelain shall be printed, not embossed and shall be applied before firing.

9.2 The Horn Gap Fuse sets (hardwares) shall be suitably packed in double gunny bags worthy of rail/ road transport . The supplies shall have to insert in each case / bag packing list giving item wise details of articles in the packing as mentioned in the list. The post insulators shall be packed in crates 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 inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbols.

Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided. Any material found short inside the packing cases shall be supplied by Supplier without any extra cost.

The inspected lot of Post Insulators should be directly delivered / dispatched from their (manufacturer's) works to consignee's stores.

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

- a) Name of the consignee.
- b) Details of consignment.
- c) Destination.
- d) Total weight of consignment.
- e) Handling and unpacking instructions.

- f) Bill of material indicating contents of each package.

10.0 TEST CHECKING OF MATERIAL AT STORES:

The material received in the stores of the NIGAM shall be subjected to the test checking at stores before final acceptance of the material, the procedure for the same shall be as under :

10.1 SAMPLING

One sample out of each sub lot/ lot of 50 sets for 33 KV Horn gap fuse sets and 100 sets for 11 KV Horn Gap fuse sets or part thereof from each inspected lot received in stores shall be selected from each store for test checking of material and shall be got tested. The selection of sample from the material received at stores shall be done as soon as material is received in stores without the presence of the representative of the supplier. However, testing of sample(s) at CTL or elsewhere as arranged by AVVNL shall be carried out in the presence of representative of the supplier after identification / confirmation by him that sample so selected belongs to them.

10.1 (a) one extra sample of 24 KV post insulator for conducting Puncture test.

At present since the facility for Puncture test is not available at Ajmer and Jodhpur Discom as such till such time this facility is made available, Puncture test on the samples selected from the supply received at stores of Ajmer & Jodhpur Discom shall be carried out at CTL, Jaipur.

10.2 TESTS

The following tests shall be carried out on the above items :

- a) Visual examination , verification of dimensions, weight and marking as per PO/ GTP / approved drawing.
- b) Post Insulators : - i) Mechanical strength test.
 ii) Porosity Test
 iii) Puncture Test
- c) All galvanized parts. - Uniformity of galvanization test.

Testing of the material shall be got done at the test laboratory of the Nigam i.e. at CTL in the presence of the representative of the supplier. Only those test shall be conducted at CTL for which facility with CTL is available.

- i) For witnessing of the testing, clear 7 days' notice shall be given to the supplier stating date, time & place where the test is to be conducted. The testing shall be started after identification / confirmation of sample by the representative of the supplier that sample selected for testing pertain from the lot supplied by them. In case the supplier does not attend for witnessing the testing, the testing shall be proceeded and completed and action be taken as per the contract.
- ii) The CTL shall send copies of test reports to the purchaser, consignees and the supplier.

10.3 CRITERIA FOR ACCEPTANCE

In case of failure of any of sample (s) in any of the above tests, the material contained in the lot / sub-lot received in store to which the samples belong, shall be rejected. The rejected material shall have to be replaced by the supplier free of cost.

TECHNICAL SPECIFICATION OF P.G. CLAMPS FOR DOG, PANTHER CONDUCTOR AND T-CLAMP FOR PANTHER CONDUCTOR

1.0 SCOPE

This specification covers the manufacture, testing before dispatch and delivery at our Stores/ Site of P.G. Clamps for ACSR Panther, Dog Conductor and T-clamp for Panther Conductor as detailed hereunder:-

2.0 MATERIAL:-

All material used shall conform to the relevant ISS. All aluminum and aluminum alloy used in the manufacture of the connector(s) shall conform to designation 'A6' of IS:617 (1975) Latest amended and IS:1367 (latest amended). Nonferrous alloy bolts, nuts and spring washers shall conform to the relevant Standards.

The material used in the manufacture of clamps shall be Aluminum alloy 4600 of IS:617-1994 as amended and shall be gravity die casting process only.

Steel Bolts and Nuts shall conform to IS:1368-1992 & IS:1367/1979-80 (with latest amendment, if any)

All ferrous metal parts intended for outdoor use except those made of stainless steel shall be protected by hot dip galvanizing in accordance with IS:2633-1986.

The temperature rise of power connectors above a reference ambient temperature of 40 Deg. C when carrying rated current as above shall not exceed 45 Deg. C to fulfill the requirement of Cl.6 IS:5561(1970).

3.0 GENERAL REQUIREMENTS:-

The power connectors shall be smooth and free from cavities, blow-holes and other defects and such adverse effects like sharp radii of curvature, ridges & excrescence which might lead to localized pressure or damage to conductor in service. Power connectors shall be so designed and proportioned that they are capable of safely withstanding stresses to which they may be subjected (including these due to short circuit and climatic conditions) and that the effect of vibrations, both on the conductor and the connector itself are minimized. Sufficient contact pressure should be maintained at the joint by the provision of the required number of bolts or other fixing arrangements. But the contact pressure should be evenly distributed by the use of pressure plates, washers or suitable saddles of adequate area & thickness.

4.0 DIMENSIONAL REQUIREMENT FOR P.G.CLAMPS & T-CLAMPS :-

| s.no | PARTICULARS | PG CLAMPS FOR | | T-CLAMP |
|------------------------|-----------------------------|---|--|---|
| | | ACSR PANTHER TO PANTHER | ACSR DOG TO DOG TYPE 'A' | FOR PANTHER CONDUCTOR |
| a.) CONDUCTOR:- | | | | |
| 1. | No. of strands in Conductor | Al. 30/ 3.00 mm Steel 7/ 3.00 mm | Al. 6/ 4.72 mm Steel 7/ 1.57 mm | Al. 30/ 3.00 mm Steel 7/ 3.00 mm |
| 2. | Conductor dia | 21.0mm | | 21.0 mm |

| | | | | |
|------------------|--|---|--|---|
| | | | 14.15mm | |
| b.)CLAMPS | | | | |
| 1. | Length (Min.) | 135mm | 125mm | 80 mm |
| 2. | Thickness of Metallic Parts (Min.) | 10 mm | 10mm | 10mm |
| 3. | No. of Bolts along with lock nuts plain washer and spring washers (Min.) | 3 | 3 | 12 |
| 4. | Size of Bolts Dia X Length (Min.) | 12mm x 60mm | 12mm x 50mm | 10mmx 65mm |
| 5. | Short circuit level for 1 Sec. | 25 kA | 16 kA | 31.5KA |
| 6. | Rated current Amps. | 630 | 400 | 800 |
| 7. | Weight (In Kg) Tolerance in weight :- (-2%) | Al:- 0.550 Steel:-0.250 Total:- 0.800 | Al:- 0.425 Steel:-0.210 Total:-0.635 | Al:- 0.550 Steel:-0.600 Total:- 1.150 |

Note:- Bidders are requested to quote alternative prices for P.G. Clamps suitable for ACSR Dog to Dog for the Type `A` & Type `B`.

5.0 TYPE TESTS:-

- a)The bidder shall furnish valid and authenticated type test certificate from a Govt. approved/ a Govt. recognized/ NABL accredited laboratory/ ILAC i.e. International Laboratory Accredited laboratory / ILAC i.e. International Laboratory Accrediation Corporation (In case of foreign laboratory) of similar rating and design of tendered material. Such type test certificates should not be older than five years as on the date of bid opening. For this purpose date of conducting type tests will be considered.
- b) The type test certificates by in house laboratory of bidding firm even if it is a Govt. approved/ Govt. recognized/ NABL accredited Laboratory / ILAC accredited, shall not be accepted, in case of their own bid. This will not apply if bidding firm is Govt. Company/ Public Sector Undertaking.
- c) The bidder should furnish documentary evidence in support of the laboratory whose type test have been furnished, that the said laboratory is a Govt./ a Govt. approved/ a Govt. recognized/ NABL accredited laboratory/ ILAC accredited (in case of foreign laboratory)
- d) The type test certificates shall be furnished either in original or duly attested by notary.
- e) **Following type test shall be conducted on Clamps :-**

- a) **Tensile test**
- b) **Temperature test.**
- c) **Resistance test.**
- d) **Dimensional test.**
- e) **Galvanizing test**

f) Short circuit test

The short circuit test shall be accompanied with the detailed dimensional drawing duly signed by the testing agency.

6.0 INSPECTION AND TESTING

- i) The material shall be tested and inspected by an authorized inspecting officer of the Nigam before dispatch. Samples shall be drawn for inspection/ testing as per provisions of relevant ISS/Purchase Order. The purchaser reserves the right to get the material tested in any testing laboratory before dispatch.
- ii) The suppliers should satisfy themselves that the stores are in accordance with the terms of the contract and fully confirm to required specifications by carrying out a thorough pre-inspection of each quota before tending the same for inspecting to the inspecting officer nominated by the purchaser. Such pre-inspection on the part of the suppliers would minimize the chances of rejection in inspection. The following shall constitute Acceptance Tests:-
 - i) Tensile Test.
 - ii) Resistance Test.
 - iii) Dimensional Check.
 - iv) Galvanizing Test, where applicable.

In the event of order temperature rise test shall be carried out once on one Clamp of each type from the first offered lot in the presence of Purchaser's representative without extra charges.

The following shall constitute Routine Tests:-

- i) Visual inspection.
- ii) Dimensional check.

7.0 TEST CHECKING OF MATERIAL AT STORES:-

The material received in the Stores of the Nigam shall be subjected to the test checking at Stores before final acceptance of the material. The procedure for the same shall be as under:-

A) Sampling:-

One sample out of each sub lot/ lot of 1,000 Nos. or part thereof from each inspected lot of each type of clamp received at Stores shall be selected for test checking of material & shall be got tested. The selection of sample from the material received at stores shall be done as soon as material is received in stores without the presence of the representative of the supplier. However, testing of sample(s) at CTL shall be carried out in the presence of representative of the supplier after identification / confirmation by him that sample so selected belongs to them.

B) Tests:-

The following tests shall be carried out on the above items:-

- a. Visual Examination, Verification of Dimension, weight and marking as per ISS/ Specification.
- b. Tensile Test
- c. Resistance Test
- d. Galvanizing test

Testing of the material shall be got done at the test laboratory of the NIGAM i.e. at CTL in the presence of the representative of the supplier.

For witnessing of testing, clear 7 days' notice shall be given to the supplier by fax / speed post stating date, time & place where the test is to be conducted. In case the supplier do not attend for

witnessing the testing, the testing shall be proceeded and completed and action be taken as per the contract.

The Officer Incharge of Central Testing Lab (CTL) Ajmer shall send copies of test reports to the purchaser, consignees and the supplier.

C) CRITERIA FOR ACCEPTANCE

a) Visual Examination, Verification of Dimension, weight and marking:

As per ISS/ Specification

b) Tensile Test AND

c) Resistance Test:-

In case of failure of sample in Tensile Test & Resistance test, the material contained in the lot/ sub-lot to which the sample belongs shall be rejected. The rejected material shall have to be replaced by the supplier free of cost.

d) Galvanizing Test:

- i) The sample(s) shall be first tested for (n-2) number of dips where(n) is specified number of dips in the contract. If the sample(s) does not pass the uniformity of Galvanization Test for (n-2) dips, the material shall be rejected and the material relating to relevant lot/ sub-lot to which sample(s) pertains shall have to be replaced by the supplier free of cost.
- ii) If the sample has passed the uniformity of Galvanization Test for (n-2) dips, then it shall be tested for (n-1) dips. If the sample has not passed the uniformity of Galvanization Test with (n-1) dips, then material pertaining to relevant lot/ sub-lot shall be accepted with a deduction @ 10% of cost of material.
- iii) If the sample has passed the uniformity of Galvanization Test with (n-1) dips, then sample shall be tested for last one dip of one minute to complete the test for 'n' dips. If the sample does not pass the uniformity of Galvanization Test with 'n' dips, then the material pertaining to relevant lot/sub-lot shall be accepted with a deduction @ 5% of cost of material.

8.0 MARKING

The items to be supplied shall be indelibly marked with suitable marks so as to identify the same. The Clamps shall be marked with 'Rated Normal Current' and name of the 'Conductor' for which the same is suitable viz. Panther to Panther, Dog to Dog, Rabbit to Rabbit and weasel to Weasel.

9.0 PACKING

You shall pack the material in the suitable double gunny bag or double HDPE bags so that the material may not be damaged in the transit

10.0 GUARANTEED TECHNICAL & OTHER PARTICULARS.

The tenderer shall furnish complete guaranteed technical particulars and other particulars of material offered by him in schedule-V.(A) and V(B)

11.0 DRAWING :

The successful bidder will submit the full dimensional drawings on A-3 size paper in triplicate for our approval before commencement of supply. If the successful bidder manufacture the equipment without obtaining approval of drawing, the purchaser will not be responsible if any part is not as per required dimensions. Approval of drawings/work by Purchaser shall not

relieve the Supplier of his responsibility and liability for ensuring correctness and correct interpretation of the latest revision of applicable standards, rules and codes of practices.

TECHNICAL SPECIFICATION FOR 11 KV 45 KN DISC INSULATORS T&C TYPE. & 11 KV 45 KN DISC INSULATORS B&S TYPE

1.0 SCOPE :

- 1.1 This section covers for the design, manufacture, testing at manufacturer's works before dispatch, supply and delivery of Disc Insulators Tongue & Clevis type and Ball & Socket type for various overhead 33 KV and 11 KV Power Lines and overhead 132/33 KV Power Lines. The description of insulators & string arrangements have been given in Appendix- I, Appendix-II and Appendix-III
- 1.2 The technical specifications, contained herein, are for the guidance of the tenderers. Any deviation from the Purchaser's specification will be considered on their relative merits in respect of performance, efficiency, durability and overall economy consistent with the requirements stipulated herein after. Such deviations shall be clearly entered by the tenderer in the form as per schedule-VI (A&B) of the specification.

2.0 STANDARDS :

The Disc Insulator shall comply in all respects with the Indian Standard Specifications IS:731-1971 (Second Revision), IS:3188-1980, IS:2486 (Part-I)-1993 (Second Revision), IS:2486 (Part-II) 1989 (Second Revision) and IS:2486 (Part-III) 1974, IS:2486 (Part-IV) 1981 with latest amendments. The galvanization of metallic parts shall conform to IS:2633/1972 (Latest amendments). The Insulator String shall consist of discs (B&S Type) of dimensions specified in Appendix-I, for use on 3 phase, 50 cycle power system. All applicable standards shall be clearly mentioned in schedule-III

3.0 MATERIALS, DESIGN & TYPE :

- 3.1 All the materials used in the manufacture of the insulators shall be of the first class quality. The porcelain shall be sound, free from defects thoroughly vitrified and smoothly glazed.
- 3.2 The glaze shall be brown in colour. The glaze shall cover all the porcelain parts of the insulators except those areas which serve as supports during firing or are left unglazed for the purpose of assembly. The glaze shall be uniform, smooth, hard, dense, continuous and brilliant.
- 3.3 The design of the insulator shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. The porcelain shall not engage directly with hard metal.
- 3.4 Cement used in the construction of the insulator shall not cause fracture by expansion or loosening by contraction and proper care shall be taken to locate the individual parts, correctly during cementing. The cement shall not give rise to chemical reaction with metal fittings and its thickness shall be as uniform as possible.

- 3.5 All parts of different fittings which provide for interconnection shall be made such that sufficient clearance is provided at the connection point to ensure free movement and suspension of the insulator string assembly.
- 3.6 All hardware fittings (except those specified otherwise) shall be made of drop forged steel or heat treated malleable cast iron, and shall be hot dip galvanized after all machining and fittings have been completed. The material used in fittings shall be corrosion resistant.
- 3.7 The locking devices shall be resilient, corrosion resistant and of suitable mechanical strength. The hardness and temper of the material are important for their satisfactory operation.

The locking devices shall retain their locking ability after being operated from the locking to the coupling position at least twenty times, at normal temperature. They should be effective at the lowest temperature likely to be encountered in service.

- 3.8 For Ball & Socket type disc insulators the cap and the pin shall be heavily galvanized and mechanically strong. The ball shall move freely in the cap sockets, but shall be so designed that they do not give way while in service. The dimensions of the pin ball & socket shall be conforming to ISS 2486/part -II. The cap shall be made of malleable cast iron conforming to IS:2108-1977. These shall be free from cracks, shrinks, air holes, burs and rough edges. The caps shall be circular, with inner and outer surfaces concentric and of such design that they will not yield or distort under the stress to the porcelain shells. The pin shall be single piece made of drop forged steel and shall be free from laps, field's burs and rough edges. All bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly. The pins shall be of such a design that they will not yield or distort under loaded condition. They shall not be made by joining, welding, shrink fitting or any other process from more than one piece of material. The locking devices 'W/R' type for Ball & Socket lockers shall be either of Phosphor bronze conforming to IS:7814-1975 or stainless steel conforming to IS:6603-1972 with minimum hardness of 160 HV. The dimensions shall conform to IS:2486(Part-3)-1974.
- 3.9 The dimension of the clevis and tongue connection shall be as shown in fig.25 and the dimension of cross arm strap shall be as shown in fig.26 of IS:2486/Pt-II/1989 (latest amendments)

The tongue and clevis type porcelain insulators shall be as per fig.2 and its dimension shall conform to table-2 of IS:3188/1980 (latest amendments)

The dimensions of pin ball socket shall be according to fig.8 and 9 respectively of IS:2486 (Part-II/1989) IInd revision.

4.0 CLASSIFICATION SIZE & NO. OF DISCS :

- 4.1 The insulators shall be of type B as specified under clause 5 "Classification" of IS:731-1971(second revision).
- 4.2 The long rod Insulator falling under type A shall conform to IEC:433-1980(with latest amendments)& IEC-575/1977.

5.0 TESTING :

5.1 Sampling inspection, testing and acceptance of insulators shall be in accordance with the latest revision of IS:731/1971 while that of hardware associated with these discs shall be as per IS:2486(Pt-I)/1993 (second revision) IS:2486(Pt. II)/1989 (second revision) and IS:2486(Pt-III)/1974 & IS:3188-1980 with latest amendments. Sampling inspection, testing and acceptance of long rod insulators shall be in accordance with the latest edition of IEC :433/1980 & IEC:575/1977.

6.0 MECHANICAL LOADS :

The insulator strings shall be suitable for the minimum failing loads specified in Table-2, clause 7 of IS:731/1971 (IInd Revision). The load shall be supplied axially to the insulator strings.

7.0 MARKINGS :

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

- a) Name or trade mark of the manufacturer.
- b) AVVNL/TN NO.
- c) Minimum failing load in KNewton.

Marking on porcelain shall be originated and shall be applied before firing.

8.0 CREEPAGE DISTANCE :

The tenderer shall specify in his tender the creepage distances of the insulator. These values should not be less than those specified in IS:731-1971 & IS:3188-1980 (Latest amendment).

9.0 CRITERION OF CONFORMITY :

9.1 The criterion of conformity to the requirements of the tests given in 3.11.2 shall be as per clause No.C-2, of Appendix 'C' of IS:731/1971 (second revision).

9.2 No part of the lot withdrawn as described in 3.12.1 above shall constitute part of any other test submitted for the first time.

10.0 ROUTINE TESTS :

Routine tests shall be carried out on each insulator & to check requirements which are likely to vary during production as per relevant IS:731/1971 (with latest amendments).

11 PACKING :

All insulators shall be packed in suitable crates or boxes with suitable steel bands so as to withstand rough handling and storage at destination. The gross weight of packing shall not exceed 50 Kgs.

12 DRAWINGS :

The bidder shall submit detailed drawings showing design and dimensions of insulator, ball pin, socket cap & security pin. The type of the material used for various parts shall be clearly specified on the drawing.

13TEST CHECKING OF MATERIAL AT STORES

The material received in the stores of the NIGAM shall be subjected to the test checking at stores before final acceptance of the material, the procedure for the same shall be as under :

i) SAMPLING

One sample out of each sub-lot / lot consisting of following quantities or part thereof in case of each type of insulators from each inspected lot received in stores shall be selected from each store for test checking of material and shall be got tested.

i(a)one extra sample of Disc insulator of each type for conducting Puncture test.

At present since the facility for Puncture test is not available at Ajmer and Jodhpur Discom as such till such time this facility is made available, Puncture test on the samples selected from the supply received at stores of Ajmer & Jodhpur Discom shall be carried out at CTL, Jaipur. All other test(s) (on the first sample) shall be carried out at the respective CTL's of Discoms as per the practice in vogue.

11 KV 45 KN Disc insulator "T&C" Type – **1000 Nos.**

11 KV 45 KN Disc insulator "B&S" Type – **1000 Nos**

The sample selection shall be done as soon as the material is received in stores, without calling the representative of supplier. However, testing at CTL or elsewhere as arranged by NIGAM shall be done in the presence of representative of supplier after identification/ confirmation by the supplier's representative that sample(s) so selected belong to them.

ii) TESTS

The following tests shall be carried out on the above items :

- a) Visual examination, verification of dimensions, creep age distance etc.
- b) Mechanical failing Load Test
- c) Porosity test
- d) Puncture Test

However, only those tests shall be conducted at CTL for which facility with CTL is available.

TECHNICAL SPECIFICATION OF LT PIN INSULATORS AND 11KV & 33 KV GUY (STAY)INSULATORSFOR 11 KV& 33 KV TRANSMISSION AND L.T.DISTRIBUION OVERHEAD POWER LINES

1.0 SCOPE :

- 1.1 This section provides for design, manufacture, inspection & testing before dispatch, supply and delivery of Porcelain 11 KV Guy (Stay) insulators, 33 KV Guy (Stay) insulators and L.T. Pin Insulators specified herein for their satisfactory use and operation on various 11 KV and 33KV sub-transmission & L.T. distribution overhead power lines of the state.
- 1.2 It is not the intent to specify completely herein all the details of the design and construction of equipment. However, the equipment shall conform in all respect to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation up to the bidder's guarantee, in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which in his judgment is not in accordance therewith. The offered equipment shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of bidder's supply irrespective of whether those are specifically brought out in this specification and / or the commercial order or not.\

2.0 PRINCIPAL PARAMETERS :

- 2.1 The material shall conform to the following specific parameters :

| S.N. Item | Specification |
|-------------------------|-----------------------|
| 1. Type of Installation | Outdoor |
| 2. System Voltage | 415 Volt (+10%, -15%) |
| 3. System frequency | 50 Hz, + 5% |
| 4. Number of phases | Three |
| 5. System of earthing | Solidly grounded. |

2.2 Details of insulators :

- 2.2.1 The all type of Insulators shall be suitable for use on various 11 KV/33 KV and L.T. distribution Power lines in a moderately polluted atmosphere.
- 2.2.2 The 11 KV Guy (Stay) insulators shall of size 110x75x22mm having dimensions as per fig 2 and 33 KV Guy Insulators shall of size 140x85x25mm having dimensions as per fig.3 of IS:5300/1969 (latest amended).

- 2.2.3 The 11 KV/33KV Guy (Stay) insulators shall be brown glazed and conforming to IS:5300/1969 (Latest amended) in all respects.
- 2.2.3 The L.T. Pin insulators shall of size 100x70mm having dimensions as shown in Fig.1, type-1 of IS:1445/1977 (latest amended).
- 2.2.3 The L.T.Pin Insulators shall be brown glazed and conforming to IS:1445 / 1977 (Latest amended) in all respects.

3.0 GENERAL TECHNICAL REQUIREMENTS :

- 3.1 The porcelain of Insulators shall be sound, free from defects, thoroughly vitrified and smoothly glazed.
- 3.2 The glaze of the insulators shall be brown in colour. The glaze shall cover the entire porcelain surface parts except those areas that serve as supports during firing or are otherwise required to be left unglazed.
- 3.3 The design of the insulator shall be such that the stresses due to expansion & contraction in any part of the insulator shall not lead to its deterioration.
- 3.4 The dimensions of guy strain insulators essential from the point of view of inter-changeability shall be in accordance with IS:5300/1969(latest amended).
- 3.5 The insulator shall be in one piece.
- 3.6 The Pin Insulators shall have a top groove and both type of insulators shall have dimensions as specified above.
- 3.7. The Pin Insulators shall be threaded to take mild steel pins having profile as IS:1445/1977 (Latest amended).

4.0 INSULATOR CHARACTERISTICS :

A. The 11 KV & 33KV Guy (Stay) insulators shall have the electrical & Mechanical characteristics as given below:

11 KV33KV

| | | | |
|----|---|-----|-----|
| 1. | Designation of insulator | B | C |
| 2. | Length (mm) | 110 | 140 |
| 3. | Diameter (mm) | 75 | 85 |
| 4. | Cable hole dia (mm) | 22 | 25 |
| 5. | Minimum failing load KN | 53 | 88 |
| 6. | Creepage distance | 48 | 57 |
| 7. | Dry one minute power frequency withstand voltage KV (rms) | 22 | 27 |
| 8. | Wet one minute power frequency withstand voltage KV (rms) | 9 | 13 |

B.The L.T. Pin Insulators shall have the electrical & Mechanical characteristics as given below:

| 1. Type of Insulator | Pin Insulator |
|-----------------------------|------------------------|
| 2. Size of Insulators (mm) | 100x70 |
| 3. Dry power frequency | 23 |
| withstand Voltage KV (rms) | |
| 4. Wet power frequency | 10 |
| withstand Voltage KV (rms) | |
| 5. Power frequency puncture | 1.3 x the actual |
| withstand voltage KV (rms) | dry flashover voltage. |
| 6. Min. failing load(KN) | 3.5 |

5.0 IDENTIFICATION & MARKING :

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

- i) Name or trade mark of the manufacturer.
- ii) Month & Year of manufacture.
- iii) Minimum failing load in KN
- iv) ISI certification mark if any.
- v) AVVNL/TN NO.

5.2 Marking on porcelain shall be printed & shall be applied before firing.

5.3 Offer not complying the condition of marking shall be treated as non-responsive.

5.4 The insulators marked with ISI Certification Mark will be given preference

6.0 DRAWINGS & DOCUMENTATION :

6.1 The bidder shall furnish full description and illustrated catalogues of insulators offered alongwith the bid.

6.2 The bidder shall also furnish alongwith the bid the outline drawing of each insulator unit comply with relevant standard with latest amendment including cross-sectional view of the shell. The drawing shall include the following information :

- i) Shell diameter and unit spacing with manufacturing tolerance.
- ii) Weight of unit insulator.
- iii) Identification mark.
- iv) Manufacturer's catalogue number.
- v) Brief installation instructions.

7.0 TESTS :**7.1 TESTS BEFORE DESPATCH :**

The insulators shall be subjected at contractor's works before dispatch, to the routine & acceptance tests given here under as per relevant IS with latest amendment.

7.2 ROUTINE TESTS :

These tests are to be carried out to check various requirements of insulators which are likely to vary during production. The following tests shall be conducted / carried out on each insulator by the bidder at his works as per relevant IS with Latest amendment and he should furnish certificate / record thereof during pre-dispatch inspection:-

- i) Visual Examination

7.3 ACCEPTANCE TESTS :

These tests shall be carried out on the sample taken from the lot for the purpose of the acceptance of that lot and shall be carried out by the bidder in the presence of the

purchaser's representative(s). The following tests should be conducted in the order given below as per relevant IS with latest amendment:

- i) **Verification of dimensions**
- ii) **Temperature Cycle test**
- iii) **Mechanical strength test**
- iv) **Porosity Test**

7.4 TYPE TESTS :

7.4.1 The type tests to be conducted on at least two units **11 KV & 33 KV Guy Insulators** as per relevant IS:5300/1969 (latest amended). The following tests shall constitute the type tests and shall be conducted in the order given below :

- (i) Visual examination (clause 7.8)
- (ii) Verification of dimensions (clause 7.5)
- (iii) Dry one minute power frequency withstand test (clause 7.2) test (clause 7.3)
- (v) Temperature cycle test (clause 7.6)
- (vi) Mechanical strength test (clause 7.4)
- (vii) Porosity test (clause 7.7)

7.4.2 The type tests to be conducted on at least two units of **LT Pin insulators** as per relevant IS:1445/1977 (latest amended). The following tests shall constitute the type tests:

- (i) Visual examination (clause 8.4)
- (ii) Verification of dimensions (clause 8.5)
- (iii) Dry power frequency voltage withstand test (clause 8.6)
- (iv) Wet power frequency voltage withstand test (clause 8.7)
- (v) Temperature cycle test (clause 8.8)
- (vi) Mechanical failing load test (clause 8.9)
- (vii) Power frequency puncture withstand test (clause 8.10)
- (viii) Porosity test (clause 8.11)

However, the purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative. For this purpose, the tenderer should indicate unit rate for carrying out such type tests. These test charges shall not be taken into consideration for bid evaluation.

8.0 SAMPLING :

The sampling procedure as laid down in IS:731/1971 with latest amended (For Guy Insulators) and IS 1445/1977 with latest amendment (For LT Pin Insulators) shall be followed for carrying out specified acceptance tests.

9.0 TOLERANCE ON DIMENSIONS / TEST RESULTS :

As per IS:5300/1969 with latest amendments (For 11 KV & 33 KV Guy Insulators).As per IS:1445/1977 with latest amendments (For LT Pin Insulators).

10.0 TESTS AT SITE :

The purchaser reserves the right to conduct all tests on each type of insulator after arrival at site and bidder shall guarantee test certificates figures under actual service conditions.

11.0 TESTING FACILITIES :

The bidder must indicate clearly about the various testing facilities for conducting various acceptance tests as well as routine tests as per relevant ISS as available at his works. In case no testing facilities are available at the bidder's works, particulars of the place where such testing is proposed to be conducted during course of inspection must be indicated.

12.0 TEST CHECKING OF MATERIAL

The material received of the NIGAM shall be subjected to the test checking at stores before final acceptance of the material, the procedure for the same shall be as under :

12.1 SAMPLING

One sample out of each sub-lot / lot of 3000 Nos. or part thereof from each inspected lot of each type of insulators received in stores shall be selected for test checking of material and shall be got tested. The sample selection shall be done in the presence of supplier or his authorized representative for which 7 days' notice shall be given to the supplier.

12.2 TESTS

The following tests shall be carried out on the above items :

- a) Visual Examination, verification of dimensions, Creepage Distance & marking.
- b) Mechanical strength test.
- c) Porosity test.

In case if the facility for conducting any of the above test(s) is not available at the NIGAM's CTL, the purchaser reserve the right to get such test (s) conducted at any independent NABL Test House.

12.3 CRITERIA FOR ACCEPTANCE

In case of failure of any of sample (s) in any of the above tests, the material contained in the lot / sub-lot received to which the samples belong, shall be rejected. The rejected material shall have to be replaced by the supplier free of cost.

TECHNICAL SPECIFICATION FOR SUPPLY OF (A) 33 KV CROSS ARM (ANGLE) WITH CLAMP AND TOP HAMPER ,(B)11 KV CROSS ARM (ANGLE) WITH CLAMP AND TOP HAMPER (C 11 KV TOP HAMPER (WITHOUT CLAMP) L.T.CROSS ARM (600 MM) WITH CLAMP AND L.T.CROSS ARM (1200 MM) WITH CLAMP (Galvanized)

1. SCOPE

This specification covers fabrication, testing & delivery of fabricated steel items as a complete package, complete in all respect as per GTP/Drawings (to be provided by the purchaser to the successful bidder). The steel sections generally used, tentative unit weight & BOM of fabricated item is enclosed at Schedule-I. The final bill of material for the purpose of payment shall be prepared and submitted by the supplier after approval of model assembly by the purchaser.

2. STANDARDS :

All materials and equipments shall comply in all respect with the requirements of the latest edition of the relevant Indian Standard Specification(s) except as modified in this specification. Where the relevant ISS is not available, the material / equipment should comply the latest BSS. All the items should be made / fabricated/tested from steel sections conforming to IS:2062 (latest amended).

3. MARKING

Each individual structure / section shall carry a code number conforming to component number given to it in the drawing / Bill of material. The code number of approved size shall be stamped with a metal dye of 16 mm size on the member and shall be legible. The name of manufacturers in suitable code and the word **AVVNL/TN No.** shall also be stamped / punched on each individual section with metal dye of not less than 16 mm size.

If the above marking is not found on the material received in the stores, the receipted challan shall not be given by the concerned stores. The challan shall only be issued after verification of material by the Store officer.

4. TESTS

Test before dispatch:- The various steel section/structure before dispatch shall be subject to following test as per IS:2062(latest amendment) at the manufacturer's works

Routine test/acceptance test

1. Dimensional checking and visual inspection
2. Weight checking
3. Chemical composition test
4. Mechanical property test
5. Galvanization test

5. SAMPLING:

The inspection shall be carried out on each lot separately. The following number of pieces selected at random shall be subject to inspection/ testing and checking.

- j) Workmanship and dimension checking : 3 % samples from finished item.
- b) Chemical test : One sample of each steel section from the entire lot of material offered for inspection.
- c) Tensile test : One sample of each steel section from every 50 MT or Part thereof.
- d) Bend test : One sample of each steel section from every 50 MT or Part thereof.

6. TOLERANCE IN DIMENSIONS :

The tolerance(s) shall be permissible as per IS: 1852: (latest amended). Further the following tolerance(s) on fabricated items will also be allowed.

- i) Tolerance in overall length $\pm 3\text{mm}$
- ii) Tolerance in edge dimensions (centre of hole to end) $\pm 2\text{mm}$
- iii) Tolerance in hole centre $\pm 2\text{mm}$
- iv) Circular holes No tolerance
- v) Weight Tolerance +2% to (-) 4%

7. GUARANTEED TECHNICAL PARTICULARS :

The bidder shall furnish the guaranteed technical particulars of the material as required in the schedule-V by mentioning specific figures therein. Any item of the GTP left unfilled or simply written as per ISS etc. shall be considered as incomplete GTP and such tender is liable to be rejected.

8. CRITERIA FOR ACCEPTANCE

The inspected material should be strictly in accordance to the GTP of the specification otherwise the material shall be treated as rejected and shall not be accepted.

9. WEIGHT

The weight of structure shall mean the weight of structures calculated by using standard sectional weights of all steel structural members of the sizes indicated in the fabrication drawings and/or subsequently revised drawings and bill of material without taking into consideration the reduction in weight due to drilling of bolt-holes, skew cuts, chamfering etc. or the increase in weight due to galvanization.

The material shall be acceptable if found within permissible tolerance limit i.e. +2% and (-)4%.

TECHNICAL SPECIFICATION FOR GALVANISED HARDWARE FITTINGS FOR L.T. SHACKLE INSULATORS FOR USE ON L. T. DISTRIBUTION OVERHEAD POWER LINES

1.0 SCOPE :

This specification provides for the design, manufacture, inspection and testing before dispatch, supply and delivery of Hardware fittings for L. T. Shackle Insulators specified herein for their satisfactory use & operation on various distribution overhead power lines of the State.

2.0 PRINCIPAL PARAMETERS :

The material shall conform to the following specific parameters :

| S.No. | Item | Specification |
|-------|----------------------|----------------------|
| 1. | Type of Installation | Outdoor |
| 2. | System Voltage | 415 Volt(+10%, -15%) |
| 3. | System frequency | 50 Hz, + 5% |
| 4. | Number of phases | Three |
| 5. | System of earthing | Solidly grounded. |

3.0 DETAILS OF ITEMS :

The Galvanized shackle insulator hardware fittings shall be suitable for use on single phase/three phase, 230/440 Volts overhead distribution lines in a moderately polluted atmosphere.

4.0 GENERAL TECHNICAL REQUIREMENTS :

4.1 GALVANISED HARDWARE FITTINGS FOR L.T. SHACKLE INSULATORS:

4.1.1The hardware fittings for L.T. Shackle Insulators shall comply in all respects, herein otherwise stated, with fig.3, type-1 of IS:7935/1975 (latest amended). The hardware fittings assembly shall comprise the following:

- i) A pair of mild steel straps,
- ii) Two numbers of mild steel bolts with hexagonal head,
- iii) Two numbers of mild steel nuts of hexagonal head to suit bolts under item (ii) above &
- iv) Two numbers suitable washers.

4.1.2 DIMENSIONS: The dimensions of hardware fittings for L.T. shackle insulators for supply under this specification shall conform to figure 3, type 1 of IS:7935/1975 (latest amended) and shall have the following dimensions:

| S.No. | Item | Dimensions |
|-------|---|--------------------------|
| i) | Length of straps | 185 mm |
| ii) | Width of straps | 30 mm |
| iii) | Thickness of straps | 3 mm |
| iv) | Diameter of holes at the end of straps | 14 mm |
| v) | Dia. of bolts | 12 mm |
| vi) | Length of bolts | 115 mm |
| vii) | Dia.of bolt head | 17 mm |
| viii) | Thickness of bolt head.(M-12) | |
| a | Nominal | 7.5 mm |
| b | Maximum | 7.95 mm |
| c | Minimum | 7.05 mm |
| ix | Thickness of nuts | |
| a | Maximum | 12.2 mm |
| b | Minimum | 10.4 mm |
| x | Shape of bolt head& nuts | Hexagonal |
| xi | Length of threaded portion of bolts. | 65 mm |
| xii | Thickness of galvanized spring washer (M-12) | 3 mm + 0.15 MM |
| xiii | Weight of complete hardware fitting set.(approx.) | 0.475 Kgs.± 2% Tolerance |

4.1.3

H
E
X
A

GONAL NUTS : Hexagonal Nuts of M-12 size shall be used & shall conform to IS:1363(Part-3):1992 (latest amended). The nuts shall be made of material conforming to class 4.8 of IS:1367 (Latest amended) with regard to its mechanical properties. The thickness of the hexagon nuts shall be in accordance with IS:1363 (Pt-3)/1984 (Latest amended). The screw threads on the shank and the nut shall be as prescribed in IS:4218 (Pt-6)/1978 (Latest amended).

4.1.4 SPRING WASHERS : Spring washers of 3.0 mm thickness of M-12 size shall be used which should conform to IS:3063:1994 (Latest amended).

4.1.5 Galvanization: The Hardware fittings shall be hot dip galvanized. The galvanization of Hardware fittings shall conform to IS:2633/1972 (latest amended). The threads of nuts and tapped holes shall be cut after galvanization and shall be well oiled or greased. Small parts like nuts and spring washers etc. may be electro-galvanized in accordance with IS:1573/1970 (latest amended)

4.2 IDENTIFICATION & MARKING :

4.2.1 The hardware fittings for shackle insulators shall be marked with the manufacturer's name or trade mark.

4.2.2 The package containing the insulator fittings may also be marked with the ISI certification mark if available.

5.0 TESTS :

5.1 TEST BEFORE DESPATCH: The Galvanized Hardware fittings for L.T.shackle insulators shall be subjected at manufacturer's works before dispatch, to the tests mentioned here-under as per IS: 7935/1975 (latest amended).

5.1.1 ROUTINE TESTS :

The following tests shall be conducted on each unit by the bidder at his works as per relevant standard - IS:7935/1975 (latest amended) :

- a) Visual Examination

5.1.2 ACCEPTANCE TESTS :

The following tests shall be conducted on samples taken at random from a lot as per relevant standard, IS:7935/1975 (latest amended) in presence of purchaser's representative :

- a) Checking of threads on heads (Clause 4.6)
- b) Galvanizing / Electroplating test (Clause 4.7)
- c) Verification of dimensions (Clause 4.5)
- d) Mechanical Strength Test (Clause 4.8)

5.2 TYPE TESTS

- a) The bidder shall furnish valid and authenticated type test certificate from a Govt. approved/ a Govt. recognized/ NABL accredited laboratory/ ILAC i.e. International Laboratory Accredited laboratory / ILAC i.e. International Laboratory Accreditation Cooperation (In case of foreign laboratory) . Such type test certificates should not be older than **five years** as on the date of bid opening. For this purpose date of conduction Type Test(s) will be considered.
- b) The type test certificates by in house laboratory of bidding firm even if it is a Govt. approved/ Govt. recognized/ NABL accredited/ ILAC accredited, shall not be accepted, in case of their own bid. This will not apply if bidding firm is Govt. Company/ Public Sector Undertaking.
- c) The bidder should furnish documentary evidence in support of the laboratory whose type test have been furnished, that the said laboratory is a Govt./ a Govt. approved/ a Govt. recognized/ NABL accredited laboratory/ ILAC accredited (in case of foreign laboratory)
- d) The type test certificates shall be furnished either in original or duly attested by notary.

5.2.1 The following shall constitute the type tests which are to be conducted on at least three units of each rating as per standard IS:7935/1975 (Latest amended) and other relevant standards :-

- a) Visual examination test (Clause 4.4).
- b) Verification of dimensions (Clause 4.5)
- c) Checking of threads on heads (clause 4.6)
- d) Galvanizing/electroplating test (Clause 4.7)
- e) Mechanical strength tests (Clause 4.8) (for pins only)

5.2.2 However, the purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative. For this purpose, the bidder should indicate unit rates for carrying out such type tests. These test charges shall not be taken into consideration for bid evaluation.

5.3 SAMPLING : As per IS:7935/1975 (latest amended)

5.4 TOLERANCE ON TEST RESULTS : The tolerance for dimensions when not indicated in the drawing i.e. fig. 2 & 3 of IS:7935/1975 (Latest amended) Hardware Fittings for L.T.Shackle Insulators, shall be $\pm 5\%$

6.0 TEST CHECKING OF MATERIAL AT STORES

The material received in the NIGAM shall be subjected to the test checking at stores before final acceptance of the material, the procedure for the same shall be as under :

6.1 SAMPLING

One sample out of each sub-lot / lot of **3000** Nos. or part thereof from each inspected lot received in stores shall be selected for test checking of material and shall be got tested. The sample selection shall be done in the presence of supplier or his authorized representative for which 7 days' notice shall be given to the supplier.

6.2 TESTS

6.2.1 The following tests shall be carried out on the above items :

- a) Visual Examination, Verification of Dimension, weight and marking.
- b) Mechanical Strength Test (for LT Pins only).
- c) Galvanization (Uniformity) Test.

Only those test shall be conducted at CTL for which facility with CTL is available.

6.2.2 Test of the material shall be got done at the test laboratory of the NIGAM or any other test laboratory designated by the Chief Engineer (MM). For witnessing of the testing, 7 days' notice shall be given to the supplier stating date, time & place where the test is to be conducted. In case the supplier do not attend for witnessing the testing, the testing shall be proceeded and completed and action taken as per the contract.

6.2.3 The witnessing officers of the NIGAM or as designated by the purchaser shall send copies of test reports to the purchaser, consignees and the supplier.

7. CRITERIA FOR ACCEPTANCE

7.1 Visual Examination, Verification of Dimension, weight and marking .

As per specification/ ISS

7.2 Mechanical Strength Test (for LT Pins only)

In case of failure of sample in Mechanical Strength Test, the material contained in the lot / sub-lot to which the sample belongs, shall be rejected. The rejected material shall have to be replaced by the supplier free of cost.

7.3 Galvanization (Uniformity) Test.

7.3.1. The sample(s) shall be first tested for (n-2) number of dips where (n) is specified number of dips in the contract. If the sample(s) does not pass the uniformity of Galvanization Test for (n-2) dips, the material shall be rejected and the material relating to relevant lot / sub-lot to which sample(s) pertains shall have to be replaced by the supplier free of cost.

7.3.2 If the sample has passed the uniformity of Galvanization Test for (n-2) dips, then it shall be tested for (n-1) dips. If the sample has not passed the uniformity of Galvanization Test with (n-1) dips, then material pertaining to relevant lot / sub-lot shall be accepted with a deduction @ 10% of cost of material.

7.3.3 If the sample has passed the uniformity of Galvanization Test with (n-1) dips, then sample shall be tested for last one dip of one minute to complete the test for 'n' dips. If

the sample does not pass the uniformity of Galvanization Test with 'n' dips, then the material pertaining to relevant lot/ sub-lot shall be accepted with a deduction @ 5% of cost of material.

7.3.4 If the sample(s) have passed the Test with number of dips as specified in the contract (n), then material pertaining to relevant lot / sub-lot shall be accepted.

TECHNICAL SPECIFICATION AND REQUIREMENT OF L.T. INSULATION PIERCING CONNECTORS SUITABLE FOR LT XLPE INSULATED AERIAL BUNCHED CABLES WITH BARE MESSENGER WIRE FOR LT OVER HEAD LINE SUITABLE FOR WORKING VOLTAGE UPTO & INCLUDING 1100 VOLTS

1. SCOPE :

This specification covers manufacture, testing before dispatch, supply and delivery F.O.R. Destination of L T Insulation Piercing connector suitable for LTXLPE Insulated Aerial Bunched Cables with bare Messenger Wire for LT Over headlines suitable for working voltage up to & including 1100 Volts as per relevant NFC Standard. The Insulation Piercing Connectors shall be supplied along with Nuts, Bolts, Washers.

2. APPLICABLE STANDARDS:

Unless otherwise stipulated in this specification the following standards with latest amendments shall be applicable :

- i) NFC - 33-020 : Insulation Piercing Connectors
- ii) NFC - 33-209 : LV Aerial Bunched Cable
- iii) NFC - 33-004 : Electrical Ageing Test.
- iv) NFC - 20-540 : Environment Testing for outdoor.
- v) IS 14255 : LV Aerial Bunched Cable.

3. CLIMATIC CONDITIONS:

- i) Peak ambient temperature 50 deg.C in shade.
- ii) Maximum average ambient 50 deg.C temperature in a 24 hours period in shade.
- iii) Min. ambient air temperature in shade (-) 5 deg. C
- iv) Maximum temperature attainable 60 deg.C by an object exposed to sun.
- v) Maximum relative humidity. 90%
- vi) Average number of thunder storm 40
4 days per annum.
- vii) Average number of rainy days 100 per annum.
- viii) Average annual rain fall 10 to 100 cm
- ix) Number of months of tropical 4 months
monsoon conditions.
- x) Maximum wind pressure. 100kg/mtrsq
- xi) Altitude not exceeding 1000 m

3. GENERAL REQUIREMENTS:

The L.T. Insulating Piercing Connectors are used for making Tee or Tap off connections to LT XLPE Insulated Aerial Bunched Cables suitable up to 1.1 KV, service voltage 0.6 KV. The L.T. Insulation Piercing Connectors are designed to make a connection between the uncut main conductor & a branch cable conductor without removing the insulation and with single tightening. The IPC will first pierce the insulation, then make good electrical contact between the main & the branch conductor while simultaneously insulating & sealing the connection. The teeth of IPC shall be compatible with aluminum phase conductor or aluminum alloy messenger. Exposed metallic

parts to be potential free during & after connector mounting. The performance/ test requirements of insulation piercing connectors shall be as per NFC Standards 33-020. The Insulation Piercing Connectors must be equipped with shear heads with minimum & maximum shearing torque as indicated by the manufacturer and within the range specified in NFC 33-020.

The L.T. Insulation Piercing Connectors shall be **suitable for LT XLPE Insulated aerial bunched cable** of following type & Size:

 Type Main Cable Tap Off Cable End Cap suitable
 for Sealing Branch

A 16-50 Sq.mm. 2.5-10 Sq.mm. 2.5-10 Sq.mm.
 B 16-50 Sq.mm. 16-50 Sq.mm. 16-50 Sq.mm.

The Insulation Piercing Connectors must be suitable for application by one worker working alone with a 17mm/ 13mm wrench. Suitable wrenches for installing the connectors shall be included in the scope of supply at the rate of 1 Set for each 1000 Pieces of Connectors ordered (Fraction of 1000 Pieces to be rounded down). The Insulation Piercing Connectors shall be water proof & the water tightness and shall be ensured by appropriate elastomer material & not by grease, gel or pastelone. The Connector shall be provided with removable end cap for sealing cut end of the branch cable enabling tapping on both sides of the connector being in its vertical position with bolt head upward. The end cap shall be rigid of slide type enabling easy positioning and un-loosable after the tap cable is positioned. The end cap shall be equipped with a water tightness seal. Rubber seal around piercing teeth shall be compatible with grease used. Rubber seal shall be designed in a manner to provide proper sealing around the piercing & to avoid the damage to conductor insulation beyond piercing point. Rubber parts shall comprised of material that exhibit resistance to aging caused by heating or other weather conditions. All the insulating material used shall be UV resistant. Metallic parts shall be hot dip galvanized or of Stainless steel.

The Insulation Piercing Connectors shall have good finish and shall be free from all flaws, sharp edge and suitably rounded off.

The Insulation Piercing Connectors and its components shall meet the following tests in accordance with the requirements & test methods of NFC 33 – 020:

Mechanical Tests

Voltage & water tightness test

Electrical Ageing Test

Corrosion Resistance Test

Climatic Ageing Test

The above hardware/ accessories shall be suitable for use with LT XLPE Insulated PVC sheathed Aerial Bunched Cable conforming to IS:14255/1995 of following sizes:

 S.No. Designation of finished cable

- i) 1CX25+25 mm².
 - ii) 3CX16+25 mm².
 - iii) 3CX25+25 mm².
 - iv) 3CX50+35 mm².
 - v) 3CX35+25 mm²
-

Note:- The first part of the designation refers to the number and size of the phase conductor and the last to the size of messenger wire. The sizes shown are the nominal cross sectional area of the conductors.

5.0 TYPE TESTS & TESTS CERTIFICATES:

The bidder shall furnish valid and authenticated type test certificates from a Govt. approved / Govt. recognized / NABL Accredited laboratory / ILAC i.e. International Laboratory Accredited Laboratory (in case of foreign laboratory) of similar rating and design of tendered material/equipment. Such type test certificates should not be older than 3 years as on the date of bid opening. For this purpose date of conducting type test will be considered.

Type Tests:

Insulation Piercing Connectors

| S.No. | Clause No. of NFC | Description of Test |
|-------|-------------------|----------------------------------|
| 1 | 2.3.1 | Electrical continuity |
| 2 | 2.3.1 | Shearhead |
| 3 | 2.3.1 | Mechanical Behavior |
| 4 | 2.3.2 | Mechanical strength of main core |
| 5 | 2.3.2 | Mechanical strength of Tap core |
| 6 | 2.4 | Voltage and water tightness |
| 8 | 2.6 | Climatic Ageing |
| 9 | 2.7 | Corrosion Test |
| 10 | 2.8 | Electrical Ageing |

The bidder must also clearly indicate various testing facilities available at their works for testing the material as per relevant standard. In case of otherwise particulars of the place where such testing is proposed to be conducted during the course of inspection shall be indicated.

6.0. TEST CHECKING OF MATERIAL AT STORES

The material received in the NIGAM shall be subjected to the test checking at stores before final acceptance of the material, the procedure for the same shall be as under :

6.1. SAMPLING

One sample out of each sub-lot / lot of 5000 Nos. or part thereof for Type-A connectors and one sample out of each sub-lot / lot of 1000 Nos. or part thereof for Type-B connectors from each inspected lot received in stores shall be selected for test checking of material and shall be got tested. The selection of sample from the material received at stores shall be done as soon as material is received in stores without the presence of the representative of the supplier. However, testing of sample(s) at CTL shall be carried out in the presence of representative of the supplier after identification / confirmation by him that sample so selected belongs to them. In case the supplier disputes that the selected samples does not pertain to them, then fresh sample shall be selected in the presence of the representative of the supplier and test(s) be carried out.

6.2 TESTS

The following tests shall be carried out on the above items :

- i) Visual Examination, verification of dimensions, marking.
- ii) The other acceptance tests as per NFC Standard / specification may also be carried out subject to availability of testing facility for the same at CTL, Ajmer.

6.2.1 Test of the material shall be got done at the test laboratory of the NIGAM i.e. CTL, Ajmer in the presence of representative of supplier. For witnessing of the testing, clear 7 (seven) days' notice shall be given to the supplier by fax/ speed post stating date, time & place where the test is to be conducted. In case the supplier do not attend for witnessing the testing, the testing shall be proceeded and completed and action be taken as per the contract.

6.2.2 The witnessing officers of the NIGAM or as designated by the purchaser shall send copies of test reports to the purchaser, consignees and the supplier.

6. CRITERIA FOR ACCEPTANCE

- i) Visual Examination, verification of dimensions, marking.

- ii) The other acceptance tests as per NFC Standard / specification may also be carried out subject to availability of testing facility for the same at CTL, Ajmer.
As per NFC-33-020/1998 for the above test (with latest amendment)/Specification.

TECHNICAL SPECIFICATION FOR SUPPLY OF 33 KV (D/C) LATTICE STRUCTURE (42' LONG) UNGALVANISED ALONGWITH 3 NOS. CROSS ARM (CHANNEL) AND NUTS & BOLTS

1. SCOPE

This specification covers fabrication, testing & delivery of fabricated steel items a complete package, complete in all respect as per GTP.

2. STANDARDS :

All materials and equipments shall comply in all respect with the requirements of the latest edition of the relevant Indian Standard Specification(s) except as modified in this specification. Where the relevant ISS is not available, the material / equipment should comply the latest BSS. All the items should be made / fabricated/tested from steel sections conforming to IS:2062 (latest amended).

3. MATERIAL:

The Supplier shall make his own arrangement for the procurement of steel sections before commencement of work. The purchaser shall be at liberty to have samples of steel used, tested / checked in any laboratory at his own cost and reject the supply, if it is found below the required standard.

All the material required for fabrication shall be stocked in adequate quantity by the Supplier to ensure the progress of the work is not jeopardized. **No relaxation in the delivery time shall be allowed on the pretext of non- availability or short supply of raw materials.**

4. WORKMANSHIP:

The fabrication shall be done in such a way that there is a good finish of the fabricated structures. The steel structure shall be fabricated accurately adhering to dimensions as per the approved drawings. All the steel sections shall be carefully leveled/ straightened and made true to method which shall not injure the material so that when assembled the adjacent surface are in close contact throughout. No rough edges shall be permitted anywhere throughout the work. Holes must be perfectly circular. The tolerance(s) as per drawing/ clause hereunder is permissible. All burrs left by drills or punches shall be removed completely. No bolts holes shall be more than **1.5 mm** bigger than the corresponding bolt diameter.

In general all fabrication work shall conform to provision of IS-802 (part-I) 1978 latest amended. However the details given in this specification shall prevail in specified items.

The overlapping of the M.S. Flat on M.S. angle shall be minimum 30 mm. The holes near the bend lines of absent member, on both sides of bent lines shall be Punched/ drilled after bending and relative position of these holes, shall be maintained with the use of proper templates/jigs and fixtures. Punched holes must be square to the plates and the wall of the holes parallel. The following maximum tolerance of accuracy of punched holes is permissible.

- a) Holes must be perfectly circular and no tolerance in this respect is permissible.
- b) The maximum allowable difference in diameter of the holes on the two sides of plates or angle is 0.8mm i.e. the allowable taper in punched holes should not exceed 0.8 mm on diameter.
- c) Holes must be square with the plates or angles and slant holes will not be permitted.

All burrs left by drills or punches shall be removed completely. Drifting or riming to enlarge defective holes shall not be permitted. Minimum edges distance from the centre of any bolt holes shall not be less than what has been indicated hereunder:

5. MARKING

Each individual structure / section shall carry a code number conforming to component number given to it in the drawing / Bill of material. The code number of approved size shall be stamped with a metal die of 16 mm size on the member and shall be legible. The name of manufacturers in suitable code and the word “AVVNL” & “TN No” shall also be stamped / punched on each individual section with metal die of not less than 16 mm size. If the above marking is not found on the material received in the stores, the receipted challan shall not be given by the concerned stores. The challan shall only be issued after verification of material by the Store officer.

6. INSPECTION, TESTING & CHECKING :

The finished product before acceptance shall be subject to inspection in respect of workmanship, checking of dimension/weight & testing as per requirement of relevant IS:2062 (latest amended), approved drawings and bill of material, at the suppliers works if not supported by test certificates of main producers viz. SAIL/TISCO/RINL. The certificate for type test (chemical composition & mechanical properties test) issued by prime producer(s) shall be furnished along with the inspection call to the SE(TW.), otherwise testing shall be arranged at independent Lab on the cost of supplier.

In case bidder use the steel sections manufactured by prime producers then the inspecting officer shall verify and record in the inspection report regarding stamping and mark of prime producers. The certificate(s) in the name of other parties/ sources shall not be accepted and in such cases the tests for chemical and mechanical properties shall have to be arranged in the presence of inspecting officer(s) at recognized lab. The supplier shall present the latest Calibration Certificate(s) of testing instruments/equipments to be used for the testing of the material covered in the purchase order to the authorized inspecting officer/inspecting agency of the purchaser. The testing instruments/ meters/ apparatus etc. should be got calibrated by the supplier from time to time from independent test laboratory/ house having valid accreditation from National/ Accreditation Board for testing and calibrating laboratories for testing equipments/ original manufacturer having trace ability to NABL/NPL or equivalent. The calibration certificate(s) should not in any case be older than one year at the time of presenting the same to the inspecting officer/inspecting agency of the purchaser. The testing instruments/equipments should be duly sealed by the Calibrating agency and be indicated in the calibration certificate(s).

The following facilities are to be provided by the supplier at his own cost to the inspecting officer of AVVNL.

- (a) Suitable accommodation.
- (b) Local conveyance between arrival point, place of stay, works and departure point.
- (c) The supplier shall assist in arranging return ticket and reservation on the request of the inspecting officer for which the payment shall be made by the inspecting officer. In case of joint inspection, single or shared double room accommodation shall be provided.

7. TESTS

Test before dispatch:-

The various steel section/structure before dispatch shall be subject to following test as per IS:2062 (latest amendment) at the manufacturer's works

Routine test/acceptance test

- (i) Visual inspection and checking of Dimension
- (ii) Weight checking
- (iii) Chemical composition test
- (iv) Mechanical property test
- (v) Checking of welding

8. SAMPLING:

The inspection shall be carried out on each lot separately. The following number of pieces selected at random shall be subject to inspection/ testing and checking.

- a) Workmanship and dimension checking : 3 % samples from finished item.
- b) Chemical test : One sample of each steel section from the entire lot of material offered for inspection.
- c) Tensile test : One sample of each steel section from every 50 MT or Part thereof.
- d) Bend test : One sample of each steel section from every 50 MT or Part thereof.

9. TOLERANCE IN DIMENSIONS :

The tolerance(s) shall be permissible as per IS: 1852-1985 (latest amended).

Further the following tolerance(s) on fabricated items will also be allowed.

- i) Tolerance in overall length $\pm 3\text{mm}$
- ii) Tolerance in edge dimensions (centre of hole to end) $\pm 2\text{mm}$
- iii) Tolerance in hole centre $\pm 2\text{mm}$
- iv) Circular holes No tolerance
- v) Weight Tolerance +2% to (-) 4%

10. GUARANTEED TECHNICAL PARTICULARS :

The bidder shall furnish the guaranteed technical particulars of the material as required in the schedule-V by mentioning specific figures therein.

11. CRITERIA FOR ACCEPTANCE

The inspected material should be strictly in accordance to the GTP of the specification otherwise the material shall be treated as rejected and shall not be accepted.

12. WEIGHT

The weight of structure shall mean the weight of structures calculated by using standard sectional weights of all steel structural members of the sizes indicated in the fabrication drawings and/or subsequently revised drawings and bill of material without taking into consideration the reduction in weight due to drilling of bolt-holes, skew cuts, chamfering etc. or the increase in weight due to galvanization.

The material shall be acceptable if found within permissible tolerance limit i.e. +2% and (-) 4%.

TECHNICAL SPECIFICATION FOR 30 KV 10 KA HEAVY DUTY SURGEARRESTERS (LIGHTNING ARRESTERS)

1.0 SCOPE:

- 1.1 This specification provides for the design, engineering, manufacture, assembly, stage testing, inspection and testing before dispatch, packing, forwarding and delivery of Metal Oxide(gapless) Surge Arresters complete with accessories for 33KV system as specified hereunder:
- 1.2 It is not the intent to specify completely herein all the details of design and construction of Surge Arresters, However, Surge Arresters shall conform in all respects to the high standard of design and workmanship and be capable of performing in continuous commercial operation up to Bidder's guarantee in a manner acceptable to Purchaser, who will interpret the meanings of drawings and specifications and shall have the power to reject any work or material which in his judgment are not in accordance therewith. The Arresters offered shall be complete with all parts, necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of supply, irrespective of whether they are specifically brought out in the commercial order or not.

2.0 STANDARDS:

- 2.1 The Surge Arresters shall conform to the latest editions and amendments available at the time of supply, of the standards listed hereunder:

| Sl No. | Standard Ref No. | Title |
|--------|-------------------|--|
| 1. | IEC 99-4 | Specification Part.4 for Surge Arresters without gap for AC system. |
| 2 | IS:3070(Part-III) | Specification for Lightning Arresters for alternating current System |
| 3 | IS:2629 | Recommended practice for hot dip galvanizing of iron and steel. |
| 4 | IS:2633 | Method for testing uniformity of coating on Zinc coated articles. |
| 5 | IS:5621 | Specification for large hollow porcelain for use in electrical installation. |
| 6 | IS:2147 | Degree of protection provided by enclosures for low voltage switchgear and control gear. |
| 7. | | Indian Electricity Rules.1956. |

Note :

- i) For the purpose of this specification all technical terms used herein after shall have the meaning as per IEC specification.
- ii) For the parameters of the Arrester which are not specified in IEC specification for Surge Arresters, the provisions of ISS 3070 (Part-III) shall be applicable.
- 2.2 Surge Arresters meeting with the requirements of other authoritative standards, which ensure equal or better quality than the standards mentioned above shall also be acceptable. Where the equipment offered by the Bidder conforms to other standards, salient points of difference between the standards adopted and the specified standards shall be clearly brought out in the offer. Four (4)copies of the reference standards in English language shall be furnished along with the offer.

3.0 PRINCIPAL PARAMETERS :

The Surge Arresters offered under this specification shall conform to the parameters given below.

 S.No. Particulars. System Voltage (KV rms)

30 KV Station type

1. Nominal system voltage 33(kvrms)
2. Highest system voltage 36(kvrms)
3. 1.2/50 micro second impulse voltage withstand level
 - a. Transformer and reactors 170(kvp)
 - b. Other equipment and 170lines (kvp)
4. Minimum prospective 25symmetrical fault current for 1 second at Arrester location(KA rms)
5. Anticipated levels of temporary over voltage and its duration.
 - a. Voltage(p.u.) 1.5
 - b. Duration(Seconds) 1/10
6. System frequency(Hz) -----50 Hz plus minus 1.5--
7. Neutral Grounding -----Effectively Earthed--
8. Number of Phases -----Three-----

Note: 1. 1 p.u. = 36 x Root 2 kvp

4.0 GENERAL TECHNICAL REQUIREMENTS :

- 4.1 The Surge Arresters shall conform to the technical requirements 4.2 The energy handling capability of each rating of Arrester offered, supported by calculations, shall be furnished in the offer.
- 4.3 The Station Type Surge Arresters shall be fitted with pressure relief devices and arc diverting ports and shall be tested as per the requirements of IEC specification for minimum prospective symmetrical fault
- 5.4 The grading ring on each complete Arrester for proper stress distribution shall be provided if required for attaining all the relevant technical parameters.

5.5 PROTECTIVE LEVELS :

The basic insulation levels and switching impulse withstand levels of the lines and equipment to be protected ".

The protective characteristics of the Arresters offered shall be clearly specified in the schedule of guaranteed technical particulars.

5.5 GENERAL REQUIREMENTS :

- 5.6.1 The materials and components not specifically stated in this specification but which are necessary for satisfactory operation of the equipment are deemed to be included in the scope of supply unless specifically excluded.
- 5.6.2 Unless otherwise brought out separately by the Bidder in the schedule of deviations the Surge Arresters offered shall conform to the specification scrupulously. All deviations from the specification shall be brought out in the schedule of deviations. The discrepancies between the specification and the catalogues or literature submitted as part of the offer shall not be considered as valid deviations unless specifically brought out in the schedule of deviations.
- 5.6.3 Any deviation which has not been specifically brought out in the schedule of deviations of the Bid Proposal Sheets, shall not be given effect to. The deviations

brought out in the schedule shall be supported by authentic documents, standards and other references.

- 5.6.4. Each individual unit of Surge Arresters shall be hermetically sealed and fully protected against ingress of moisture. The hermetic seal shall be effective for the entire life time of the Arrester and under the service conditions as specified. The Bidder shall furnish sectional view of the Arrester, showing details of sealing employed.
- 5.6.5 The bidder shall furnish in the offer, a sectional view of pressure relief device employed in the Station type Surge Arresters offered.
- 5.6.6 The Surge Arresters shall be suitable for hot line washing.
- 5.7 Construction :
- 5.7.1 All the units of Arresters of same rating shall be interchangeable without adversely affecting the performance.
- 5.7.2 The Surge Arresters shall be outdoor and suitable for pedestal/ clamp type mounting.
- 5.7.3 All the necessary flanges, bolts, nuts, clamps etc., required for assembly of complete Arrester with accessories and mounting on support structure to be supplied by the Purchaser shall be included in Bidder's scope of supply.
- 5.7.4 The drilling details for mounting the Arrester on Purchaser's support shall be supplied by the Supplier.
- 5.7.5 The minimum permissible separation between the Surge Arrester and any earthed object shall be indicated by the Bidder in his offer.
- 5.8. PORCELAIN / POLYMERIC HOUSING :
- 5.8.1 The housing may be of Porcelain or Polymeric.
- 5.8.2 Where the bidders are quoting for Surge Arresters with Porcelain Housing, all porcelain housings shall be free from lamination cavities or other flaws affecting the maximum level of mechanical and electrical strengths.
- 5.8.3 The porcelain shall be well vitrified and nonporous.
- 5.8.4 The porcelain petticoat shall be preferably of self-cleaning type (Aero foil design).The details of the porcelain housing such as height, angle of inclination, shape of petticoats, gap between the petticoats, diameter(ID and OD) etc., shall be indicated by the Bidder in his offer in the form of a detailed drawing.
- 5.8.5 The Arrester housing shall conform to the requirements of IEC specification.

5.9. GALVANISATION, NICKEL PLATING ETC.:

- 5.9.1. All ferrous parts exposed to atmosphere shall be hot dip galvanized as per IS:2629 as amended from time to time. Tinned copper/brass lugs shall be used for internal wiring. Screws used for electrical connections shall be either made of brass or nickel plated.
- 5.9.2. Ground terminal pads and name plate brackets shall be hot dip galvanized.
- 5.9.3 The material shall be galvanized only after completing all shop operations.
- 5.10. ACCESSORIES AND FITTINGS :
- 5.10.1 All necessary accessories and earthing connection leads shall be in the Bidder's scope of supply.
- 5.10.2 Terminal connector conforming to IS:5561 shall be supplied along with the arrester.
- 5.11. The grounding terminal shall be suitable for accommodating Purchaser's grounding connection to steel earth mat.
- 5.12. Name Plate :

The arrester shall be provided with non-corrosive legible name plate indelibly marked with the following information:

1. AVVNL

2. Order No.
3. Manufacturer's name, address, Phone & Fax Number, trade mark and identification no. of the Arrester being supplied.
4. Rated Voltage.
5. Maximum continuous operating voltage.
6. Type.
7. Rated Frequency.
8. Nominal discharge current.
9. Line discharge class.
10. Pressure relief current in kA rms.
11. B.I.L. of the equipment to be protected.
12. Year of manufacture.
13. Date of dispatch.
14. Date of Expiry of Warranty.

6.0. TESTS :

6.1 TEST BEFORE DESPATCH: The Surge Arrester of various rating and accessories shall be subjected at maker's works before dispatch, to the following tests as per relevant standards.

A) ROUTINE TEST ON EACH UNIT AS PER RELEVANT STANDARDS :

1. Measurement of reference voltage.
2. Residual voltage test.
3. Satisfactory absence from partial discharges and contact noises.
4. For arrester units with sealed housing leakage check shall be made on each unit.
5. Current distribution test for multi Column arrester.

6.2 TYPE TESTS :

The bidder must furnish type test reports from a Govt. approved / Govt. recognized/ NABL Accredited laboratory / ILAC i.e. International Laboratory Accredited Laboratory (in case of foreign laboratory) of similar rating and design of tendered material/ equipment along with detailed dimensional drawing duly signed & verified by testing agency also showing size & numbers of blocks dimensions contained in the housing along with bid as per the qualification requirement of the Tender Specification. Such type test certificates should not be older than **5 (Five) years** as on the date of bid opening. For this purpose date of conducting type test will be considered. The type test certificates should be furnished either in Original or in copy duly Notary attested.

6.2.2: TYPE TESTS SHALL BE CONDUCTED ON ONE UNIT OF EACH RATING AS PER RELEVANT STANDARD.

1. Insulation withstand test.
2. Residual voltage test.
3. Bending test on arrester housing assembly.
4. Long duration current impulse withstand test.
5. Operating duty test.
6. Pressure relief test(Only for station type)
7. Artificial pollution test on porcelain.
8. Partial discharge test.
9. Housed arresters.
 - a) Temperature cycle test.

b) Porosity test.

10. Galvanizing test on exposed ferrous metal parts.
11. Any other type test which are not specified above but covered as per amendment/latest edition of relevant IS/IEC.

6.3 TEST ON BOUGHT OUT ITEMS :

Tests are not required to be performed on bought out equipments/items like, Terminal connector etc. at the works of manufacturer. Furnishing Test Certificate of bought out items from the original equipment manufacturers shall be deemed to be satisfactory evidence. Inspection of the tests at Sub-contractors works will be arranged by the supplier whenever required.

6.4 ROUTINE/ACCEPTANCE TESTS :

The following tests shall be got conducted in presence of purchaser's representative, as per stipulation of the relevant standards. Acceptance tests whenever possible, shall be conducted on the complete arrester unit. No. of samples to be selected for acceptance tests shall be nearest lower whole number to the cube root of the number of arresters to be supplied.

1. Measurement of power frequency reference voltage on the complete arrester at the reference current measured at the bottom of the arrester.
2. Lightning Impulse residual voltage.
3. Partial discharge test.
4. Visual inspection & verification of dimension.
5. Special thermal stability test.
6. Galvanizing test on Ferrous metal parts.
7. Any other tests as per IS.

6.5 TOLERANCE ON TEST RESULTS :

As per relevant standards/specifications.

6.6. CHECKING AT STORES (TEST AT CTL):

One out of every 50 Nos. Surge Arresters will be selected for checking for visual, dimensional, weight, marking etc. as per relevant ISS/GTP/approved drawing.

TECHNICAL SPECIFICATION FOR 9 KV 10 KA HEAVY DUTY SURGE ARRESTERS (LIGHTNING ARRESTERS)

1.0 SCOPE:

- 1.1 This specification provides for the design, engineering, manufacture, assembly, stage testing, inspection and testing before dispatch, packing, forwarding and delivery of Metal Oxide(gapless) Surge Arresters complete with accessories for 11KV system as specified hereunder:
- 1.2 It is not the intent to specify completely herein all the details of design and construction of Surge Arresters, However, Surge Arresters shall conform in all respects to the high standard of design and workmanship and be capable of performing in continuous commercial operation upto Bidder's guarantee in a manner acceptable to Purchaser, who will interpret the meanings of drawings and specifications and shall have the power to reject any work or material which in his judgment are not in accordance therewith. The arresters offered shall be complete with all parts, necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of supply, irrespective of whether they are specifically brought out in the commercial order or not.

2.0 STANDARDS:

2.1 The Surge Arresters shall conform to the latest editions and amendments available at the time of supply, of the standards listed hereunder:

| Sl No. | Standard Ref No. | Title |
|--------|--------------------------------|--|
| 1. | IEC 99-4 | Specification Part.4 for Surge Arresters without gap for AC system. |
| 2 | IS:3070(Part-III) | Specification for Lightning Arresters for alternating current System |
| 3 | IS:2629 | Recommended practice for hot dip galvanizing of iron and steel. |
| 4 | IS:2633 | Method for testing uniformity of coating on Zinc coated articles. |
| 5 | IS:5621 | Specification for large hollow porcelain for use in electrical installation. |
| 6 | IS:2147 | Degree of protection provided by enclosures for low voltage switchgear and control gear. |
| 7. | Indian Electricity Rules.1956. | |

Note :

- i) For the purpose of this specification all technical terms used herein after shall have the meaning as per IEC specification.
- ii) For the parameters of the Arrester which are not specified in IEC specification for Surge Arresters, the provisions of ISS 3070 (Part-III) shall be applicable.

2.2 Surge Arresters meeting with the requirements of other authoritative standards, which ensure equal or better quality than the standards mentioned above shall also be acceptable. Where the equipment offered by the Bidder conforms to other standards, salient points of difference between the standards adopted and the specified standards shall be clearly brought out in the

offer. Four (4) copies of the reference standards in English language shall be furnished along with the offer.

3.0 **PRINCIPAL PARAMETERS :**

The Surge Arresters offered under this specification shall conform to the parameters given below.

S.No. Particulars. System Voltage (KV rms)

9 KV Station type

1. Nominal system voltage 11(kvrms)
 2. Highest system voltage 12(kvrms)
 3. 1.2/50 micro second impulse voltage withstand level
 - a. Transformer and reactors 75(kvp)
 - b. Other equipment and 75lines (kvp)
 4. Minimum prospective 10symmetrical fault current for 1 second at Arrester location(KA rms)
 5. Anticipated levels of temporary over voltage and its duration.
 - a. Voltage(p.u.) 1.5
 - b. Duration(Seconds) 1/10
 6. System frequency(Hz) -----50 Hz plus minus 1.5--
 7. Neutral Grounding -----Effectively Earthed--
 8. Number of Phases -----Three-----
- Note: 1. 1 p.u. = $12 \times \text{Root } 2 \text{ kvp} / \text{Root } 3$

4.0 **GENERAL REQUIREMENTS :**

- 4.1 The materials and components not specifically stated in this specification but which are necessary for satisfactory operation of the equipment are deemed to be included in the scope of supply unless specifically excluded.
- 4.2 The discrepancies between the specification and the catalogues or literature submitted as part of the offer shall not be considered as valid deviations unless specifically brought out in the schedule of deviations.
- 4.3 Each individual unit of Surge Arresters shall be hermetically sealed and fully protected against ingress of moisture. The hermetic seal shall be effective for the entire life time of the Arrester and under the service conditions as specified. The Bidder shall furnish sectional view of the Arrester, showing details of sealing employed.
- 4.5 The bidder shall furnish in the offer, a sectional view of pressure relief device employed in the Station type Surge Arresters offered.
- 4.6 The Surge Arresters shall be suitable for hot line washing.
- 4.7 Construction :
 - 4.7.1 All the units of Arresters of same rating shall be interchangeable without adversely affecting the performance.
 - 4.7.2 The Surge Arresters shall be outdoor and suitable for pedestal/ clamp type mounting.
 - 4.7.3 All the necessary flanges, bolts, nuts, clamps etc., required for assembly of complete Arrester with accessories and mounting on support structure to be supplied by the Purchaser shall be included in Bidder's scope of supply.
 - 4.7.4 The drilling details for mounting the Arrester on Purchaser's support shall be supplied by the Supplier.
 - 4.7.5 The minimum permissible separation between the Surge Arrester and anyearthed object shall be indicated by the Bidder in his offer.

4.8. PORCELAIN / POLYMERIC HOUSING :

- 4.8.1 The housing may be of Porcelain or Polymeric.
- 4.8.2 Where the bidders are quoting for Surge Arresters with Porcelain Housing, all porcelain housings shall be free from lamination cavities or other flaws affecting the maximum level of mechanical and electrical strengths.
- 4.8.3 The porcelain shall be well vitrified and nonporous.
- 4.8.4 The creep age distance of the Arrester housing shall be as per Annexure-A.
- 4.8.5 The porcelain petticoat shall be preferably of self-cleaning type (Aero foil design).The details of the porcelain housing such as height, angle of inclination, shape of petticoats, gap between the petticoats, diameter(ID and OD) etc., shall be indicated by the Bidder in his offer in the form of a detailed drawing.
- 4.8.6 The Arrester housing shall conform to the requirements of IEC specification.

4.9. GALVANISATION, NICKEL PLATING ETC.:

- 4.9.1. All ferrous parts exposed to atmosphere shall be hot dip galvanized as perIS:2629 as amended from time to time. Tinned copper/brass lugs shall be used for internal wiring. Screws used for electrical connections shall be either made of brass or nickel plated.
- 4.9.2. Ground terminal pads and name plate brackets shall be hot dip galvanized.
- 4.9.3 The material shall be galvanized only after completing all shop operations.

5.0. ACCESSORIES AND FITTINGS :

- 5.1 All necessary accessories and earthing connection leads shall be in the Bidder's scope of supply.
- 5.2 Terminal connector conforming to IS:5561 shall be supplied along with the arrester.
- 5.3 The grounding terminal shall be suitable for accommodating Purchaser's grounding connection to steel earth mat.
- 5.4. Name Plate :
The arrester shall be provided with non-corrosive legible name plate indelibly marked with the following information:
 - 1. AVVNL
 - 2. Order No.
 - 3. Manufacturer's name, address, Phone & Fax Number, trade mark and identification no. of the Arrester being supplied.
 - 4. Rated Voltage.
 - 5. Maximum continuous operating voltage.
 - 6. Type.
 - 7. Rated Frequency.
 - 8. Nominal discharge current.
 - 9. Line discharge class.
 - 10. Pressure relief current in kA rms.
 - 11. B.I.L. of the equipment to be protected.
 - 12. Year of manufacture.
 - 13. Date of dispatch.
 - 14. Date of Expiry of Warranty.

6.0. TESTS :

- 6.1 **TEST BEFORE DESPATCH:** The Surge Arrester of various rating and accessories shall be subjected at maker's works before dispatch, to the following tests as per relevant standards.

A) ROUTINE TEST ON EACH UNIT AS PER RELEVANT STANDARDS :

- 1. Measurement of reference voltage.
- 2. Residual voltage test.
- 3. Satisfactory absence from partial discharges and contact noises.

4. For arrester units with sealed housing leakage check shall be made on each unit.
5. Current distribution test for multi Column arrester.

6.2 TYPE TESTS :

The bidder must furnish type test reports from a Govt. approved / Govt. recognized/ NABL Accredited laboratory / ILAC i.e. International Laboratory Accredited Laboratory (in case of foreign laboratory) of similar rating and design of tendered material/ equipment along with detailed dimensional drawing duly signed & verified by testing agency also showing size & numbers of blocks dimensions contained in the housing along with bid as per the qualification requirement of the Tender Specification. Such type test certificates should not be older than **5 (Five) years** as on the date of bid opening. For this purpose date of conducting type test will be considered. The type test certificates should be furnished either in Original or in copy duly Notary attested.

6.2.1: TYPE TESTS SHALL BE CONDUCTED ON ONE UNIT OF EACH RATING AS PER RELEVANT STANDARD.

1. Insulation withstand test.
2. Residual voltage test.
3. Bending test on arrester housing assembly.
4. Long duration current impulse withstand test.
5. Operating duty test.
6. Pressure relief test(Only for station type)
7. Artificial pollution test on porcelain.
8. Partial discharge test.
9. Housed arresters.
 - a) Temperature cycle test.
 - b) Porosity test.
10. Galvanizing test on exposed ferrous metal parts.
11. Any other type test which are not specified above but covered as per amendment/latest edition of relevant IS/IEC.

6.3 TEST ON BOUGHT OUT ITEMS :

Tests are not required to be performed on bought out equipments/items like, Terminal connector etc. at the works of manufacturer. Furnishing Test Certificate of bought out items from the original equipment manufacturers shall be deemed to be satisfactory evidence. Inspection of the tests at Sub-contractors works will be arranged by the supplier whenever required.

6.4 ROUTINE/ACCEPTANCE TESTS :

The following tests shall be got conducted in presence of purchaser's representative, as per stipulation of the relevant standards. Acceptance tests whenever possible, shall be conducted on the complete arrester unit. No. of samples to be selected for acceptance tests shall be nearest lower whole number to the cube root of the number of arresters to be supplied.

1. Measurement of power frequency reference voltage on the complete arrester at the reference current measured at the bottom of the arrester.
2. Lightning Impulse residual voltage.
3. Partial discharge test.
4. Visual inspection & verification of dimension.
5. Special thermal stability test.
6. Galvanizing test on Ferrous metal parts.
7. Any other tests as per IS.

6.5 TOLERANCE ON TEST RESULTS :

As per relevant standards/specifications.

6.6. CHECKING (TEST AT CTL):

One out of every 50 Nos. Surge Arresters will be selected for checking at Store for visual, dimensional, weight, marking etc. as per relevant ISS/GTP/approved drawing.

TECHNICAL SPECIFICATION OF 11 KV DROP OUT FUSE CUT OUTS**1. SCOPE**

This specification covers outdoor, open, drop-out expulsion type Fuse Cutouts suitable for installation in 50 Hz, 11 KV distribution system.

2. APPLICATION

The distribution fuse cutouts are intended for use in distribution transformers and have no inherent load break capacity.

3. APPLICABLE STANDARD

Unless otherwise modified in this specification, the cutout shall conform to IS:9385 (Part-I to III) as amended from time to time.

4. RATED VOLTAGE

The rated voltage shall be 12 KV.

5. RATED CURRENT

The rated current shall be 100 A.

6. RATED LIGHTNING IMPULSE WITHSTAND VOLTAGE VALUES FOR THE FUSE BASE

The rated lightning impulse withstand voltages both for positive and negative polarities shall be as given below:

- | | |
|---|--------------|
| a) To earth and between poles | 75 KV (Peak) |
| b) Across the isolating distance of fuse base | 85 KV (Peak) |

7. RATED ONE MINUTE POWER FREQUENCY WITHSTAND VOLTAGE (DRY & WET) VALUES FOR THE FUSE BASE

- | | |
|----------------------------------|-------------|
| a) To earth and between poles | 28 KV (rms) |
| b) Across the isolating distance | 32 KV (rms) |

8. TEMPERATURE RISE LIMIT (In Air)

- | | |
|-----------------------------------|--|
| a) Copper contacts silver faced | 65°C |
| b) Terminals | 50°C |
| c) Metal parts acting as springs. | The temp. shall not reach such a value that elasticity of metal is changed |

9. RATED BREAKING CAPACITY

The rated breaking capacity shall be 8 KA (Asymmetrical).

10. GENERAL REQUIREMENTS/CONSTRUCTIONAL DETAILS

- 10.1** The cutouts shall be of single vent type (downward) having a front connected fuse carrier suitable for angle mounting.
- 10.2** All ferrous parts shall be hot dip galvanized in accordance with the latest version of IS:2633. Nuts and bolts shall conform to IS:1364. Spring washers shall be electro-galvanized.
- 10.3** Typical constructional details of the fuse cutout are shown in Fig. 1

11. FUSE BASE TOP ASSEMBLY

- 11.1** The top current carrying parts shall be made of a highly conductive copper alloy and the contact portion shall be silver plated for corrosion resistance and efficient current flow. The contact shall have a socket cavity for latching and holding firmly the fuse carrier until the fault interruption is completed within the fuse.
- 11.2** The top contact shall be actuated by a strong steel spring which keeps it under sufficient pressure to maintain a firm contact with the fuse carrier during all operating conditions. The spring shall also provide flexibility and absorbs most of the stresses when the fuse carrier is pushed into the closing position.
- 11.3** The current carrying parts of the assembly shall be protected from water and dust formation by a stainless steel top cover.
- 11.4** The top contact assembly shall have a robust galvanized steel hook to align and guide the fuse carrier into the socket latch even when the fuse carrier is closed at an off-Centre angle.
- 1.5** The top assembly shall have an aluminum alloy terminal connector
- 1.6** The top assembly shall be robust enough to absorb bulk of the forces during the fuse carrier closing and opening operations and shall not over-stress the spring contact. It shall also prohibit accidental opening of the fuse carrier due to vibrations or impact.

12. FUSE BASE BOTTOM ASSEMBLY

- 12.1** The conducting parts shall be made of high strength highly conductive copper alloy and the contact portion shall be silver plated for corrosion resistance and shall provide a low resistance current path from the bottom fuse carrier contacts to the bottom terminal connector.
- 12.2** The bottom assembly shall have hinge contacts made from highly conductive, anti-corrosive copper alloy and shall accommodate and make a firm contact with the fuse carrier bottom assembly. The fuse carrier shall be placed easily in or lifted from The hinges without any maneuvering. In addition, the bottom assembly shall perform the following functions :-

- i) When opened manually or after fault interruption the fuse carrier shall swing through 180° to the vertical and its further travel shall be prevented by the fuse base bottom assembly.
- ii) The fuse carrier shall be prevented from slipping out of the self-locking hinges during all operating conditions and only when the fuse carrier has reached its fully open position can it be removed from the hinge support.

12.3 The assembly shall have an aluminum alloy terminal connector

13 FUSE CARRIER TOP ASSEMBLY

- 13.1** The fuse carrier top contact shall have a solid replaceable cap made from highly conductive, anti-corrosive copper alloy and the contact portion shall be silver plated to provide a low resistance current path from the Fuse Base Top Contact to the Fuse Link. It shall make a firm contact with the button head of the fuse link and shall provide a protective enclosure to the fuse link to check spreading of arc during fault interruptions.
- 13.2** The fuse carrier shall be provided with a cast bronze opening eye (pull ring) suitable for operation with a hook stick from the ground level to pull-out or close-in the fuse carrier by manual operation.

14. FUSE CARRIER BOTTOM ASSEMBLY

- 14.1** The fuse carrier bottom assembly shall be made of bronze castings with silver plating at the contact points to efficiently transfer current to fuse base. It shall make smooth contact with the fuse base bottom assembly during closing operation.
- 14.2** The bottom assembly shall have a lifting eye for the hook stick for removing or replacing the fuse carrier.
- 14.3** The bottom assembly shall have a suitable ejector which shall perform the following functions :
- i) It shall keep the fuse link in the centre of fuse tube and keep it tensioned under all operating conditions.
 - ii) It shall be capable of absorbing the shock when the fuse carrier is pushed into the closed position and shall not allow the fuse link to be damaged. This is specially important when the fuse link is of low-ampere rating.
 - iii) The ejector at the instant of interruption shall retain the fuse carrier in the closed position long enough to ensure that the arc is extinguished within the fuse tube thereby excluding the possibility of arcing and subsequent damage at the contact surfaces.
 - iv) The ejector shall help the fuse link separation after fault interruption, allowing the fuse carrier to drop out and clearing the pigtail of the blown fuse link through the bore of fuse tube.

15. FUSE BASE (PORCELAIN)

The fuse base shall be a bird-proof, single unit porcelain insulator with a creep age distance (to earth) not less than 320mm. The top and bottom assemblies as also the middle clamping hardware shall be either embedded in the porcelain insulator with sulphur

cement or suitably clamped in position. For embedded components, the pull out strength should be such as to result in breaking of the porcelain before pull out occurs in a test. For porcelain insulators, the beam strength shall not be less than 1000 Kg.

16. FUSE TUBE

The fuse tube shall be made of fiber glass coated with ultraviolet inhibitor on the outer surface and having arc quenching bone fiber liner inside. The tube shall have high bursting strength to sustain high pressure of the gases during fault interruption. The inside diameter of the fuse tube shall be 17.5mm. The

solid cap of the fuse carrier shall clamp the button head of the fuse link, closing the top end of the fuse tube and allowing only the downward venting during fault interruption.

17. TYPE TESTS

The cutout shall be subjected to the following type tests :

- i) Dielectric tests (rated impulse withstands and rated one minute power frequency with stand test voltages)
- ii) Temperature rise test

The above tests shall be carried out in accordance with IS:9385 Part I & II.

For Porcelain Fuse Base only.

- iii) Pull out test for embedded components of the fuse base
- iv) Beam strength of porcelain base

18. MOUNTING ARRANGEMENT

18.1 The cutouts shall be provided with a suitable arrangement for mounting these on 75x40mm or 100x50mm channel cross arm in such a way that the centre line of the fuse base is at an angle of 15° to 20° from the vertical and shall provide the necessary clearances from the support. Mounting arrangement shall be made of high strength galvanized steel flat and shall be robust enough to sustain the various stresses encountered during all operating conditions of the cutout. For more details see enclosed figure 2.

18.2 Strength of the component marked 1 (see figure) shall be determined by clamping the member with the shorter leg at the top to a rigid support by M-10 carriage bolts. A downward force shall be applied along the axis of M-14 carriage bolt parallel to the longer leg and in the direction of longer leg of the member under test. A load of 50 Kg. shall be applied and then removed to take up any slack in the mounting arrangement before the measurement of position is taken, the permanent set measured at the axis of the M-14 carriage bolt shall not exceed 1.6mm when a load of 425 Kg. is applied and removed.

18.3 The strength of the M-14 bolt shall in no case be less than 1900 Kg. and the strength of M-10 bolts not less than 3500 Kg.

19. TERMINAL CONNECTIONS

The cut-out shall be provided with two aluminum alloy (alloy designation 2280 (A-11) as per IS:617-1975) terminal connectors at top and bottom of fuse base assemblies to receive aluminum conductors of diameters between 6.3mm to 10.05mm. These terminals shall be easily accessible irrespective of the cut-out location with respect to the pole. The terminals shall meet the test requirements of REC Construction Standard.

20. INSPECTION

All tests and inspection shall be made at the place of manufacture unless otherwise especially agreed upon by the manufacturer and the purchaser at the time to purchase. The manufacturer shall afford the inspector representing the purchaser all reasonable facilities without charge, to satisfy him that the material is being furnished in accordance with this specification.

The purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is dispute regarding the quality of supply.

Technical Specification for Porcelain Insulators and Insulator Fittings for 33 kV Overhead Power Lines

1. SCOPE

This specification covers the details of the porcelain insulators and insulator fittings for use on 33 KV lines in rural electric sub-transmission systems.

2. APPLICABLE STANDARDS

Unless otherwise stipulated in this Specification, the insulators shall comply with the Indian Standard Specification **IS:731-1971** and the insulator fittings with **IS:2486 (Pt-I)-1971** and **IS:2486 (Pt-II)-1974** or the latest version thereof.

3. INSULATORS

3.1 General Requirements

- 3.1.1** The porcelain shall be sound, free from defects, thoroughly vitrified and smoothly glazed.
- 3.1.2** Unless otherwise specified, the glaze shall be brown in colour. The glaze shall cover all the porcelain parts of the insulator except those areas which serve as supports during firing or are left unglazed for the purpose of assembly.
- 3.1.3** The design of the insulator shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. The porcelain shall not engage directly with hard metal.
- 3.1.4** Cement used in the construction of the insulator shall not cause fracture by expansion or loosening by contraction and proper care shall be taken to locate the individual parts correctly during cementing. The cement shall not give rise to chemical reaction with metal fittings, and its thickness shall be as uniform as possible.

3.2 Classification

Only Type 'B' insulators as defined in Indian Standards shall be used. The string insulators shall only be of ball and socket type.

3.3 Basic Insulation Levels

- 3.3.1** The test voltages of the insulators shall be as under :

Table (Clause 3.3.1)

| Highest System Voltage | Visible Discharge | Wet Power Frequency | Power Frequency Puncture Withstand Test | Impulse Voltage |
|------------------------|-------------------|---------------------|---|-----------------|
|------------------------|-------------------|---------------------|---|-----------------|

| | Test | Withstand Test | Pin | String Insulator Units | Withstand Test |
|--|----------|----------------|----------|--|----------------|
| | KV (rms) | KV (rms) | KV (rms) | KV(rms) | KV (Peak) |
| | 36 | 27 | 180 | 1.3 times the actual dry flash over voltage of the Unit. | 170 |

3.3.2 In this specification, power frequency voltages are expressed as peak values divided by $\sqrt{2}$ and impulse voltages are expressed as peak values.

3.3.3 The withstand and flashover voltages are referred to the 'Reference Atmospheric Conditions' as per Indian Standard.

3.4 Mechanical Load

The insulators shall be suitable for the minimum failing loads specified as under :

| Pin Insulator Failing loads | String Insulator Units | |
|-----------------------------|------------------------|-----------------------------------|
| | Failing Loads | Commended Pin Ball Shank Diameter |
| 10 KN | 45 KN | 16 m |

3.5 Creep age Distance

The minimum creep age distance shall be as under :

| Highest System Voltage | Normal and Moderately Polluted Atmosphere (Total) | Highly polluted Atmosphere (Total) |
|------------------------|---|------------------------------------|
| 1 | 2 | 3 |
| 36KV | 580mm | 840mm |

Note : For insulator used in an approximately vertical position the values given in Col.(2) or (3) shall apply. For insulators used in an approximately horizontal position, the value given in Col.(2) shall apply but the value in Col.(3) may be reduced by as much as 20%.

3.6 Tests :

The insulators shall comply with the following tests as per **IS:731-1971** and latest version thereof.

3.6.1 Type Tests

- Visual examination,
- Verification of dimensions,
- Visible discharge test,
- Impulse voltage withstand test,
- Wet power-frequency voltage withstand test,
- Temperature cycle test,
- Electro-mechanical failing load test

- h) Mechanical failing load test (for those of Type B string insulator units to which electro mechanical failing load test (g) is not applicable).
- i) Twenty four hours mechanical strength test (for string insulators only when specified by the purchaser).
- j) Puncture Test
- k) Porosity test and
- l) Galvanizing test

3.6.2 Acceptance Tests

The test samples after having withstood the routine tests shall be subjected to the following acceptance test in the order indicated below :

- a) Verification of dimensions.
- b) Temperature cycle test
- c) Twenty four hours mechanical strength test (for string insulator units only when specified by the purchaser)
- d) Electro-mechanical failing load test.
- e) Puncture test.
- f) Porosity test and
- g) galvanizing test

3.6.3 Routine Test

- a) Visual examination.
- b) Mechanical routine test (for string insulator units only) and
- c) Electrical routine test (for string insulator units only)

3.7 Marking

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

- a) Name or trade mark of the manufacturer
- b) Month and year of manufacture
- c) Minimum failing load in Newtons
- d) Country of the manufacture and
- e) ISI Certification mark, if any.

3.7.2 Marking on porcelain shall be printed and shall be applied before firing.

3.8 Packing

All insulators (without fittings) shall be packed in wooden crates suitable for easy but rough handling and acceptable for rail transport. Where more than one insulator are packed in a crate, wooden separators shall be fixed between the insulators to keep individual insulators in position without movement within the crate. Disc insulators, however, may be assembled in string and packed inside a crate to prevent movement.

4. INSULATOR FITTINGS

4.1 Pins for Pin Insulators

4.1.1 General Requirements

4.1.1.1 The pin shall be a single piece obtained preferably by the process of forging. It shall not be made by joining, welding, shrink-fitting or any other process from more than one piece of material. It shall be of good finish, free from flaws and other defects. The finish of the collar shall be such that a sharp angle between the collar and the shank is avoided.

4.1.1.2 All ferrous pins, nuts and washer except those made of stainless steel shall be galvanized. The threads of nuts shall be cut after galvanizing and shall be well oiled and greased.

4.1.2 Type & Dimensions

4.1.2.1 Pins with large steel head Type L300N as per **IS:2486 (Pt-II)** having stalk length of 300 mm and shank length of 150 mm with minimum failing load of 10 KN shall be used.

4.1.2.2 The complete details of the pin are given in Fig.1.

4.1.3 Tests

Insulator pins shall comply with the following tests as per **IS:2486 (pt.I)**.

4.1.3.1 Type Tests

- a) Visual examination test
- b) Checking of threads on heads
- c) galvanizing test and
- d) Mechanical test

4.1.3.2 Acceptance Tests

- a) Checking of threads on heads
- b) galvanizing test and
- c) Mechanical test

4.1.3.3 Routine Test

Visual examination

4.2 String Insulator Fittings

4.2.1 General Requirements

4.2.1.1 All forgings and castings shall be of good finish and free of flaws and other defects. The edges on the outside of fittings, such as at the ball socket and holes, shall be rounded.

4.2.1.2 All parts of different fittings which provide for interconnection shall be made such that sufficient clearance is provided at the connection point to ensure free movement and suspension of the insulator string assembly. All ball and socket connections shall be free in this manner but care shall be taken that too much clearance between ball and socket is avoided.

4.2.1.3 All ferrous fittings and the parts other than those of stainless steel, shall be galvanized. Small fittings like spring washers, nuts, etc. may be electro-galvanized.

4.2.2. Type and Dimensions

4.2.2.1 Only ball and socket type insulator sets shall be used. The nominal dimensions of the ball and sockets, ball eye and cross-arm straps are given in Fig. 2. An assembly drawing of the complete insulator string is given in Fig. 3.

4.2.2.2 Strain clamps shall be suitable for ACSR conductors 7/3.35 mm² (50 mm² Al. area), 7/4.09mm (80mm² Al. area) and 6/4.72mm + 7/1.57 mm (100 mm² Al. area). The ultimate strength of clamps shall not be less than 41 KN.

4.2.3 Tests

String insulator fittings shall comply with the following tests as per **IS:2486 (Pt-I)**.

4.2.3.1 Type Tests

- a) Slip strength test
- b) Mechanical test
- c) Electrical resistance test
- d) Heating cycle test
- e) Verification of dimensions
- f) galvanizing/Electroplating test, and
- g) Visual examination test

4.2.3.2 Acceptance Tests

- a) Verification of dimensions
- b) galvanizing/Electroplating test, and
- c) Mechanical tests

4.2.3.3 Routine Tests

- a) Visual examination test and
- b) Routine mechanical test

4.2.4 Marking

4.2.4.1 The caps and clamps shall have marked on them the following :

- a) Name or trade mark of the manufacturer and
- b) Year of manufacture

4.3 Packing

4.3.1 For packing of GI pins, strain clamps and related hardware, double gunny bags (or wooden cases, if deemed necessary) shall be employed. The heads and threaded portions of pins and the fittings shall be properly protected against damage. The gross weight of each packing shall not normally exceed 50 Kg. Different fittings shall be packed in different bags or cases and shall be complete with their minor accessories fitted in place. All nuts shall be hand-tightened over the bolts and screwed upto the farthest point.

4.3.2 The packages containing fittings may also be marked with the ISI certification mark

TECHNICAL SPECIFICATION ISI MARKED FOUR CORE AND TWO CORE LT XLPE INSULATED AND PVC SHEATHED ARMoured CABLES.**11.0 SCOPE:**

1.1 This specification covers the details of ISI Marked Four Core & Two Core LT XLPE Insulated and PVC Sheathed Armoured Circular Cables with Aluminum Conductor suitable for working voltage upto & including 1100 Volts & Conforming to IS:7098 (Pt.-I)/ 1988 with latest amendments.

2. STANDARDS:

Unless otherwise stipulated in this specification the following standards with latest amendments shall be applicable.

- i) IS:7098(Pt.-I)/1988: XLPE Insulated cables for working voltages upto and including 1100 Volts.
- ii) IS:8130 :Conductors for insulated cables.
- iii) IS:5831 :PVC insulation and sheath of electric cables.
- iv) IS:10810 :Methods of test for cables.
- v) IS:3975/1979 :Galvanized Steel Wire/Strips.
- vi) IS:10418 :Drums for electric cables.

3. GENERAL REQUIREMENT:

The LT XLPE Insulated Armoured cables shall conform to IS:7098 (Pt.-I)/1988 with latest amendment and bear BIS certification mark. The material used for construction of the cables shall be of best qualities complying with the requirements of IS:7098 (Pt.-I)/1988 and other relevant standards. The cables shall be suitable for outdoor/ indoor installation free in air and shall be capable of withstanding the normal stresses associated with transportation, erection, reeling and unreeling operations without getting deformed.

The cable shall be suitable for use where combination of ambient temperature and temperature rise due to load results in a conductor temperature not exceeding 90 degree C under normal operation and 250 degree C under short circuit condition.

The LT XLPE Insulated Armoured Cable shall be ISI marked.

4.0 CONDUCTOR:

The conductor shall be composed of plain aluminum wires complying with IS:8130/1984 with latest amendments.

The bidder must guaranteed the minimum weight of Aluminum Kg/Km corresponding to nominal cross sectional area of conductor as mentioned in the G.T.P.

5.0 INSULATION:

Insulation shall be **Cross-Linked Polyethylene (XLPE)** conforming to the requirements given in Table-I of IS:7098 (Pt.-I)/ 1988 with latest amendments.

6.0 FILLERS:

The filler shall be of vulcanized rubber, un-vulcanized rubber, Thermoplastic material or textile material and shall be provided to fill the gaps between cores.

The filler materials shall be so chosen so as to be compatible with temperature of the cable and shall have no deleterious effect on other components of the cable. These shall not be harder than XLPE and PVC used for insulation and outer sheath respectively.

The Central hole/ void, if any, of the cable shall be invariably filled with suitable filler material so that there is no gap in the center.

7.0 ARMOURING:

Armouring shall be galvanized round steel wires/ Strip.

7. OUTER SHEATH:

The outer sheath shall consist of type ST-2 PVC Compound conforming to the requirements of IS:5831/1984.

The construction of the **conductor shall be solid for 4Cx6Sq.mm & 2Cx4Sq.mm** where as the conductor shall be **stranded for size 4CX10Sq.mm** as per Clause No.8.1 of IS:7098 (Pt.-I)/ 1988 & relevant clause of IS:8130/1984.

A protective barrier may be applied between the conductor and insulation. Such barriers when used, shall be compatible with insulating material and suitable for the operating temperature of the cable.

8. INSULATION:

The conductor (with protective barrier, wherever applied) shall be provided with Cross-Linked Polyethylene (XLPE) insulation applied by extrusion. The insulation shall be so applied that it fits closely on the conductor and it shall be possible to remove it without damage to the conductor. The thickness and tolerance on thickness of insulation shall be as per Clause No.9.2 of IS:7098 (Pt.-I)/1988.

9. CORE IDENTIFICATION:

The core shall be identified by different colouring of XLPE insulation as per Clause No.10.1 of IS:7098 (Pt.-I)/1988.

10. LAYING UP OF CORES:

The cores shall be laid up together with the suitable right hand lay. The interstices shall be filled with non-hygroscopic material.

11. INNER SHEATH (COMMONCOVERING):

The laid up cores shall be provided with an inner sheath applied either by extrusion or by wrapping. **However, application of inner sheath by EXTRUSION shall be preferred.** It shall be ensured that it is as circular as possible. The thickness of inner sheath shall be as given in Table-5

of IS:7098 (Pt.-I)/1988.

The inner sheath shall be so applied that it fits closely on the laid up cores and it shall be possible to remove it without damage to the insulation.

12 ARMOURING:

Application:-Armouring shall be applied over the inner sheath. The armour Wire/ Strip shall be applied as closely as possible.

The direction of lay of armour shall be left hand. A Binder Tape may be provided on the armour.

Type of Armour & Dimension:-The armour shall consist of **galvanized round steel wires for cable size 2Cx4Sq.mm, 4Cx6Sq.mm. & 4Cx10Sq.mm.** where as it shall consist of **galvanized steel strip for remaining sizes** with the dimensions as specified in Table-6ofIS:7098(Pt.-I)/1988.

Joints:-The joints in the armour Wire /Strips shall be made by brazing or welding and the surface irregularities shall be removed. A joint in any strips shall be atleast 300 mm.from the nearest joint in any other armour strip in the completed cable.

13 OUTER SHEATH:

The outer sheath shall be applied by extrusion over armouring.

The colour of the outer sheath shall be black.

The minimum thickness of PVC outer sheath shall not fall below the nominal thickness (ts) specified in Table-8of IS:7098 (pt.I/1988).

14. TESTS AND TEST CERTIFICATES:

The cables should meet the requirement of all tests including optional tests as specified at Clause No.15.4 of IS:7098(Pt.1)/1988.

The following shall constitute Routine Test:

- 6.1.1 Conductor resistance test.**
- 6.1.2 High Voltage test.**

The following shall constitute Acceptance Tests:

- i) Tensile test (for Aluminum).
- ii) Wrapping test (forAluminum).
- iii) Conductor resistance test.
- iv) Test for thickness of Insulation & Sheath.
- v) Hot Set Test for Insulation.
- vi) Tensile strength & elongation at break of insulation & sheath.
- vii) Insulation resistance (Volume Resistivity) test.
- viii) High Voltage test.
- ix) Test for Armour:
 - a) Verification of Dimension of Wire/ Strip.
 - b) Tensile Strength & elongation at break.
 - c) Uniformity of Zinc Coating.
 - d) Weight of Zinc Coating.
 - e) Winding Test on Armour.

f) Resistivity Test on Armour.**The following shall constitute Optional Tests:**

- i) Cold Bend Test for outer sheath.
- ii) Cold Impact Test for outer sheath.

The following shall constitute Type Tests:**a) Tests of Conductor:**

- i) Tensile test (for aluminum)
- ii) Wrapping test (for aluminum)
- iii) Conductor resistance test.

b) Test for Armouring Wire/ Strip.**c) Tests for thickness of insulation and sheath.****d) Physical tests for insulation:**

- i) Tensile strength and elongation at break.
- ii) Ageing in air oven.
- iii) Hot Set test.
- iv) Shrinkage Test
- v) Water Absorption (Gravimetric).

e) Physical tests for Outer Sheath:

- i) Tensile strength and elongation at break.
- ii) Ageing in air oven.
- iii) Loss of mass in air oven.
- iv) Shrinkage Test.
- v) Hot Deformation Test.
- vi) Heat Shock Test.
- vii) Thermal Stability.
- f) Insulation resistance (Volume Resistivity test)
- g) High voltage test.
- h) Flammability test.
- i) Any other test as per relevant ISS.

TYPE TESTS: The material offered, shall be fully type tested as per relevant standard of specification of IS :7098 (Part.1/1988) amended up to date. The bidder must furnish type test reports of similar rating & design of material

The manufacturers must have valid ISI license for the offered cable. The bidder shall furnish the details of ISI License granted to them.

15. INSPECTION (TEST BEFORE DISPATCH):

The inspection may be carried out by the purchaser at any stage of manufacturer. Acceptance of any equipment/ material under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment/ material is found to be defective.

The supplier shall keep the purchaser informed in advance about the manufacturing program so that arrangement can be made for inspection.

The acceptance tests as per IS:7098(Pt.I)/ 1988 shall also be conducted by the manufacturer before dispatch in the presence of our Representative/ Inspecting Officer alongwith verification of lengths & weight and checking the manufacturing defects, if any of samples coils. The mass of Aluminium, XLPE, PVC& Filler in sample coils shall also be verified by the Inspecting Officer(s).

Cold bend/ cold impact test (IS:5831/1984) shall constitute the optional tests and shall be conducted on first lot and any from other lot of the offered cables of each size as per Clause No.15.4 of IS:7098 (Pt.-I)/1988.

- The purchaser reserves the right to insist or witnessing the acceptance/ routine tests of the bought out items.

The bidder shall furnish Packing list mentioning serial Nos. of Drums, length in each drum, gross weight of drum without lagging along with inspection offer duly signed by the authorized representative of the firm. The purchaser reserves the rights to insist for witnessing the acceptance/ routine tests of the bought out items.

Atleast 5% of total numbers of drums subject to minimum of 2 in any lot put up for inspection shall be selected at random to ascertain the length/ workmanship of cable by the following method:

“At the works of the manufacturer, the cable shall be transferred from one drum to another for checking any manufacturing defects in the cable drums selected for conducting acceptance tests, at the sametime measuring its length with the help of the graduated pulley & cyclometer.The difference in the average length thus obtained from the declared length by the supplier in the packing list shall be applied to all the drums if the cable is found short during checking the sample lot(s)”.

The supplier shall present the latest Calibration Certificate(s) of testing instruments/ equipments to be used for the testing of the material covered in the Purchase Order to the authorized inspecting officer/ inspecting agency of the purchaser. The testing instruments/ meters/ apparatus etc. should be got calibrated by the supplier from time to time from Govt.Laboratory or any independent test laboratory/ house having valid accreditation from National Accreditation Board for Testing and Calibrating Laboratories for the testing equipments/ original manufacturer having traceability to NABL/ NPL or equivalent.

The calibration certificate (s) should not in any case be older than one year at the time of presenting the same to the inspecting officer/ inspecting agency of the purchaser. The testing instruments/ equipments should be duly sealed by the Calibrating Agency and mention there of shall be indicated in the calibration certificate(s).

16. TEST CHECKING OF MATERIAL:

- i) Sample drums from the material received in Nigam shall be selected for testing at CTL as per sampling plan given here under in presence of firm's representative.
- ii) The selected sample drum for CTL testing shall be identified by the seals provided by Inspecting Officer/ Inspecting Agency during pre-dispatch inspection at firms works and these sealing details shall be invariably mentioned in the selection Memo by the nominated officers of Nigam.

- iii) The tests in the Nigam Testing laboratory (CTL) shall be conducted in the presence of representative of supplier for which a 7 days' notice shall be issued through Fax/ Speed Post stating Date & Time to the firm, so that supplier can depute their representative to witness the test. In case the supplier or his representative does not turn up the testing shall be proceeded & completed. The payment shall be released only after receipt of successful test reports for the samples selected at purchaser's stores for mandatory test checking on the samples to be selected from material received at Nigam's stores by officers to be nominated by Circle SE's/ SE(I&S) for testing at CTL.

17. SAMPLING:

One number Drum out of each lot/ sub-lot of 25 Nos. Drums or part there of for the material received in Nigam.

- i) TESTS: The following tests shall be carried out as per relevant clause of latest IS on each selected drum by drawing sample of 10 Mtr. At CTL from random distance during re-winding:
- a) Rewinding test(Measurement of Length) & Checking of Manufacturing defects.
 - b) Measurement of Resistance of conductor.
 - c) Tensile strength & Elongation at Break Test for Insulation & Sheath
 - d) Test for Thickness of Insulation & Sheath
 - e) Hot Set Test
 - f) Test for Armour:
 - i) Verification of Dimension of Wire/Strip.
 - ii) Tensile Strength & elongation at break.
 - iii) Uniformity of Zinc Coating.
 - iv) Weight of Zinc Coating.
 - v) Winding Test on Armour.
 - vi) Resistivity Test on Armour.
 - g) Verification of Marking

In addition to above tests remaining acceptance tests as per relevant IS shall also be conducted at CTL provided the testing facility is available at CTL for these tests time to time. Only those tests shall be conducted for which testing facilities are available in NIGAM's Lab.

ii) CRITERIA FOR ACCEPTANCE:

- h) If the measured conductor resistance of the sample (s) exceeds beyond 2% as per the resistance specified in the contract, the material shall be rejected and the same shall have to be replaced by the supplier.
- i) If the measured conductor resistance of the sample (s) exceeds the value specified in the contract but does not exceed by more than 2% of the resistance value specified in the contract, the material pertaining to the relevant lot / sub-lot to shall be accepted with a deduction @1.5% of the cost of cable for increase in resistance for every 1% or part thereof.
- j) If the sample (s) fails in any other test, the material contained in the pertinent lot /sub-lot shall be rejected and shall have to be replaced by the supplier.
- k) If the contract or / supplier fails to lift the material declared rejected or any part thereof from the consignee within a period of 15 days from the date of dispatch

of information from the purchaser, the purchaser shall be entitled to effect recovery alongwith other actions as per Clause No.1.62 of Section-II (General Condition of Contract).

- l) The results of measurement of length test shall be made applicable to all drums contained in each lot/ sub lot by making deduction of less length of cable in a Sample Drum.

18. TESTCHARGES:

All test charges incurred towards test checking of the material received in our stores shall be borne by the NIGAM.

19. IDENTIFICATION:

- i) The manufacturer shall be identified through-out the length of cable as per Clause No.17.1 of IS:7098 (Pt-I)/ 1988.

In order to distinguish these electric cables from telephone cables the word 'ELECTRIC' shall be indicated, printed or embossed throughout the length of the cable on outer sheath.

The cable code shall be used as per Clause No.17.3 of IS:7098(Pt-.I)/1988.

The cable shall also be required to be embossed with the word 'Name of Manufacturer or trade name, Cable code, Voltage Grade, NAME OF DISCOM/ TN-/AVVNL/size of cable & year of manufacture' at every meter length for which no extra charges shall be paid. **The cable should be ISI marked & same should be embossed on the outer sheath of every meter of length of cable.**

20. MARKING:

The progressive length of cable shall be marked on the outer sheath of every meter length of cable.

21. PACKING AND MARKING:

The cables shall be wound on non-returnable wooden drums conforming to IS:10418/1982 of suitable size and packed. The ends of the cable shall be sealed by means of non-hygroscopic sealing material. Only one cable length shall be supplied on a drum. The shaft diameter of Drum shall be as per relevant ISS but not less than 50mm. The cable can also be supplied on M-Steel Drums as per relevant ISS as applicable.

The cable shall carry the following information stenciled/ painted on the drum:

- i) **Manufacturer's name, Brand name or trademark.**
- ii) **Type of cable and voltage grade.**
- iii) **Number of Cores.**
- iv) **Nominal Cross-sectional area of the conductor.**
- v) **Cable Code.**
- vi) **Length of cable on the drum.**
- vii) **Approximate gross weight.**
- viii) **Year of manufacture.**
- ix) **BIS Certification mark.**
- x) **Name of the Consignee and full destination.**

xi) B **FOR OUTDOOR USE & LOW TEMPERATURE CONDITIONS**
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16. STANDARD LENGTH:

The cables shall be supplied in the standard length of 1000 Meters for size 4Cx10Sq.mm, 4Cx6Sq.mm & 2CX4 Sq.mm.

22.1 A tolerance (+/-) 5% shall be allowed in standard length

22.2 Only one cable length shall be acceptable by non-standard length measuring not less than 50% of standard length to complete the ordered quantity in each size.

TECHNICAL SPECIFICATION FOR SUPPLY OF ISI MARKED SINGLE CORE LT XLPE INSULATED AND PVC SHEATHED UN-ARMoured CABLES

1. SCOPE:

1.1 This section provides for manufacture, testing before dispatch, supply and delivery F.O.R. destination of **ISI Marked** Single Core LT XLPE Insulated and PVC Sheathed Un-Armoured Circular Cables with Aluminium Conductor suitable for working voltage up to & including 1100 Volts & Conforming to IS:7098(Pt.-I)/1988 with latest amendments. **The cables shall be ISI marked.**

2. STANDARDS:

Unless otherwise stipulated in this specification the following standards with latest amendments shall be applicable.

i) IS:7098(Pt.-I)/1988 : XLPE Insulated cables for working voltages upto and including 1100 Volts.

ii) IS:8130 : Conductors for insulated cables.

iii) IS:5831 : PVC insulation and sheath of electric cables.

iv) IS:10810 : Methods of test for cables.

v) IS:10418 : Drums for electric cables.

3. CLIMATIC CONDITIONS:

| | | |
|-------|--|----------------|
| i) | Peak ambient temperature in shade. | 50 Deg.C |
| ii) | Maximum average ambient temperature in a 24 hours period in shade. | 40 Deg.C |
| iii) | Min. ambient air temperature in shade | (-)5 Deg.C |
| iv) | Maximum temperature attainable by an object exposed to sun. | 60 Deg.C |
| v) | Maximum relative humidity | 100% |
| vi) | Average number of thunder storm days per annum | 40 |
| vii) | Average number of rainy days per annum. | 100 |
| viii) | Average annual rainfall | 10 to 100 cm |
| ix) | Number of months of tropical monsoon conditions | 4 months |
| x) | Maximum wind pressure. | 100 Kg/ Sq. mm |
| xi) | Altitude not exceeding | 1000 M |

4. GENERAL REQUIREMENT:

4.1 The LT XLPE Insulated Un-Armoured cables shall conform to IS:7098 (Pt.-I)/1988 with latest amendment and **bear BIS certification mark**. The material used for

construction of the cables shall be of best qualities complying with the requirements of IS:7098(Pt.-I)/1988 and other relevant standards. The cables shall be suitable for outdoor / indoor installation free in air and shall be capable of withstanding the normal stresses associated with transportation, erection, reeling and unreeling operations without getting deformed.

4.2 The cable shall be suitable for use where combination of ambient temperature and temperature rise due to load results in a conductor temperature not exceeding 90 degree C under normal operation and 250 degree C under short circuit condition.

4.3 The LT XLPE Insulated Un-Armoured Cable shall be **ISI marked. The bidder should be a manufacturer of item.**

5.0 MATERIAL:

5.1 CONDUCTOR:

The conductor shall be composed of plain aluminium wires complying with IS:8130/1984 with latest amendments.

The bidder must guaranteed the minimum weight of Aluminium in Kg/Km corresponding to nominal cross sectional area of conductor as mentioned in the G.T.P.

5.2 INSULATION:

Insulation shall be **Cross-Linked Polyethylene (XLPE)** conforming to the requirements given in Table-I of IS: 7098(Pt.-I)/1988 with latest amendments.

5.3 OUTER SHEATH:

The outer sheath shall consist of type ST-2 PVC Compound conforming to the requirements of IS:5831/1984.

6. CONSTRUCTION:

6.1 CONDUCTOR:

The construction of the conductor shall be as per Clause No.8.1 of IS:7098(Pt.-I)/1988 & relevant clause of IS:8130/1984.

A protective barrier may be applied between the conductor and insulation. Such barriers when used, shall be compatible with insulating material and suitable for the operating temperature of the cable.

6.2 INSULATION:

The conductor (with protective barrier, wherever applied) shall be provided with Cross-Linked Polyethylene (XLPE) insulation applied by extrusion. The insulation shall be so applied that it fits closely on the conductor and it shall be possible to remove it without

damage to the conductor. The thickness and tolerance on thickness of insulation shall be as per Clause No.9.2 of IS:7098(Pt-.I)/1988.

6.3 OUTER SHEATH:

6.3.1 The outer sheath shall be applied by extrusion over armouring.

6.3.2 The colour of the outer sheath shall be black.

6.3.3 The minimum thickness of PVC outer sheath shall not fall below the nominal thickness (ts) specified in Table-8 of IS:7098(pt.I/1988.

7. TESTS AND TEST CERTIFICATES:

7.1 The cables should meet the requirement of all tests including optional tests as specified at Clause No.15.4 of IS:7098(Pt.1)/1988.

The following shall constitute Routine Test:

- i) Conductor resistance test.
- ii) High Voltage test.

The following shall constitute Acceptance Tests:

- i) Tensile test (for Aluminium).
- ii) Wrapping test (for Aluminium).
- iii) Conductor resistance test.
- iv) Test for thickness of Insulation & Sheath.
- v) Hot Set Test for Insulation.
- vi) Tensile strength & elongation at break of insulation & sheath.
- vii) Insulation resistance (Volume Resistivity) test.
- viii) High Voltage test.

The following shall constitute Optional Tests:

- i) Cold Bend Test for outer sheath.
- ii) Cold Impact Test for outer sheath.

The following shall constitute Type Tests:

- a) Tests of Conductor:
 - i) Tensile test (for aluminium)
 - ii) Wrapping test (for aluminium)
 - iii) Conductor resistance test.
- b) Tests for thickness of insulation and sheath.
- c) Physical tests for insulation:
 - i) Tensile strength and elongation at break.
 - ii) Ageing in air oven.
 - iii) Hot Set test.
 - iv) Shrinkage Test
 - v) Water Absorption (Gravimetric).
- d) Physical tests for Outer Sheath:

- i) Tensile strength and elongation at break.
- ii) Ageing in air oven.
- iii) Loss of mass in air oven.
- iv) Shrinkage Test.
- v) Hot Deformation Test.
- vi) Heat Shock Test.
- vii) Thermal Stability.
- e) Insulation resistance (Volume Resistivity test)
- f) High voltage test.
- g) Flammability test.
- h) Any other test as per relevant ISS.

7.2 TYPE TESTS :

The material offered, shall be fully type tested as per relevant standard of specification of IS:7098 (Part.1/1988) amended up to date. **The bidder must furnish type test reports of similar rating & design of tendered material .**

7.4 The bidder must also clearly indicate various testing facilities available at their works for testing the material as per relevant standards. In case of otherwise particulars of the place where such testing in proposed to be conducted during the course of inspection shall be indicated with the offer.

7.5 However, the purchaser reserves the right to demand repetition of same or all the type tests in presence of purchaser's representative.

7.6 The bidding firms (manufacturers) must have valid ISI license for the offered cable. The bidder shall furnish the details of ISI License granted to them.

8. INSPECTION (TEST BEFORE DISPATCH):

8.1 The inspection may be carried out by the purchaser at any stage of manufacturer. Acceptance of any equipment / material under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment/material is found to be defective.

8.2 The supplier shall keep the purchaser informed in advance about the manufacturing program so that arrangement can be made for inspection.

8.3 The acceptance tests as per IS:7098(Pt.I)/1988 shall also be conducted by the manufacturer before dispatch in the presence of our Representative /Inspecting Officer as per Clause No.1.27 'Inspection & Testing' of "General Conditions of Contract" Section-II along with verification of lengths & weight and checking the manufacturing defects, if any of samples coils. The mass of Aluminium, XLPE, PVC& Filler in sample coils shall also be verified by the Inspecting Officer(s).

Cold bend/ cold impact test (IS:5831/1984) shall constitute the optional tests and shall be conducted on first lot and any from other lot of the offered cables of each size as per Clause No.15.4 of IS:7098(Pt-.I)/1988.

8.4 The purchaser reserves the right to insist or witnessing the acceptance/routine tests of the bought out items.

8.5 The bidder shall furnish Packing list mentioning serial Nos. of Drums, length in each drum, gross weight of drum without lagging alongwith inspection offer duly signed by the authorized representative of the firm. The purchaser reserves the rights to insist for witnessing the acceptance / routine tests of the bought out items.

8.6 At least 5% of total numbers of drums subject to minimum of 2 in any lot put up for inspection shall be selected at random to ascertain the length/ workmanship of cable by the following method :

“At the works of the manufacturer, the cable shall be transferred from one drum to another for checking any manufacturing defects in the cable drums selected for conducting acceptance tests, at the same time measuring its length with the help of the graduated pulley & cyclometer. The difference in the average length thus obtained from the declared length by the supplier in the packing list shall be applied to all the drums if the cable is found short during checking the sample lot(s)”.

8.7 The supplier shall present the latest Calibration Certificate(s) of testing instruments / equipments to be used for the testing of the material covered in the Purchase Order to the authorized inspecting officer/ inspecting agency of the purchaser. The testing instruments/ meters/ apparatus etc. should be got calibrated by the supplier from time to time from Govt. Laboratory or any independent test laboratory/house having valid accreditation from National Accreditation Board for Testing and Calibrating Laboratories for the testing equipments / original manufacturer having trace ability to NABL/NPL or equivalent.

The calibration certificate(s) should not in any case be older than one year at the time of presenting the same to the inspecting officer/ inspecting agency of the purchaser. The testing instruments/ equipments should be duly sealed by the Calibrating Agency and mention thereof shall be indicated in the calibration certificate(s).

9. TYPE TESTS ON SAMPLE(S) TO BE SELECTED FROM MATERIAL RECEIVED IN STORE:

9.1 The first lot offered for Inspection shall not be less than 10% of ordered quantity of each size of LT XLPE Insulated Un-Armoured Cable or minimum quantity of 20 Kms. whichever is More.

9.2 If the bidder has already got conducted the requisite type test from the 1st lot of material received in Nigam`s Store against any previous / earlier tender of AVVNL and such Type Test reports are valid i.e. not older than 5 Years on the date of opening of Techno-Commercial Bids, then the requirement of conducting Mandatory Type Test on the sample selected from 1st Lot of supply received in Nigam`s store is RELAXED. For this purpose date of conducting type test will be considered.

ALTERNATIVELY

In case the bidder do not meet above requirement then One sample of 15 Mtr. Length from the 1st Lot of each size of LT XLPE Insulated Un-armoured Cable as received in

purchaser's store shall be selected and sealed in the presence of representative of supplier for getting it Type Tested at Govt. / Govt. approved / Govt. Recognized / NABL accredited Laboratory / ILAC Accredited.

However, suppliers own lab shall not be considered for the purpose of type test reports. **The selected and sealed sample for type test shall be identified by providing Polycarbonate Seals on both ends of cable and two stickers seals provided along the length of the cable.** The transportation charges of sample from store to test house shall be borne by NIGAM, whereas the charges incurred towards type test of the material at test house shall be borne by the Supplier. **The testing charges should be remitted through D.D. in favour of Test House. The name of the Test House shall be intimated separately.**

In case sample from first lot fails then:

a) Supplier shall have to replace the full quantity of the respective inspected lot supplied to various stores and lying unused at stores.

b) For the quantity already utilized against the order in field a deduction of @ 30% (Thirty Percent) of F.O.R. Destination price of the material supplied shall be made.

c) Sample from next lot shall be selected again for type test. All test charges incurred towards type test of the material for second time shall be borne by the Supplier.

d) The supplier shall have to pay the type test charges again for testing of fresh sample for which the testing charges should be remitted through D.D. in favour of Test House.

In case sample again fails in the type test then:

a) The quantity lying unused at various stores shall be rejected.

b) For the quantity already utilized against the order in field a deduction of @ 30% (Thirty Percent) of F.O.R. Destination price of the material supplied shall be made.

c) Further supplies shall not be accepted.

“At the option of purchaser, the material received in the stores may be utilized in the field after receipt of successful test report from CTL, Ajmer for the mandatory test checking on the samples selected from the material received at stores against first lot and subsequent lot(s) in anticipation of successful type test report(s).”

10. TEST CHECKING OF MATERIAL AT STORES:

i) Sample drums from the material received at stores shall be selected for testing at CTL as per sampling plan given hereunder in presence of firm's representative. The selected sample drum / drums shall be transported to CTL .

ii) The selected sample drum for CTL testing shall be identified by the seals provided by Inspecting Officer / Inspecting Agency during pre-dispatch inspection at firm's works and these sealing details shall be invariably mentioned in the selection Memo by the nominated officers of Nigam.

iii) The tests in the Nigam Testing laboratory (CTL) shall be conducted in the presence of representative of supplier for which a 7 days' notice shall be issued through Fax / Speed Post stating Date & Time to the firm, so that supplier can depute their representative to witness the test. In case the supplier or his representative does not turn up the testing shall be proceeded

& completed. **The payment shall be released only after receipt of successful test reports** for the samples selected at purchaser's stores for mandatory test checking on the samples to be selected from material received at Nigam's stores by officers to be nominated by Circle SE's for testing at CTL.

iv) **SAMPLING:**

One number Drum out of each lot / sub-lot of 25 Nos. Drums or part thereof for the material received in Stores of Nigam.

v) **TESTS:** The following tests shall be carried out as per relevant clause of latest IS on each selected drum by drawing sample of 10 Mtr. at CTL from random distance during re-winding:

- a) Rewinding test (Measurement of Length) & Checking of manufacturing defects.
- b) Measurement of Resistance of conductor.
- c) Tensile strength & Elongation at Break Test for Insulation & Sheath
- d) Test for Thickness of Insulation & Sheath
- e) Hot Set Test
- f) Verification of Marking

In addition to above tests remaining acceptance tests as per relevant IS shall also be conducted at CTL provided the testing facility is available at CTL for these tests time to time. Only those tests shall be conducted for which testing facilities are available in NIGAM's Lab.

vi) **CRITERIA FOR ACCEPTANCE:**

a) If the measured conductor resistance of the sample(s) exceeds beyond 2% as per the resistance specified in the contract, the material shall be rejected and the same shall have to be replaced by the supplier.

b) If the measured conductor resistance of the sample(s) exceeds the value specified in the contract but does not exceed by more than 2% of the resistance value specified in the contract, the material pertaining to the relevant lot / sub-lot shall be accepted with a deduction @ 1.5% of the cost of cable for increase in resistance for every 1% or part thereof.

c) If the sample(s) fails in any other test, the material contained in the pertinent lot/sub-lot shall be rejected and shall have to be replaced by the supplier.

d) If the contractor / supplier fails to lift the material declared rejected or any part thereof from the consignee within a period of 15 days from the date of dispatch of information from the purchaser, the purchaser shall be entitled to effect recovery along with other actions as per Clause No. 1.62 of Section-II (General Conditions of Contract).

e) The results of measurement of length test shall be made applicable to all drums contained in each lot / sub lot by making deduction of less length of cable in a Sample Drum.

11. TEST CHARGES:

All test charges incurred towards test checking of the material received in our stores shall be borne by the NIGAM.

12. CHALLENGE TESTING CLAUSE:

The other manufacturer can also request challenge testing for any test based on specification. The challenger would request for testing with testing fee. The challenge test fees are proposed at least three time cost of testing. This is likely to deter unnecessary challenges. The challenger would have the opportunity to select the sample from the store and any such challenge should be made within the guarantee period. The party challenged, the challenger & the utility could witness the challenge testing. The challenged testing would cover all the type tests as per relevant IS.

The challenge test could be conducted at NABL Accredited Laboratory like ERDA, CPRI, Bangalore / Muradnagar / Bhopal. If the values are within limit the products gets confirmed else not confirmed. If the product is not confirmed the manufacturer would pay the challenge fee and challenger would get the fee refunded. However, as a redressal system the challenger would be asked for fresh selection of two more samples from the stores and the same be tested in a NABL Laboratory (which shall be other than previously selected NABL Accredited Lab) at the cost of supplier in presence of party challenged, challenger and the utility. If any one or both samples does not confirmed the tests then the product is said to have failed the tests. In such cases, the manufacturer will be declared as unsuccessful manufacturer for the said product and balance supply shall not be availed and the order shall be cancelled with levy of maximum penalty.

13. IDENTIFICATION:

13.1 The manufacturer shall be identified through-out the length of cable as per Clause No.17.1 of IS:7098(Pt-I)/ 1988.

13.2 In order to distinguish these electric cables from telephone cables the word 'ELECTRIC' shall be indicated, printed or embossed throughout the length of the cable on outer sheath.

13.3 The cable code shall be used as per Clause No.17.3 of IS:7098(Pt-.I)/1988.

13.4 The cable shall also be required to be embossed with the word 'Name of Manufacturer or trade name, cable code, Voltage Grade, NAME OF DISCOM/TN- , size of cable & year of manufacture' at every meter length for which no extra charges shall be paid. **The cable should be ISI marked & same should be embossed on the outer sheath of every meter of length of cable.**

14. MARKING:

The progressive length of cable shall be marked on the outer sheath of every meter length of cable.

15 PACKING AND MARKING:

15.1 The cables shall be wound on non-returnable wooden drums conforming to IS:10418/1982 of suitable size and packed. The ends of the cable shall be sealed by means of non-hygroscopic sealing material. Only one cable length shall be supplied on a drum. The shaft diameter of Drum shall be as per relevant ISS but not less than 50 mm. The cable can also be supplied on M-Steel Drums as per relevant ISS as applicable.

15.2 The cable shall carry the following information stenciled / painted on the drum :

- i) Manufacturer's name, Brand name or trade mark.
- ii) Type of cable and voltage grade.
- iii) Number of Cores.
- iv) Nominal Cross-sectional area of the conductor.
- v) Cable Code.
- vi) Length of cable on the drum.
- vii) Approximate gross weight.
- viii) Year of manufacture.
- ix) BIS Certification mark.
- x) Name of the Consignee and full destination.
- xi) Bid number/Purchase Order No.
- xii) The word SUITABLE FOR OUTDOOR USE & LOW TEMPERATURE CONDITIONS.

16 STANDARD LENGTH:

16.1 The cables shall be supplied in the standard length of 500 Mtrs. for size 1Cx185 Sq. mm., 1Cx120 Sq. mm., 1Cx70 Sq. mm.& 1Cx16 Sq.mm.

16.2 A tolerance (+/-) 5% shall be allowed in standard length.

16.3 Only one cable length shall be acceptable by non-standard length measuring not less than 50% of standard length to complete the ordered quantity in each size.

17 GUARANTEED TECHNICAL PARTICULARS:

The bidder shall furnish guaranteed technical particulars in the relevant Schedule VA & VB.

18 DRAWINGS& DOCUMENTATIONS:

The bidder is required to furnish the detailed constructional drawings of cable clearly showing shape of Core, Type, Size of Fillers / Interstices along with Center Filler etc. The calculations of weight of different components of the cable shall also be furnished. In absence of this, the bids are likely to be ignored. The drawings of drums shall also be furnished as per relevant applicable ISS.

19 DRAWING & DOCUMENTATION:

The bidder is required to furnish the detailed constructional drawing of the cable clearly showing the various components. The calculation of weights of different components of the cable shall also be furnished in absence of this, the tenders are likely to be ignored.

20. GUARANTEED TECHNICAL PARTICULARS:

The bidder shall furnish guaranteed technical particulars in the relevant Schedule VA & VB. Any departure from the G.T.P be indicated in Schedule-V.

**GUARANTEED TECHNICAL AND OTHER PARTICULARS FOR THE SUPPLY OF
SINGLE CORE LT XLPE Un-ARMoured CABLES**

| Sr. No. | PARTICULARS | SINGLE CORE XLPE UN-ARMoured CABLES IN SQ.MM |
|---------|---|--|
| | | 1CX70 |
| 1. | a) Name of the Firm | |
| | b) Works address | |
| | c) Contact person & Contact No. | |
| | d) Email ID | |
| 2 | Standard specification to which the material shall conform. | IS:7098(Part-I):1988 with latest amendment |
| 3 | VOLTAGE GRADE | 1100V |
| 4 | NO. OF CORES | (1C) |
| 5 | CONDUCTOR DETAILS : | |
| | a) Nominal cross section area of : | |
| | i) Phase Conductor(sq.mm) | 70 |
| | ii) Neutral Conductor (Sq.mm.) | 70 |
| | b) No. & size of strands(in mm) of : | |
| | i) Phase Conductor(sq.mm) | As per IS-8130/1984 with latest amend. |
| | ii) Neutral Conductor (Sq.mm.) | As per IS-8130/1984 with latest amend. |
| | c) SHAPE OF CONDUCTOR | To be furnished by the bidder |
| | d) Whether compacted or non compacted | To be furnished by the bidder |
| | e) Resistance | As per IS-8130/1984 with latest amend. |
| | i) Phase Conductor(sq.mm) | |
| 6 | INSULATION | |
| | i) Type | XLPE As per IS:7098(Part-I):1988 with latest amendment |
| | ii) Colour | Black |
| | iii) Thickness | |
| | A) Phase Conductor(sq.mm) | As per Table - 3 of IS-7098 (Part-I):1988 with latest amendments |
| | a) Nominal (mm) | |

| | | |
|----|---|--|
| | b) Minimum (mm) | |
| | B) Neutral Conductor (Sq.mm.) | As per Table - 3 of IS-7098 (Part-I):1988 with latest amendments |
| | a) Nominal (mm) | |
| | b) Minimum (mm) | |
| 7 | Outer Sheath | |
| | I) Material | Extruded PVC ST-2 type as IS 5831:1984 with latest amendment |
| | ii) Thickness | As per Table - 8 of IS-7098 (Part-I):1988 with latest amendments |
| | a) Nominal (mm) | |
| | b) Minimum (mm) | |
| | iii) Standard to which it conform | As per IS:7098(Part-I):1988 with latest ammendment |
| 8 | MAX.OVERALL DIAMETER OF THE CABLE IN MM. | To be furnished by bidder |
| 9 | Nature of Packing | Wooden drum |
| 10 | DRUM | |
| 11 | TARE WEIGHT OF DRUM | To be furnished by bidder |
| 12 | a) Minimum weight of Aluminium in Kg./Km. corresponding to nominal cross sectional area of conductor.(guaranteed) | To be furnished by bidder |
| | b) Total weight of PVC contents Kg/ Km. (Inner / Outer Sheath / Filler) | To be furnished by bidder |
| | c) Total weight of XLPE in Kg./Km.(Min.) | To be furnished by bidder |
| | d) Total weight of finished cable Kg/Km. | To be furnished by bidder |
| 13 | Standard length of cable in meters &it's Tolerance. | ----- 500(+/-5%) ----- |
| 14 | Whether material bears BIS certification mark | YES , ISI MARKING embossed on outer sheath |
| 15 | BIS licence no. & validity | To be furnished by bidder |
| 16 | Embossing | As per specification of TN: |
| 17 | Any other particulars | |

**GUARANTEED TECHNICAL AND OTHER PARTICULARS OF DRUM FOR
SUPPLY OF SINGLE CORE LT XLPE INSULATED
UN-ARMOURED CABLES**

| S. No. | PARTICULARS | SINGLE CORE XLPE UN-ARMOURED CABLES IN SQ.MM |
|--------|--|--|
| | | 1Cx70 |
| A | Drum Size | |
| B | Flange Diameter(d1) (mm) | |
| C | Barrel Diameter(d2) (mm) | |
| D | Centre hole Diameter(d3) (mm) | |
| E | Overall width (L1) (mm) | |
| F | Traverse (L2) (mm) | |
| G | Thickness of Flange | |
| H | Barrel End (supporting disc or coresegment) | |
| a) | Diameter (mm) | |
| b) | Thickness (mm) | |
| I | Stretchers(Core Carrier Planks) | |
| a) | Number (Min) | |
| b) | Thickness x width (mm) | |
| J | Barrel Battens thickness (Core Filler Planks) | |
| K | Barrel Middle Supports (Middle Core discs) | |
| L | Thickness of External Laggings.(mm) | |
| | DETAILS OF METAL COMPONENTS: | |
| M | Clamping Studs with Hexagonal Nuts | |
| a) | Numbers | |
| b) | Diameter (mm) | |
| N | Square or Round Washers | |
| a) | Numbers | |
| b) | Diameter (mm) | |
| O | M.S. Bushes | |
| a) | Numbers | |
| b) | Thickness of Sleeve (mm) | |
| c) | Dimension of Sleeve (mm) | |
| d) | Number of Bolts | |
| e) | Diameter of Bolts | |
| P | M.S./ C.I. Centre Plate | |

| | | |
|-----|---|--|
| a) | Numbers | |
| b) | Dimensions of Square/ Triangular equal sides (mm) | |
| c) | Centre Plate Bolts. | |
| Q | Numbers | |
| i) | Diameter of bolts (mm) | |
| ii) | Centre Hole Diameter (mm) | |

TECHNICAL SPECIFICATION FOR MIP SHEET METAL METER BOXES

1.0 SCOPE :

This specification provides for the design, manufacture, and stage inspection and testing before dispatch, supply and delivery of sheet metal meter boxes specified herein for their satisfactory operation. The MIP meter box for wall mounting as per requirement indicated in the drawings. The wall mounting of MIP meter boxes shall be achieved by providing four (4) grouted studs on the walls, two of them will be inside the meter box and two will be outside the meter box as shown in the attached general arrangement drawing. The mounting holes of the boxes must be accessible without removing any non-metallic sheet.

- 1.1 It is not the intent to specify completely herein all the details of the design and construction of equipment. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation up to the bidder's guarantee, in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which in his judgment is not in accordance there with. The offered equipment shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of bidder's supply irrespective of whether those are specifically brought out in this specification and/ or the commercial order or not.

2.0 STANDARDS :

- 2.1 The meter boxes shall conform to the following Indian Standards which shall mean latest revisions, amendments/changes adopted and published, unless otherwise specified hereinafter.

| S.No. | Indian Standard | Title |
|-------|-----------------|---|
| 1. | IS:14772- 2000 | General requirement for enclosure for accessories for household and similar fixed electrical installations. |
| 2. | IS:1852 - 1985 | Specification for rolling & cutting tolerances for hot rolled steel products |
| 3. | IS:2036 - 1974 | Specification for Phenolic laminated sheets (superseding IS:2038-1962). |
| 4. | IS:4820 - 1968 | Specification for Thin vulcanized fibre sheets for electrical purposes. |
| 5. | IS:808-1989 | Specification for MS Channel (ISMB) |

3.0 GENERAL TECHNICAL REQUIREMENTS:

REQUIREMENT FOR SHEET METAL METER BOXES:

a) **STANDARD:**

The meter boxes along with the doors shall be fabricated out of MS sheet of fine quality and thickness as per relevant drawings attached and capable of withstanding the mechanical, Electrical and Thermal stresses as well as the effects of humidity which are likely to be encountered in the services and at the same time ensuring the desired degree of safety. The same shall comply in all respect with the requirement of latest IS: 14772(2000) for "Boxes for enclosure of electrical accessories". In case of any discrepancy between write-up and drawings attached, the details given in drawings will prevail. The bill of material as indicated in the drawings shall be covered in the scope of supply.

All sides of the box will be fabricated out of M.S. sheet of fine quality. The two sides and rear one will be fabricated out of one single sheet. Top and bottom will be in one piece each from one M.S. Sheet, which will be continuously welded from inside to form a complete box. The door will be in one part for MIP meter box which shall be fabricated out of M.S. sheet(s). Each door will be fixed with the box with inside hinges in such a way that door hinges cannot be removed from outside. The doors shall be provided with handle. The door shall be provided with a lining of minimum 5mm thick felt in order to make it dust proof.

The door shall ensure reasonable safety against the spread of fire. They should not be ignited by thermic over-load of live parts housed by the box.

b) SEALING ARRANGEMENT :

The doors shall also be provided with sealing arrangement from outside by fixing 30x9 mm long, bolts at the top and bottom and the Hexagonal nuts as per arrangement shown in the enclosed drawings. These bolts shall be welded on the collars in such a manner that the fly nuts can be tightened from outside. These bolts should possess hole of 2 mm as in the center of the head from where the sealing wire shall pass and the meter boxes can be sealed properly. The doors will further be provided with a felt lining of 5 mm in order to make it dust proof.

c) EARTHING OF METER BOX:

The earthing bolts of size 35x9 mm made of hot dipped G.I. with four plain 1.2 mm thick G I washers, one G I spring washer and two G I nuts on either side of the box shall be provided as shown in the drawing for earthing of meter box. The earthing bolts provided in the meter box on both sides should have arrangement that the bolts cannot be loosened and removed from outside. The bolt should have the cottar pin arrangement.

d) INCOMING AND OUTGOING CABLE ARRANGEMENT:

Two holes at the bottom just below the cable fixing bracket shall be provided for entry & exit of cable. Holes of 50mm dia shall be provided for fixing cable as shown in the drawing.

e) WINDOW GLASS

One unbreakable transparent sheet of toughened/triplex glass of thickness 6 mm for window of required size will be provided on the upper door as per arrangement indicated in the drawing so that the meter inside the box can be read easily. The glass

sides shall be lined up with V-shaped rubber gasket of 1mm thickness. This glass shall be fixed inside the box in a projected groove. The glass assembly shall be secured with a zinc passivized rectangular MS frame screwed at four corners.

f) WORKMANSHIP

The fabrication of material shall be done in such a way that there is a good finish of fabricated material. The material shall be fabricated accurately to adhere to dimensions as per attached drawings. Holes must be perfectly circular and dimensional tolerance as given below shall be permissible. The box should be fabricated/welded such that the rain water does not enter into it.

g) TOLERANCE:

The sheet metal boxes shall be subjected to a maximum of plus-minus one percent(+/-1%) tolerance on the overall dimensions and -ive rolling tolerance for sheet metal boxes shall be as per IS:1852/1985 & IS 513-1994 with latest amendment(s). However there shall be no limit for +ive tolerance in thickness. The rolling tolerance for non metallic bakelite base sheet shall be as per IS:2036/1995 with latest amendments. The tolerance in weight of meter box shall not be more than plus three percent and minus zero percent (+ 3% & - 0%).

h) Painting/Protection against corrosion:

The box(es) shall be adequately protected against rust, dust and corrosion both from inside and outside.

All sheet steel work shall be phosphated in accordance with IS:6005 code of practice for phosphating iron and steel.

Oil, grease, dirt and swarm shall be thoroughly removed by emulsion cleaning.

Rust and scale shall be removed by pickling with dilute acid followed by washing with running water rinsing with slightly alkaline hot water and drying. After phosphating thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying.

After phosphating the cabinet must be painted by electrostatic method only (powder coating) and the minimum coating should be 50 microns. The colour shade shall be 631 of IS - 5.

i) GUARANTEED TECHNICAL PARTICULARS:

The tenderer shall furnish all the necessary information as desired in the schedule of GTPs at Annexure-(A & B) of this specification. If the tenderer desires to furnish any other information in addition to the details as asked for, the same may be furnished against the last item for each type of box of this schedule.

j) PROTO TYPE SAMPLE :

The successful bidder will offer for inspection a proto type sample of MIP meter boxes before commencement of supplies as per enclosed drawing.

The prototype sample is required to be offered for inspection prepared, cut& made to size except welding. The prototype sample shall be verified by the inspecting officer of the Nigam as per following guidelines:-

Thickness of walls of MS sheet without paint & weld be verified. Thereafter getting the box welded, the weight of the box be taken and recorded. **Weight of proto type sample after approval of design shall be taken with paint/Powder Coating and same shall be verified during inspection.**Four sticker seals & two polycarbonate seals be provided on proto-type meter box keeping the door in open condition.

The inspecting officer will inspect accordingly and if any suggestion or modifications are required same will be reviewed and a final revised drawing will be furnished by the bidder for approval of the purchaser before taking up mass production.

k) EMBOSSING:

The following information shall be clearly/ indelibly embossed on the meter boxes made of MS sheet.

- i) A.V.V.N.L (on the top of the door.)
- ii) Manufacturer's trade name
- iii) AVVNL/TN-. (at the bottom of the door.)
- iv) Sign of Danger (in upper side of front door)
- v) M.I.P. Meter box

5.0 PRINCIPAL PARAMETERS:

MIP METER BOXES:

TECHNICAL REQUIREMENT

a) GENERAL:

The MIP metering cabinet dimensions shall be 1100x625x375mm as per enclosed drawing and shall be suitable to house the 3 phase static meter in the upper compartment and current transformers (Resin Cast Bar Type) in the lower compartment. Both the compartments will be separated by a portion of 1.6 mm thick MS Sheet. The cabinet shall be suitable for wall mounting.

The box shall be fabricated out of 1.6mm thick MS sheet of fine quality. The two sides and rear one will be fabricated out of one single sheet of minimum 1.6 mm thick. Top & bottom will be in one piece each from 1.6 mm MS sheet which will be welded from inside to form a complete box. The top cover sheet shall be slopping by 15mm to 20 mm towards back side of the box. The approximate weight of the meter box will be more than 46kgs. or as per approved prototype sample's weight.

b) DOOR

The door will be fabricated in one piece out of 1.6 mm sheet. M S angle of size of 25x25x3mm should be welded on the back of the door at ABCDE as per drawing enclosed at a distance of 20mm from rubber lining. The door shall be fixed with the

box with two inside hinges. The door shall be provided with handle. The door shall also be provided with sealing arrangement from outside by fixing stud at the top middle & bottom and hexagonal nuts . These studs should possess hole of 2mm as in center of the head from where the sealing wire shall pass & meter box can be sealed properly. The door will further be provided with a lining of 5mm thick felts in order to make it dust proof. The door shall be provided with window with additional door having size as per relevant drawing will be provided on the door so that the meter inside the box shall be read easily. Four fixing clamps, two at top side and two at bottom of the meter box for fixing the box on wall.

c) CABLE ENTRY/ EXIT

Two holes of 50mm dia shall be provided for fixing cable as per drawing. The cable entry and exit holes should be fitted with metallic glands for proper closing and sealing after installation of the cable.

d) ADDITIONAL DOOR WINDOW:

i) One additional door with window as per separate drawing shall be required to be provided with the box such that

a) Meter will not be accessible physically without opening the door of the box.

b) It will not allow any external thing to enter into the box.

c) It will have separate sealing arrangement as per drawing.

d) The meter shall be readable from outside through a unbreakable transparent sheet of toughened/ triplex glass of thickness 6 mm for window of required size provided on the upper door as per arrangement indicated in the drawing so that the meter inside the box can be read easily.

e) Opening for push button mode (as per drawing)-

The window of this additional door shall be provided with toughened/ triplex glass by securing the same with the help of a rectangular frame which can be tightened through 4 nos. nut bolts of appropriate size. The 4 bolts shall be welded inside the door from its head such that the nuts can be tightened to secure the rectangular frame. This glass shall be fixed inside the box in a projected groove. This additional door shall also be required to be provided with sealing bolts with holes and hexagonal nuts as shown in the drawing. This door shall be provided with 2 nos. suitable size hinges from inside such that the hinges are not visible from outside. This door shall be provided with u-shaped rubber gasket along the edges of the door.

e) MOUNTING OF NONMETALLIC BASE SHEET :

The box shall be provided with 4 rectangular brackets of size mentioned in the drawing so as to fix bakelite sheet to mount the meter on it at a distance of about 50mm from the rear wall on which the meter & CTs will be fixed. The supply shall include bakelite sheet as per ISS.

f) ARRANGEMENT OF CT MOUNTING :

The primary terminal P1 of CTs shall be mounted on porcelain supports bolted on three Nos. The other side of CT (P2) shall also be mounted on another three Nos.

porcelain supports/clits. The position should be adjusted by sliding clits to & fro horizontally as per the requirement of primary terminals of CTs.

g) PARTITION PLATE

There shall be one partition plate at the height of 700mm from the bottom of the box to facilitate 4 Nos. CTs

6.0 TESTS :

6.1 TESTING FACILITIES :

The manufacturer must ensure various testing facilities for routine/acceptance tests as per relevant ISS in respect of Meter Box as are available at their works. In case no testing facilities are available at the works particulars of the place where such testing is proposed to be conducted during the course of inspection must be indicated.

6.2 TEST VALUES :

For all acceptance tests, the acceptance values shall be the values guaranteed by the bidder in the guaranteed technical particulars or the acceptance value specified in this specification or the relevant standard whichever is more stringent.

6.3 ADDITIONAL TESTS :

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

6.4.1 TYPE TESTS :

Tests carried out to prove conformity with the requirement of the standard. These are intended to prove the general qualities & design of a given type of product. This test shall be carried out on two sample of enclosure for accessories of the same type selected preferably at random from a regular production lot. Before commencement of tests, the sample shall be visually examined & inspected for obvious visual defects in respect of component, part and their assembly, construction, marking, mechanical hazards, earthing etc. The external surface finish shall be even and free from finishing defects.

The following tests as per IS: 14772/2000 shall constitute the type test:

S.No. Tests

- | | |
|----|--|
| 1. | Marking |
| 2. | Dimensions |
| 3 | Protection against electric shock |
| 4. | Provision For earthing |
| 5. | Construction |
| 6. | Resisting to aging, to humid condition, ingress of material. |

7. Mechanical Strength
8. Resistance to heat
9. Resistance to rusting.

Criteria of acceptance: Both samples shall successfully pass all type tests for providing conformity with the requirements of the standard. If any of the sample fails in any of the type tests, the testing authority, at its discretion, may call for fresh sample not exceeding twice the original number and subject to all tests or to the test(s) in which failure(s) occurred.

6.4.2 ACCEPTANCE TESTS :

The following tests shall constitute the acceptance tests :-

Tests

1. Marking
2. Dimensions
3. Protection against electric shock
4. Provision for earthing
5. Construction

The verification of above tests shall be arranged by the supplier in the presence of purchaser's inspecting officer at the time of inspection.

6.4.3 ROUTINE TESTS:

The tests at s.no.(3) and (4) in the Cl.6.4.2 shall constitute this test as per IS:14772/2000.

7.0 INSPECTION & TESTING :

The inspection and testing shall be carried out by the purchaser's representative as per provisions of relevant ISS, specification & GTP and shall be governed by clause of General conditions of Contract" except mentioned hereunder.

- a) The supplier shall arrange fifteen days advance notice to enable the purchaser to depute the inspecting officer for conducting necessary testing at supplier's works. Any delay beyond fifteen days in arranging the inspection shall be to the purchaser's account.
- b) In case the manufacturer does not have adequate facilities for getting all the required tests conducted in his laboratory, the purchaser at his option may get these tests conducted in any reputed testing laboratory. All the expenses for such tests to be conducted outside shall be borne by the supplier.
- c) In case material/equipment is not found ready by the representative of the purchaser deputed for inspection to the extent of the quantity indicated in the inspection call with tolerance of (-) 10% or if the inspection is not got carried out by any reasons on account of the supplier the re-inspection charges shall be `7,500.00 for the supplier works located in Rajasthan and ` 15,000.00 for the supplier works located outside Rajasthan will become payable by the supplier on this account to the Sr. Accounts Officer (EA & Cash) AVVNL, Ajmer.

- d) The Acceptance tests shall be carried out as per relevant ISS Latest Amended) , P.O., GTP and the proto type sample approved by this office .For acceptance tests samples from the offered quantity for inspection shall be selected by inspecting officer as per provisions of IS:14772/2000 (Latest amended).
- e) The inspection may be carried out by the purchaser's representative at any stage of manufacture/before dispatch as per relevant standard. Inspection and acceptance of any material under the specification by the purchaser, shall not relieve the bidder of his obligation of furnishing material in accordance with the specification & shall not prevent subsequent rejection if the material is found to be defective. The bidder shall keep the purchaser informed in advance, about manufacturing program so that arrangements can be made for inspection.
- f) The purchaser reserves the right to insist for witnessing the acceptance /routine testing of the bought out items. The bidder shall give 15 days advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests. The inspection charges would be to the purchaser's account.

8.0 DRAWING

The bidder shall furnish drawings of MIP meter boxes enclosed with the specification duly signed on each along with the tender , failing which the offer is likely to be ignored.

9.0 GUARANTEED TECHNICAL AND OTHER PARTICULARS :

The guaranteed technical and other particulars shall be given in the Performa (Annexure-A).

10.0 STAGE INSPECTION DURING MANUFACTURE :

The stage inspection/ testing during manufacture shall mean those tests which are to be carried out during the process of manufacture and end inspection to ensure quality control such that the end product is of the designed quality conforming to the intent of this specification. The inspection may be carried out by the purchaser at any stage of manufacture/before dispatch as per relevant standard.

11.0 TEST REPORTS:

- i) All records of routine test reports shall be maintained by the Supplier at his works for periodic inspection by the Purchaser.
- ii) All test reports of tests conducted during manufacture shall be maintained by the Supplier. These shall be produced for verification as and when requested for by the Purchaser.

12.0 PACKING & FORWARDING:

MIP meter boxes shall be suitably packed in order to avoid damage during transit and handling.

ANNEXURE-A

**STATEMENT OF GUARANTEED TECHNICAL PARTICULARS AND OTHER
DETAILS FOR MIP METER BOXES AGAINST TN-1005**

| S. No. | Particulars | |
|---------------|--|-------|
| 1 (a) | Name & address of / firm / bidder. | |
| b) | Work's complete address of manufacture | |
| 2 | Dimensions of Box in mm | |
| 3 | Thickness of M.S.Sheet in mm | |
| a) | For three sides, top & door | |
| b) | For bottom. | |
| 4 | Dimensions of Bakelite/ Acrylic sheet in mm. | |
| a) | Sheet for mounting meter. | |
| b) | Sheet for cleats | |
| 5 | Window/window door details : | |
| a) | Inner dimension of window | |
| b) | Window door dimension. | |
| c) | Viewing window dimension. | |
| d) | Toughened/triplex glass | |
| e) | Metal frame for fixing acrylic Sheet | |
| i) | Inner dimensions. | |
| ii) | Outer dimensions. | |
| 6 | Dimensions of sealing/earthing bolts in mm. | |
| a) | Door sealing bolts. | |
| b) | Earthing bolts. | |
| 7 | Approximate weight of complete Box in Kgs. | |
| 8 | Details of painting. | |
| 9 | Shade No. of colour/paint. | |
| 10 | Tolerance in fabrication : | |
| a) | In overall dimension. | |
| b) | Rolling tolerance. | |
| 11 | Dimensions of fixing brackets As per drawings in mm. | |
| 12 | Embossing details. | AVVNL |

| | | |
|----|---|----------------------------|
| | | Trade mark of manufacturer |
| | | TN-1005 |
| | | Sign of danger |
| | | MIP meter box |
| 13 | Dimensions of felt lining to make box dust proof. | |
| 14 | Details of Bus bar cleats | |
| 15 | Details of drawing | |

TECHNICAL SPECIFICATION FOR ACSR DOG CONDUCTOR

1. SCOPE

1.1 This section provides for manufacture of Aluminum Conductor, Galvanized Steel reinforced (ACSR) for satisfactory operation in various lines and sub-stations. The conductor should conform to latest IS.

1.2 Aluminum Conductor with galvanized Steel re-enforcement shall be conforming to IS: 398 (Pt.2)/1996 with latest amendments if any, supplied on non returnable strong wooden drums generally conforming to IS: 1778/1981 (Latest).

The firms (manufacturers) must possess valid ISI License for the Conductor.

2. CLIMATIC CONDITIONS:

| | |
|--|-----------------|
| i) Peak ambient temperature in shade. | 50 deg.C |
| ii) Maximum average ambient temperature in a 24 hours period in shade. | 40 deg.C |
| iii) Min. ambient air temperature in shade | (-) 5 deg.C |
| iv) Maximum temperature attainable by an object exposed to sun. | 60 deg.C |
| v) Maximum relative humidity. | 100% |
| vi) Average number of thunder storm days per annum. | 40 |
| vii) Average number of rainy days per annum. | 100 |
| viii) Average annual rainfall | 10 to 100 cm |
| ix) Number of months of tropical Monsoon conditions. | 4 months |
| x) Maximum wind pressure. | 100 kg/ sq. mm. |
| xi) Altitude not exceeding | 1000 M |

3. GENERAL TECHNICAL REQUIREMENT OF ACSR DOG CONDUCTOR:

The technical particulars shall be furnished strictly in the Performa attached at Schedule-V-A of this specification. The specific values must be indicated against each column and no 'dash', 'dot', 'blank' or as per IS word should be indicated in this schedule. The technical

suitability shall be adjudged from the values furnished in the clause 3.2 “PRINCIPAL PARAMETERS”.

The ACSR conductor shall comply in all respect with IS: 398(Part.2)/1996 with latest amendment, if any from the date of its applicability. Any departure from the standard be indicated in Schedule-III

3.1 MATERIAL

The material offered shall be of the best quality and workmanship. The conductor shall be constructed from hard drawn aluminum and galvanized steel wires which have the mechanical and electrical properties specified in Tables 1 & 2 of IS:398(Part.2)/1996 with latest amendment, if any, The Zinc coating on the galvanized steel wires may be applied in accordance with IS:4826/1979 with latest amendment if any. The EC Grade Aluminum rods for use in the manufacture of Aluminum Wires shall conform to IS:5484/1978 amended up to date. The zinc used for galvanizing shall be Electro type High Grade Zinc not less than 99.95 percent purity. It shall conform to and satisfy all the requirements of IS:209/1992 amended up to date. Galvanized Steel Wire should comply mechanical properties as per Table 2 of IS:398 (Part.2)/1996 amended up to date. The chemical composition is as per Annexure-C of IS:398 (Part.2)/1996 amended up to date.

3.2 PRINCIPAL PARAMETERS:

The details of ACSR Dog conductor are tabulated below:-

| PARTICULAR | ACSR DOG |
|---|--------------------------|
| a) Stranding and wire diameter (mm) | 6/4.72 Al. 7/1.57 St. |
| b) Number of strands Central Steel wire Aluminum | 7 6 |
| c) Sectional area of Aluminum (Sq. mm) | 105 |
| d) Total Sectional area (Sq. mm) | 118.5 |
| e) Overall diameter (mm) (Approx.) | 14.15 |
| f) Weight (Kg/Km) (Approx.) | 394.00 |
| g) Calculated max. DC resistance at 20 Deg. C (Ohm./ Km.) | 0.2792 |
| h) Approx. calculated breaking load (KN) | 32.41 |
| i) Modulus of elasticity (GN/Sq. meter) | 75 |
| j) Coefficient of liner Expansion per deg C. | 19.8x10 ⁻⁶ |

3.3 The details of aluminum strands are as follows:

| PARTICULAR | ACSR Dog |
|--|-----------------------|
| a) Min. Breaking load of strand before stranding (KN) | 2.78 |
| b) Min. Breaking load of strand after stranding (KN) | 2.64 |
| c) Max. D.C. Resistance of strand at 20 Deg. C (ohm/Km.) | 1.650 |
| d) Diameter mm | |
| Nominal | 4.72 |
| Minimum | 4.67 |
| Maximum | 4.77 |
| e) Mass (Kg/Km.) | 47.30 |
| PARATICULAR | ACSR Dog |
| i) Min. Breaking load of strand before stranding (KN) | 2.70 |
| ii) Min. Breaking load of strand after stranding (KN) | 2.57 |
| iii) Diameter mm | |
| a) Nominal | 1.57 |
| b) Max./Min | 1.60/1.54 |
| iv) Zinc coating testing | 2 dips of 1 min. each |
| v) Min. weight of zinc coating GM/ Sq. Mtr. | 180.50 |
| vi) Mass of strand at normal diameter of strand(Kg./Km.) | 15.10 |

3.4 The details of steel strands are as follows:

3.5 **Tolerance on normal sizes:**

The tolerance in diameter of aluminum wires and steel wire used in the manufacture of ACSR shall be allowed as per IS: 398/ (Part-2) /1996 amended up to date.

3.6 **Stranding :**

3.6.1 The wires used in the construction of a galvanized steel reinforced aluminum conductor shall before stranding, satisfy all the relevant requirements of this specification and relevant IS.

| S. No. | Particulars | ACSR DOG |
|--------|-------------------|----------|
| 1 | Number of wires : | |
| | a) Aluminum | 6 |
| | b) Steel | 7 |

| | | | | |
|-----|----|--|----------|----------------------------------|
| lay | 2 | Ratio of aluminum Wire dia-meter to Steel wire dia-meter | 3 | 3.6.2 The ratio of the different |
| | 3 | Lay ratio for aluminum Wires (Outer most layer): a) Minimum b) Maximum | 10 14 | |
| | 4. | Lay ratio for steel core (6 wire layer) a)Minimum a) Maximum | 13 28 | |

layers shall be within the limits given:

NOTE: For the purpose of calculation, the mean lay ratio shall be taken as the arithmetic mean of the relevant minimum and maximum value given in this table.

4. TESTS (FOR ACSR DOG CONDUCTOR):

TESTS BEFORE DESPATCH: The ACSR Dog Conductor shall be subjected at manufacturer's works before dispatch, to the tests mentioned here-under as per IS: 398 (Part-2)/1996 with latest amended.

4.1 ROUTINE TESTS:

The following tests shall be conducted before and after stranding on each drum of the conductor by the manufacturer at his works as per relevant standard IS: 398 (Part-2)/ 1996 (latest amended)

- a) Visual & dimensional check on drum as per specification.
- b) Visual check for joints, scratches etc. and length of conductor by re-winding of conductor on empty drum as per Specification/ IS.
- c) Measurement of dia-meter of individual Aluminum and steel wires. (Clause-13.2)
- d) Measurement of Lay Ratio. (Clause-13.8)
- e) Breaking load of individual wires (Clause-13.3.1)
- f) Ductility Test (Clause-13.4)
- g) Wrapping Test (Clause-13.5)
- h) Resistance Test (Clause-13.6)
- i) Galvanizing Test (Clause-13.7)
- j) Any other test as per relevant IS

4.2 ACCEPTANCE TESTS:-

The following tests shall be conducted on samples taken at random from a lot as per relevant standard IS: 398 (Part-2)/1996 (Latest amended) in presence of purchaser's representative:-

- a) Visual & dimensional check on drum as per specification.
- b) Visual check for joints, scratches etc. and length of conductor by re-winding of conductor on empty drum as per Specification / IS.
- c) Measurement of dia-meter of individual Aluminum and steel wires. (Clause-13.2)
- d) Measurement of Lay Ratio. (Clause-13.8)
- e) Breaking load of individual wires (Clause-13.3.1)
- f) Ductility Test (Clause-13.4)

- g) Wrapping Test (Clause-13.5)
- h) Resistance Test (Clause-13.6)
- i) Galvanizing Test (Clause-13.7)

5.0 TYPE TESTS :-

For ACSR Dog Conductor, the bidders shall have required type test report as per relevant IS:398 Pt.2)/1996 with latest amendment.

The following shall constitutes type test which are to be conducted on the samples taken from Three Drums of the conductor as per relevant IS:398 (Pt.2)/1996 with latest amendment:

- a) Stress – Strain Test (Clause No.13.11 of ISS).
- b) Surface Condition Test (clause No.13.9 of ISS).
- c) Ultimate Breaking Load Test (Clause No.13.10 of ISS).

6.0 SAMPLING PLAN:

6.1. Samples for Acceptance Tests: Samples shall be taken as per relevant IS i.e. IS-398 (Part-2)/1996 with latest version as the case may be.

6.2 Apart from the sample selected for carrying out Acceptance Tests at the works of the firm during inspection, **one more sample from each length be also selected out of one drum under re-winding for carrying out various Acceptance Tests as per relevant IS. If any of the sample so selected from each length failed in any acceptance test the entire lot under inspection is not acceptable.**

6.3 TOLERANCE ON TEST RESULTS:

Tolerance on test results shall be allowed as per relevant IS/Spec. whichever is more stringent.

7.0 INSPECTION

7.1 (a) The conductor shall be manufactured in accordance with latest edition of IS: 398(Part.2)/1996 with all subsequent amendments issued from time to time for ACSR Dog Conductor. All the tests as laid down in the above mentioned specification on individual aluminum wire and steel wire shall be carried out. The testing shall also include the tests on manufactured finished conductor. Moreover the supplier shall also furnish test certificate(s) of raw materials to the inspecting officer at the time of inspection. The inspection & testing shall be governed by Clause No.1.27 of Section-II (General Condition of Contract).

(b) The supplier / manufacturer must offer conductor for inspection through a letter of offer mentioning size and quantity of the conductor along with Packing List duly signed indicating drum Serial No. individual lengths total length, net weight & gross weight in DUPLICATE. This letter of offer shall be addressed to this office. The packing list shall also be furnished to the Inspecting Officer prior to carrying out the inspection at the works.

(c) The Manufacturer shall provide all adequate facilities at his works for inspection of at least one number conductor drum or 5% conductor drums offered for inspection whichever is higher selected at random by the authorized representative of the purchaser for checking / verification of conductor length/ manufacturing defects by transferring the conductor from one drum to the another empty drum and at the same time measuring the length and lay ratio of each conductor length so transferred by means of the standard calibrated and sealed meter.

(d) If the firm is not having the necessary facilities for carrying out the required tests as per relevant IS / Purchase Order, the supplier will arrange such testing facilities in some other Government laboratory and shall bear the cost so incurred. But in such cases firm shall inform to the purchaser in advance before commencement of supplies.

(e) The supplier shall provide adequate facilities for weighing of all the drums offered for inspection.

7.2 In case of testing after re-offering as per Clause No.15 of IS:398 (Part.2)/1996 the lot under reference will be subject to 100% checking, if required by the purchaser.

7.3 The supplier shall present the latest Calibration Certificate(s) of testing instruments / equipments to be used for the testing of the material covered in the Purchase Order to the authorized inspecting officer / inspecting agency of the purchaser. The testing instruments / meters/ apparatus etc. should be got calibrated by the supplier from time to time from Govt. Lab or Independent test laboratory / house having valid accreditation from National Accreditation Board for Testing and Calibrating Laboratories for the testing equipments or original manufacturer having traceability to NABL / NPL or equivalent accredited lab.

The calibration certificate(s) should not in any case be older than one year at the time of presenting the same to the inspecting officer / inspecting agency of the purchaser. The testing instruments / equipments should be duly sealed by the Calibrating Agency and mention thereof shall be indicated in the calibration certificate(s).

7.4 The manufacturer will provide certificates as per the Clause No.7 of IS: 398((Part.2)/1996 "Freedom from defects" and clause No.9 "Joint in Wires" of IS:398 (Part 2) /1996 for ACSR Conductors and the certificates as per Clause No.6.

8.0 STANDARD LENGTH & VARIATION IN LENGTHS:

8.1 The ACSR Dog Conductor shall be supplied in the standard length. The standard length of ACSR Dog Conductor shall not less than the value specified below with a tolerance of (-) 5%. More than the standard length shall be acceptable.

a) ACSR DOG - 1000 Mtrs.

8.2 Short length(s), if any shall not measure less than 80% of standard length as specified above in any case. The total quantity of such short length(s) shall not exceed 5% of the quantity of the lot offered for inspection.

8.3 The maximum permissible length per drum shall be as under subject to condition that the manufacturer while packing the conductor in drum shall ensure that after winding complete quantity of conductor in drum a uniform space of not less than 100 mm. remains between outer layer of conductor and inner surface of the external protective lagging of the drum. This is essential to ensure that the conductor does not get closer to the lagging and to avoid damaged during transportation/ reeling / unreeling or rolling on the undulated ground / fields:

a) ACSR DOG --- 2.4 Kms.

9.0 PACKING FORWARDING AND MARKING:

a. The packing shall have to be done as per standard practice worthy of road transport. The conductor shall be wound in strong wooden drums so as to withstand all stresses due

to transportation, handling and stringing operation so that there is no damage caused to the conductor during the process of these operations. The wooden drums shall be non-returnable and shall **generally conform IS:1778/1981 with latest amendments, however, the main parameters of the drum shall be as under:**

| S.NO. | PARTICULARS | DIMENSION FOR ACSR DOG CONDUCTOR |
|-------|------------------|----------------------------------|
| 1. | Flange Dia | 1250 mm (+/- 5%) |
| 2. | Flange Thickness | 2x25 mm (+/- 5%) |
| 3. | Barrel Dia | 500 mm (+/- 10 mm) |
| 4. | Traverse | 510 mm (+/- 10 mm) |
| 5. | Number of Bolts | 4 Nos. |
| 6. | Dia of Bolts | 12 mm |
| 7. | Bore Dia | 80 mm |

However, use of seasoned wood shall not be insisted, provided wood used should be of good quality to withstand transportation hazards. The drums shall be having inside flanges painted with Aluminum Paint and with Ordinary White Enamel paint from outside. The conductor on each drum shall be securely fastened at each end. The outer end of the conductor shall be fastened inside the drum against one of the sides of the flanges while it is under tension and shall be such that no looseness is transmitted to the internal layers. The conductor shall be snugly, tightly and uniformly spooled on the drums. The wrapping of conductor on the drums shall be laid snugly against side of the preceding wrap and the first and last wrap in each layer shall fit snugly against the sides of the flanges. Drums shall be lagged with sufficient strong wooden laggings to support the full drum without crushing. The wooden drums after providing lagging shall be fastened by two steel wires of min. 3 mm. Dia over the lagging on the two sides of adequate size to keep the lagging intact and to prevent the drum from crushing/ damage.

Although the various dimension of the drums such as flanges, stretches, traverse and barrel diameter shall depend on the quantity of conductor as offered and agreed upon, on one drum. **The manufacturer while packing the conductor in drum shall ensure that after winding complete quantity of conductor in drum a uniform space of not less than 100 mm. remains between outer layer of conductor and inner surface of the external protective legging of the drum. This is essential to ensure that the conductor does not get closer to the legging and to avoid damaged during transportation/ reeling / unreeling or rolling on the undulated ground / fields.**

b. Water proof material shall be wrapped round the barrel and inner surface of flange before winding the conductor and also wrapped round over the conductor completely wounded and under the laggings.

c. **The drums shall be marked clearly in block letters with water proof mark having the marking attached to them so that there is no possibility of goods being lost or wrongly dispatched due to faulty marking. The marking shall constitute the following:-**

- a) Name & full address of the consignee.
- b) Destination station.
- c) Serial number of drum.

- d) Size of Conductor with its code name.
- e) Total length of Conductor in drum, with individual length (s).
- f) Number of length(s) in each drum.
- g) Gross mass of drum including the tare mass of drum.
- h) Tare mass of the empty drum with lagging.
- i) Net mass of conductor.
- j) BIS standard mark.
- k) Name of the supplier.
- l) Purchase order reference/TN number.
- m) Date of expiry of warranty / guarantee period.

Besides above, an arrow shall be put on the drum so as to indicate the direction in which the drum can be unwound. The manufacturer shall also provide his own lead seal with distinguishing mark at the outer end of the conductor on each drum before dispatch of the material.

10.0 TEST CHECKING OF MATERIAL AT STORES:

iv) Sample drums from the material received at stores shall be selected for testing at CTL as per sampling plan given hereunder in presence of firm's representative.

v) The selected sample drum for CTL testing shall be identified by the seals provided by Inspecting Officer / Inspecting Agency during pre-dispatch inspection at firm's works and these sealing details shall be invariably mentioned in the selection Memo by the nominated officers of Nigam.

vi) The tests in the Nigam Testing laboratory (CTL) shall be conducted in the presence of representative of supplier for which a 7 days notice shall be issued through Fax / Speed Post stating Date & Time to the firm, so that supplier can depute their representative to witness the test . In case the supplier or his representative does not turn up the testing shall be proceeded & completed. **The payment shall be released only after receipt of successful CTL test reports** for the samples selected at purchaser's stores for mandatory test checking the samples to be selected from material received at Nigam's stores by officers to be nominated by Circle SE's / SE (I&S) for testing at CTL.

10.1 SAMPLING

Selection of samples from the material received at stores shall be done as soon as material received in stores in the presence of representative of supplier.

One number Drum out of each lot / sub-lot of 20 Nos. Drums or part thereof for the material received in Stores of Nigam. The selected sample drum / drums shall be transported to CTL by concerned ACOS / SS.

In case of selection of sample for type test the length of the sample shall be of 15 Mtrs. The selected and sealed sample for type test shall be identified by providing polycarbonate seals on both ends of conductor and after forming the coil of conductor two stickers seals provided around the coil.

10.2 TESTS

10.2.1. The following tests shall be carried out as per relevant Clause of latest IS-398 (Part2)/1996 on each selected drum by drawing sample of 5 Mtrs. at CTL

from random distance from any length of the selected drum of ACSR Conductor during rewinding:

- a) Rewinding test (Measurement of Length and weight) & Checking of Manufacturing defects.
- b) Measurement of lay ratio during rewinding of Conductor Drum.
- c) Dia. of Aluminum Strands and Steel Wires.
- d) Breaking load test.
- e) Resistance Test.
- f) Galvanization of steel wire (Uniformity) and Mass of Zinc Coating.
- g) Verification of Water Proof marking on Drum as per Specification.

10.2.2 The following tests shall be carried out as per relevant Clause of latest IS / Specification on each selected drum by drawing sample of 5 Mtrs. at CTL from random distance from any length of the selected drum of Conductor during rewinding:

- i) Rewinding test (Measurement of Length and weight) & Checking of Manufacturing defects.
- ii) Measurement of lay ratio during rewinding of Conductor Drum
- iii) Breaking Load test
- iv) Elongation Test
- v) Resistance test
- vi) Measurement of dia-meter of individual Aluminum.
- vii) Verification of Water Proof marking on Drum as per Specification.

NOTE: (a) In addition to above tests remaining acceptance tests as per relevant IS shall also be conducted at CTL provided the testing facility is available at CTL for these tests time to time. Only those tests shall be conducted for which testing facilities are available in NIGAM's Lab.

- (a) The Officer In charge of central Testing Lab (CTL) of Nigam shall send copies of test reports to the Purchasing Officer / Sr. AO (CPC), consignee and the supplier.
- (b) The payment of every lot shall be released after receipt of successful test report from Nigam's Lab (CTL) on the samples selected from the material received in Nigam stores.**

10.3 CRITERIA FOR ACCEPTANCE:

(a) Rewinding Test (Measurement of Length and weight):

The results of measurement of length test shall be made applicable to all drums contained in each lot/sub-lot by making deduction of less length of conductor in a sample drum. In case short length is observed more than one percent of the length contained in lot / sub-lot , then the lot / sub-lot shall liable to be rejected

The net calculated weight of conductor corresponding to minimum prescribed diameter in IS of Aluminum Strand & Steel Strands shall be as under:

a) ACSR DOG 384.33 Kg./Km.

If weight of conductor corresponding to minimum prescribed diameter as per IS found less up to 2% in respect to measured length the lot shall be acceptable otherwise the entire lot for which sample drum represents shall be rejected and to be replaced by the supplier.

(b) If the sample(s) fail in any test other than length measurement, the entire material in the Lot shall be rejected and shall have to be replaced by the supplier.

(c) If the contractor / supplier fails to lift the material declared rejected or any part thereof from the consignee within a period of 15 days from the date of dispatch instruction from the purchaser, the purchaser shall be entitled to effect recovery along with other actions as per Clause No. 1.62 of Section-II (General Condition of Contract).

TECHNICAL SPECIFICATION AND SCHEDULE OF REQUIREMENT FOR SUPPLY OF 33 KV CROSS-LINKED POLYETHYLENE (XLPE) INSULATED POWER CABLES

1. SCOPE:

1.1 This section provides for manufacture of ISI Marked 33 KV Aluminium conductor Screened, Cross linked Polyethylene (XLPE) Insulated Armoured Shielded PVC Sheathed cable of rated voltage 33 KV (earthed system) conforming to IS:7098 (Part-II/1985) with latest amendment.

The 33 KV Aluminium Conductor, Screened CROSS-LINKED POLYETHEYLENE (XLPE) INSULATED Armoured Shielded PVC Sheathed Power cable shall be ISI marked.

a) The Manufacturer shall manufacture the 33 KV Power Cable with CCV Line Procoess only and offer from other type of manufacturing process (Syoplas) shall not be considered.

The manufacture must possess valid ISI License for the bid item.

2. STANDARDS:

Unless otherwise stipulated in this specification the following standards with latest amendments shall be applicable. Any departure from the Standards be indicated in Schedule-III.

- i) IS:7098(Part-II) : Cross linked Polyethylene Insulated PVC sheathed cable for voltage from 3.3 KV upto & Including 33 KV.
- ii) IS:8130 : Conductors for insulated Cables.
- iii) IS:5831 : PVC insulation and sheath of Electric cables.
- iv) IS:3975 : Mild steel wires, strips and tapes for armouring cables.
- v) IS:10812 : Methods of test for cables.
- iv) IS:10418 : Drums for Electric Cables

3. CLIMATIC CONDITIONS:

- i) Peak ambient temperature 50 deg.C

| | |
|--|-----------------|
| in shade. | |
| ii) Maximum average ambient temperature in a 24 hours period in shade. | 40 deg.C |
| iii) Min. ambient air temperature in shade | (-) 5 deg.C |
| iv) Maximum temperature attainable by an object exposed to sun. | 60 deg.C |
| v) Maximum relative humidity. | 100% |
| vi) Average number of thunder storm days per annum. | 40 |
| vii) Average number of rainy days per annum. | 100 |
| viii) Average annual rainfall | 10 to 100 cm |
| ix) Number of months of tropical Monsoon conditions. | 4 months |
| x) Maximum wind pressure. | 100 kg/ sq. mm. |
| xi) Altitude not exceeding | 1000 M |

4. GENERAL REQUIREMENT:

4.1 The 33 KV power cable shall be ISI Marked Aluminium conductor screened cross linked polyethylene insulated armoured shielded and over all PVC sheathed. The 33 KV XLPE Cable shall conform to IS: 7098 (Part-II)/1985 with latest amendments shall bear ISI Certification mark. The cable shall be capable of withstanding the normal stresses associated with transportation, erection, reeling and unreeling operations without getting deformed.

4.2 The 33KV XLPE Cable shall be suitable for the following conditions of laying:

- i) Laid directly in ground.
- ii) Installed outdoor in free air in vertical position.
- iii) Drawn into underground ducts.

4.3 The 33 KV XLPE Power Cable shall be suitable for use where combination of ambient temperature and temperature rise due to load results in conductor temperature not exceeding 90 degree C. under normal operation and 250 degree C under short circuit conditions.

4.4 The cable shall be used on 33 KV earthed system. The cables shall be suitable for continuous operation at a power frequency voltage 10% higher than rated voltage.

5.0 MATERIAL:

5.1 CONDUCTOR:

The conductor shall be composed of aluminium wires complying with the requirement of Class-2 of IS: 8130/1984.

The bidder must guaranteed the minimum weight of Aluminium in Kg/Km corresponding to nominal cross sectional area of conductor as mentioned in the G.T.P.

5.2 INSULATION:

The insulation shall be cross linked polyethylene conforming to the requirement given in Table-1 of IS:7098(Part-II)/1985.

5.3 SCREENING:

The screening shall consist of one or more of the following:

- i) Non-Metallic semi conducting tape.
- ii) Non-Metallic semi conducting compound and
- iii) Non-Magnetic Metallic tape wire, strip or sheath.

5.4 FILLERS AND INNER SHEATH:

5.4.1 The filler and inner sheath shall be of the following:

- a) Vulcanized or Un-vulcanized rubber or
 - b) Thermoplastic material.

5.4.2 Vulcanized or Un vulcanized rubber or Thermoplastic material used for inner sheath shall not be harder than XLPE and PVC used for insulation and outer sheath respectively. The filler and inner sheath material shall be chosen to be compatible with the temperature rating of the cable and shall have no deleterious effect on any other components of the cable.

5.4.3 The Central hole / void, if any, of the cable shall be invariably filled with suitable filler material so that there is no gap in the center.

5.5 ARMOURING:

5.5.1 The Armouring shall be of Galvanized Steel Strip.

5.5.2. Galvanized steel strips shall comply with the requirements of IS:3975/1979 with latest amendments.

5.6 OUTER SHEATH:

5.6.1 The outer sheath shall be of Poly Vinyl Chloride (PVC) compound conforming to the requirement of type ST-2 of IS:5831/1984.

6. CONSTRUCTION:

6.1 CONDUCTOR:

The Conductor shall be of stranded construction complying with Class-2 of IS:8130/1984. The aluminium shall be reasonably uniform in size and shape and its surface be free from any sharp edges.

6.2 CONDUCTOR SCREENING:

The conductor screening shall be provided over the conductor by applying non-metallic semi conducting tape or by extrusion of semi conducting compound or a combination of the two.

6.3 INSULATION:

The Conductor (with screen) shall be provided with cross linked polyethylene (XLPE) insulation applied by extrusion. The insulation shall be so applied that it fits closely on the conductor (or conductor screening) and it shall be possible to remove it without damaging the conductor. The thickness of insulation and tolerance of thickness of insulation shall be as per Clause No.11 of IS:7098 (Part-II)/1985.

6.4 INSULATION SCREENING:

6.4.1 The insulation screening shall consist of two parts namely metallic and non-metallic.

6.4.2 Non-metallic part shall be applied directly over the insulation of each core and shall consist of either a semi conducting tape or extruded semi conducting or a combination of the two or either material with a semi conducting coating.

6.4.3 Metallic part shall consist of either tape or braid or concentric serving of wires or a sheath should be non-magnetic and shall be applied over the non metallic part.

6.5 CORE IDENTIFICATION:

The core identification shall be done as per Clause-13 of IS:7098 (Part-II)/ 1985.

6.6 LAYING UP OF CORES:

The Cores (with screening) shall be laid together with a suitable right hand lay. Wherever, necessary the interstices shall be filled with non-hygroscopic material.

6.7 INNER SHEATH (COMMON COVERING):

The laid up core shall be provided with inner sheath applied either by extrusion or by wrapping. However, application of inner sheath by EXTRUSION shall be preferred. It shall be ensured that the shape is as circular as possible. The inner sheath shall be so applied that it fits closely on the laid up cores and it shall be possible to remove it without damage to the insulation. The thickness of inner sheath shall be as per Clause No.15.3 of IS: 7098 (Part-II)/ 1985 (with latest amendments)

6.8 ARMOURING:

The armouring shall be applied over the inner sheath. The Galvanized Steel Armoured strips shall be applied as closely as practicable. The direction of lay of the Armour shall be left hand. A binder tape may be applied on the armouring. The dimensions of the galvanized steel strips shall be as specified in Table-4 of IS:7098 (Part-II)/1985. The joints in Armour strips if any shall be made by brazing or welding and the surface irregularities shall be removed. A joint in any strip shall be at least 300 mm. from the nearest joint in any other armour strips in the completed cable.

6.9 OUTER SHEATH:

6.9.1 The outer sheath shall be applied by extrusion over the armouring. The colour of outer sheath shall be black.

6.9.2 The thickness of the outer sheath shall be as per Clause No.17.3 of IS: 7098 (Part-II)/1985 with latest amendments.

7. TYPE TESTS:

7.1 The material offered, shall be fully type tested as per relevant standard of specification of IS:7098 (Part-II/1985) amended up to date. The following shall constitute type tests:

- a) Tests of Conductor:
 - i) Annealing test (for copper)
 - ii) Tensile test (for aluminium)
 - iii) Wrapping test (for aluminium)
- iv) Conductor Resistance test
 - b) Tests for armouring wires/strips.
 - c) Tests for thickness of insulation and sheath.
 - d) Physical tests for insulation:
 - i) Tensile strength and elongation at break.
 - ii) Ageing in air oven.
 - iii) Hot test.
 - iv) Shrinkage test.
 - v) Water absorption (gravimetric).
 - e) Physical test for outer sheath:
 - i) Tensile strength and elongation at break.
 - ii) Ageing in air oven.
 - iii) Shrinkage test.
 - iv) Hot deformation,
 - f) Partial discharge test.
 - g) Bending test.
 - h) Dielectric power factor test:
 - i) As a function of voltage.
 - ii) As a function of temperature.
- i) Insulation resistance (volume resistivity test).
 - j) Heating cycle test.
 - k) Impulse withstand test.
 - l) High voltage test.
 - m) Flammability test.

7.2 However, the purchaser reserves the right to demand repetition of same or all the type tests in presence of purchaser's representative.

7.3 The bidder must also clearly indicate various testing facilities available at their works for testing the material as per relevant standards. In case of otherwise

particulars of the place where such testing is proposed to be conducted during the course of inspection shall be indicated with the offer.

8. INSPECTION (TEST BEFORE DISPATCH):

8.1 The inspection may be carried out by the purchaser at any stage of manufacturer. The Inspection & Testing shall be governed by Clause No. 1.27 of Section-II (General Conditions Of Contract). Acceptance of any equipment / material under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment/material is found to be defective. The following Acceptance tests as per Clause No.18.2 of IS:7098(Part-II)/1985 shall be conducted in presence of the purchaser's authorized representative / agency on each lot of offered cables:

- i) Tensile Test.
- ii) Wrapping Test.
- iii) Conductor Resistance Test.
- iv) Test for thickness of insulation & sheath.
- v) Hot Set Test for insulation.
- vi) Tensile strength & elongation at break test for insulation and sheath.
- vii) Partial Discharge Test (for screened cables only).
- viii) High voltage test and
- ix) Insulation resistance (Volume resistivity) Test.
- x) Test for Armour:
 - a) Verification of Dimension of Strip.
 - b) Tensile Strength & elongation at break.
 - c) Uniformity of Zinc Coating.
 - d) Weight of Zinc Coating.
 - e) Winding Test on Armour.
 - f) Resistivity Test on Armour.

Cold impact test for outer sheath (IS:5831/1984) shall constitute the optional test and shall be conducted on first lot of the offered cables of each size as per Clause No.18.4 of IS:7098(Part-II)/1985.

8.2 ROUTINE TEST:-

The following shall constitute routine tests:

- a) Conductor resistance test
- b) Partial discharge test
- c) High voltage test.

8.3 The bidder shall furnish Packing list mentioning serial Nos. of Drums, length in each drum, gross weight of drum without lagging alongwith inspection offer duly signed by the authorized representative of the firm. The purchaser reserves the rights to insist for witnessing the acceptance / routine tests of the bought out items.

8.4 At least 5% of total numbers of drums subject to minimum of two (2) in the lot put up for inspection shall be selected at random to ascertain the length of cable by the following method.

“At the works of manufacturer of the cable shall be transferred from one drum to another for checking any manufacturing defects in the cable, at the same time measuring its length with the help of the graduated pulley and cyclometer. The difference in average length thus obtained from the declared length by the supplier in the packing list shall be applied to all the drums if the cable is found short during checking the sample lot (s).”

8.5 The supplier shall present the latest Calibration Certificate(s) of testing instruments / equipments to be used for the testing of the material covered in the Purchase Order to the authorized inspecting officer/ inspecting agency of the purchaser. The testing instruments/ meters/ apparatus etc. should be got calibrated by the supplier from time to time from Govt. Laboratory or any independent test laboratory/house having valid accreditation from National Accreditation Board for Testing and Calibrating Laboratories for the testing equipments / original manufacturer having trace ability to NABL/NPL or equivalent.

8.6 The calibration certificate(s) should not in any case be older than one year at the time of presenting the same to the inspecting officer/ inspecting agency of the purchaser. The testing instruments/ equipments should be duly sealed by the Calibrating Agency and mention thereof shall be indicated in the calibration certificate(s).

8.7 TEST CHECKING OF MATERIAL AT STORES:

i) Sample drums from the material received at stores shall be selected for testing at CTL as per sampling plan given hereunder in presence of firm's representative. The selected sample drum / drums shall be transported to CTL by concern S.S / ACOS of Nigam.

ii) The selected sample drum for CTL testing shall be identified by the seals provided by Inspecting Officer / Inspecting Agency during pre-dispatch inspection at firms works and these sealing details shall be invariably mentioned in the selection Memo by the nominated officers of Nigam.

iii) The tests in the Nigam Testing laboratory (CTL) shall be conducted in the presence of representative of supplier for which a 7 days notice shall be issued through Fax / Speed Post stating Date & Time to the firm, so that supplier can depute their representative to witness the test . In case the supplier or his representative does not turn up the testing shall be proceeded & completed. The payment shall be released only after receipt of successful test reports for the samples selected at purchaser's stores for mandatory test checking on the samples to be selected from material received at Nigam's stores by officers to be nominated by Circle SE's / SE (I&S) for testing at CTL.

iv) SAMPLING:

One number Drum out of each lot / sub-lot of 25 Nos. Drums or part thereof for the material received in Stores of Nigam.

v) TESTS: The following tests shall be carried out as per relevant clause of latest IS on each selected drum by drawing sample of 10 Mtr. at CTL from random distance during re-winding:

- a) Rewinding test (Measurement of Length) & Checking of Manufacturing defects.
- b) Measurement of Resistance of conductor.
- c) Tensile strength & Elongation at Break Test for Insulation & Sheath
- d) Test for Thickness of Insulation & Sheath
- e) Hot Set Test
- f) Test for Armour:
- i) Verification of Dimension of Wire / Strip.
- ii) Tensile Strength & elongation at break.
- iii) Uniformity of Zinc Coating.
- iv) Weight of Zinc Coating.
- v) Winding Test on Armour.
- vi) Resistivity Test on Armour.
- g) Verification of Marking

In addition to above tests remaining acceptance tests as per relevant IS shall also be conducted at CTL provided the testing facility is available at CTL for these tests time to time. Only those tests shall be conducted for which testing facilities are available in NIGAM's Lab.

vi) CRITERIA FOR ACCEPTANCE:

a) If the measured of conductor resistance of the sample(s) exceeds beyond 2% as per the resistance specified in the contract, the material shall be rejected and the same shall have to be replaced by the supplier.

b) If the measured conductor resistance of the sample(s) exceeds the value specified in the contract but does not exceed by more than 2% of the resistance value specified in the contract, the material contained in the lot / sub-lot to which the sample belongs shall be accepted with a deduction @ 1.5% of the cost of cable for increase in resistance for every 1% or part thereof.

b) If the sample(s) fails in any other test, the material shall be rejected and shall have to be replaced by the supplier.

c) If the contractor / supplier fails to lift the material declared rejected or any part thereof from the consignee within a period of 15 days from the date of dispatch of information from the purchaser, the purchaser shall be entitled to effect recovery along with other actions as per Clause No. 1.62 of Section-II (General Condition of Contract).

d) The results of measurement of length test shall be made applicable to all drums contained in each lot / sub lot by making deduction of less length of cable in a Sample Drum.

8.9 TEST CHARGES :

All test charges incurred towards test checking of the material received in our stores shall be borne by the NIGAM.

9. IDENTIFICATION:

10.1 The manufacturer shall be identified throughout the length of cable as per Clause No.20.1 of IS:7098(Part-II)/ 1985.

10.2 The cable code employed shall be as per Clause No.20.3 of IS:7098 (Part-II) /1985.

10.3 EMBOSSING:

The cable shall also be required to be embossed with the word `Name of manufacturer or Trade name, ELECTRIC/ Voltage Grade/ NAME OF DISCOM/ TN-cable code, size of cable & year of manufacture at every meter length for which no extra charges shall be paid. The cable should be ISI marked & same should be embossed on the outer sheet of every meter length of HT Cable.

11. MARKING:

The progressive length of cable in meter shall be marked on the outer sheath of every meter length of HT Cable.

12. PACKING AND MARKING:

12.1 The cable shall be wound on a non returnable wooden drum conforming to IS: 10418/1982 of suitable size. The ends of cables shall be sealed by means of non-hygroscopic material. Only one cable length shall be supplied on a drum. The cable can also be supplied on M-Steel Drums as per relevant ISS as applicable.

12.2 The cable drums shall carry the following information either stenciled or painted.

- i) Manufacturer's name, Brand or trade mark.
- ii) Type of cable and voltage grade.
- iii) Number of cores.
- iv) Nominal cross-sectional area of the Conductor.
- v) Cable Code.
- vi) Length of cable on the drum.
- vii) Direction of rotation of drum (by means of an arrow).
- viii) Gross mass.
- ix) Year of manufacture.
- x) ISI Certification mark.
- xi) Purchase order/bid No. and
- xii) Name of Consignee.

13. STANDARD LENGTH:

The cable shall be supplied in standard length of 250 Mtrs in one Drum for size 33 KV, 3CX300 Sq.mm.

13.1 A tolerance of (+/-) 5% shall be allowed on standard length.

14 DRAWINGS & DOCUMENTATIONS:

The manufacturer is required to furnish the detailed constructional drawing of cable clearly showing shape of core, type, size of fillers/ interstices along with Center Filler etc. The calculations of weights of different components of the cable along with weight of armouring and calculation of number of armour strips indicating Lay Ratio & Lay Factor shall also be furnished. In absence of this, the bids are likely to be ignored. The drawing of drums shall also be furnished as per relevant applicable ISS.

TECHNICAL SPECIFICATION AND SCHEDULE OF REQUIREMENT FOR SUPPLY OF 11 KV CROSS-LINKED POLYETHYLENE (XLPE) INSULATED POWER CABLES AGAINST TN-887.

1. SCOPE:

1.1 This section provides for manufacture of ISI Marked 11 KV Aluminium conductor Screened, Cross linked Polyethylene (XLPE) Insulated Armoured Shielded PVC Sheathed cable of rated voltage 11 KV (earthed system) conforming to IS:7098 (Part-II/1985) with latest amendment.

The 11 KV Aluminium Conductor, Screened CROSS-LINKED POLYETHEYLENE (XLPE) INSULATED Armoured Shielded PVC Sheathed Power cable shall be ISI marked.

a) The 11 KV Power Cable may be manufactured either by CCV Line or Syoplas Process.

The manufacture must possess valid ISI License for the item.

2. STANDARDS:

Unless otherwise stipulated in this specification the following standards with latest amendments shall be applicable. Any departure from the Standards be indicated in Schedule-III.

- i) IS:7098(Part-II) : Cross linked Polyethylene Insulated PVC sheathed cable for voltage from 3.3 KV upto & Including 33 KV.
- ii) IS:8130 : Conductors for insulated Cables.
- iii) IS:5831 : PVC insulation and sheath of Electric cables.
- iv) IS:3975 : Mild steel wires, strips and tapes for armouring cables.

- v) IS:10810 : Methods of test for cables.
- iv) IS:10418 : Drums for Electric Cables

3. CLIMATIC CONDITIONS:

- i) Peak ambient temperature in shade. 50 deg.C
- ii) Maximum average ambient temperature in a 24 hours period in shade. 40 deg.C
- iii) Min. ambient air temperature in shade (-) 5 deg.C
- iv) Maximum temperature attainable by an object exposed to sun. 60 deg.C
- v) Maximum relative humidity. 100%
- vi) Average number of thunder storm days per annum. 40
- vii) Average number of rainy days per annum. 100
- viii) Average annual rainfall 10 to 100 cm
- ix) Number of months of tropical Monsoon conditions. 4 months
- x) Maximum wind pressure. 100 kg/ sq. mm.
- xi) Altitude not exceeding 1000 M

4. GENERAL REQUIREMENT:

4.1 The 11 KV power cable shall be ISI Marked Aluminium conductor screened cross linked polyethylene insulated armoured shielded and over all PVC sheathed. The 11 KV XLPE Cable shall conform to IS: 7098 (Part-II)/1985 with latest amendments shall bear ISI Certification mark. The cable shall be capable of withstanding the normal stresses associated with transportation, erection, reeling and unreeling operations without getting deformed.

4.2 The 11 KV XLPE Cable shall be suitable for the following conditions of laying:

- i) Laid directly in ground.
- ii) Installed outdoor in free air in vertical position.
- iii) Drawn into underground ducts.

4.3 The 11 KV XLPE Power Cable shall be suitable for use where combination of ambient temperature and temperature rise due to load results in conductor temperature not exceeding 90 degree C. under normal operation and 250 degree C under short circuit conditions.

4.4 The cable shall be used on 11 KV earthed system. The cables shall be suitable for continuous operation at a power frequency voltage 10% higher than rated voltage.

5.0 MATERIAL:

5.1 CONDUCTOR:

The conductor shall be composed of aluminium wires complying with the requirement of Class-2 of IS: 8130/1984.

The bidder must guaranteed the minimum weight of Aluminium in Kg/Km corresponding to nominal cross sectional area of conductor as mentioned in the G.T.P.

5.2 INSULATION:

The insulation shall be cross linked polyethylene conforming to the requirement given in Table-1 of IS:7098(Part-II)/1985.

5.3 SCREENING:

The screening shall consist of one or more of the following:

- i) Non-Metallic semi conducting tape.
 - ii) Non-Metallic semi conducting compound and
 - iii) Non-Magnetic Metallic tape wire, strip or sheath.

5.4 FILLERS AND INNER SHEATH:

5.4.1 The filler and inner sheath shall be of the following:

- a) Vulcanized or Un-vulcanized rubber or
 - b) Thermoplastic material.

5.4.2 Vulcanized or Un vulcanized rubber or Thermoplastic material used for inner sheath shall not be harder than XLPE and PVC used for insulation and outer sheath respectively. The filler and inner sheath material shall be chosen to be compatible with the temperature rating of the cable and shall have no deleterious effect on any other components of the cable.

5.4.3 The Central hole / void, if any, of the cable shall be invariably filled with suitable filler material so that there is no gap in the center.

5.5 ARMOURING:

5.5.1 The Armouring shall be of Galvanized Steel Strip.

5.5.2. Galvanized steel strips shall comply with the requirements of IS:3975/1979 with latest amendments.

5.6 OUTER SHEATH:

5.6.1 The outer sheath shall be of Poly Vinyl Chloride (PVC) compound conforming to the requirement of type ST-2 of IS:5831/1984.

6. CONSTRUCTION:

6.1 CONDUCTOR:

The Conductor shall be of stranded construction complying with Class-2 of IS:8130/1984. The aluminium shall be reasonably uniform in size and shape and its surface be free from any sharp edges.

6.2 CONDUCTOR SCREENING:

The conductor screening shall be provided over the conductor by applying non-metallic semi conducting tape or by extrusion of semi conducting compound or a combination of the two.

6.3 INSULATION:

The Conductor (with screen) shall be provided with cross linked polyethylene (XLPE) insulation applied by extrusion. The insulation shall be so applied that it fits closely on the conductor (or conductor screening) and it shall be possible to remove it without damaging the conductor. The thickness of insulation and tolerance of thickness of insulation shall be as per Clause No.11 of IS:7098 (Part-II)/1985.

6.4 INSULATION SCREENING:

6.4.1 The insulation screening shall consist of two parts namely metallic and non-metallic.

6.4.2 Non-metallic part shall be applied directly over the insulation of each core and shall consist of either a semi conducting tape or extruded semi conducting or a combination of the two or either material with a semi conducting coating.

6.4.3 Metallic part shall consist of either tape or braid or concentric serving of wires or a sheath should be non-magnetic and shall be applied over the non metallic part.

6.5 CORE IDENTIFICATION:

The core identification shall be done as per Clause-13 of IS:7098 (Part-II)/ 1985.

6.6 LAYING UP OF CORES:

The Cores (with screening) shall be laid together with a suitable right hand lay. Wherever, necessary the interstices shall be filled with non-hygroscopic material.

6.7 INNER SHEATH (COMMON COVERING):

The laid up core shall be provided with inner sheath applied either by extrusion or by wrapping. However, application of inner sheath by EXTRUSION shall be preferred. It shall be ensured that the shape is as circular as possible. The inner sheath shall be so applied that it fits closely on the laid up cores and it shall be possible to remove it without damage to the insulation. The thickness of inner sheath shall be as per Clause No.15.3 of IS: 7098 (Part-II)/ 1985 (with latest amendments)

6.8 ARMOURING:

The armouring shall be applied over the inner sheath. The Galvanized Steel Armoured strips shall be applied as closely as practicable. The direction of lay of the Armour shall be left hand. A binder tape may be applied on the armouring. The dimensions of the galvanized steel strips shall be as specified in Table-4 of IS:7098 (Part-II)/1985. The joints in Armour strips if any shall be made by brazing or welding and the surface irregularities shall be removed. A joint in any strip shall be at least 300 mm. from the nearest joint in any other armour strips in the completed cable.

6.9 OUTER SHEATH:

6.9.1 The outer sheath shall be applied by extrusion over the armouring. The colour of outer sheath shall be black.

6.9.2 The thickness of the outer sheath shall be as per Clause No.17.3 of IS: 7098 (Part-II)/1985 with latest amendments.

7. TYPE TESTS:

7.1 The material offered, shall be fully type tested as per relevant standard of specification of IS:7098 (Part-II/1985) amended up to date. The following shall constitute type tests:

- a) Tests of Conductor:
 - i) Annealing test (for copper)
 - ii) Tensile test (for aluminium)
 - iii) Wrapping test (for aluminium)
- b) Tests for armouring wires/strips.
- c) Tests for thickness of insulation and sheath.
- d) Physical tests for insulation:
 - i) Tensile strength and elongation at break.
 - ii) Ageing in air oven.
 - iii) Hot test.
 - iv) Shrinkage test.
 - v) Water absorption (gravimetric).
- e) Physical test for outer sheath:
 - i) Tensile strength and elongation at break.
 - ii) Ageing in air oven.
 - iii) Shrinkage test.

- iv) Hot deformation,
- f) Partial discharge test.
- g) Bending test.
- h) Dielectric power factor test:
 - i) As a function of voltage.
 - ii) As a function of temperature.
- i) Insulation resistance (volume resistivity test).
- j) Heating cycle test.
- k) Impulse withstand test.
- l) High voltage test.
- m) Flammability test.

7.2 However, the purchaser reserves the right to demand repetition of same or all the type tests in presence of purchaser's representative.

7.3 The bidder must also clearly indicate various testing facilities available at their works for testing the material as per relevant standards. In case of otherwise particulars of the place where such testing is proposed to be conducted during the course of inspection shall be indicated with the offer.

8. INSPECTION (TEST BEFORE DISPATCH):

8.1 The inspection may be carried out by the purchaser at any stage of manufacturer. The Inspection & Testing shall be governed by Clause No. 1.27 of Section-II (General Conditions Of Contract). Acceptance of any equipment / material under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment/material is found to be defective. The following Acceptance tests as per Clause No.18.2 of IS:7098(Part-II)/1985 shall be conducted in presence of the purchaser's authorized representative / agency on each lot of offered cables:

- i) Tensile Test.
- ii) Wrapping Test.
- iii) Conductor Resistance Test.
- iv) Test for thickness of insulation & sheath.
- v) Hot Set Test for insulation.
- vi) Tensile strength & elongation at break test for insulation and sheath.
- vii) Partial Discharge Test (for screened cables only).
- viii) High voltage test and
- ix) Insulation resistance (Volume resistivity) Test.
- x) Test for Armour:
 - a) Verification of Dimension of Strip.
 - b) Tensile Strength & elongation at break.
 - c) Uniformity of Zinc Coating.
 - d) Weight of Zinc Coating.
 - e) Winding Test on Armour.
 - f) Resistivity Test on Armour.

Cold impact test for outer sheath (IS:5831/1984) shall constitute the optional test and shall be conducted on first lot of the offered cables of each size as per Clause No.18.4 of IS:7098(Part-II)/1985.

8.2 ROUTINE TEST:-

The following shall constitute routine tests:

- a) Conductor resistance test
- b) Partial discharge test
- c) High voltage test.

8.3 The bidder shall furnish Packing list mentioning serial Nos. of Drums, length in each drum, gross weight of drum without lagging alongwith inspection offer duly signed by the authorized representative of the firm. The purchaser reserves the rights to insist for witnessing the acceptance / routine tests of the bought out items.

8.4 At least 5% of total numbers of drums subject to minimum of two (2) in the lot put up for inspection shall be selected at random to ascertain the length of cable by the following method.

“At the works of manufacturer of the cable shall be transferred from one drum to another for checking any manufacturing defects in the cable, at the same time measuring its length with the help of the graduated pulley and cyclometer. The difference in average length thus obtained from the declared length by the supplier in the packing list shall be applied to all the drums if the cable is found short during checking the sample lot (s).”

8.5 The supplier shall present the latest Calibration Certificate(s) of testing instruments / equipments to be used for the testing of the material covered in the Purchase Order to the authorized inspecting officer / inspecting agency of the purchaser. The testing instruments / meters / apparatus etc. should be got calibrated by the supplier from time to time from Govt. Laboratory or any independent test laboratory / house having valid accreditation from National Accreditation Board for Testing and Calibrating Laboratories for the testing equipments / original manufacturer having trace ability to NABL / NPL or equivalent.

8.6 The calibration certificate(s) should not in any case be older than one year at the time of presenting the same to the inspecting officer/ inspecting agency of the purchaser. The testing instruments/ equipments should be duly sealed by the Calibrating Agency and mention thereof shall be indicated in the calibration certificate(s).

8.8 TEST CHECKING OF MATERIAL AT STORES:

- i) Sample drums from the material received at stores shall be selected for testing at CTL as per sampling plan given hereunder in presence of firm's representative. The selected sample drum / drums shall be transported to CTL by concern S.S / ACOS of Nigam.
- ii) The selected sample drum for CTL testing shall be identified by the seals provided by Inspecting Officer / Inspecting Agency during pre-dispatch inspection at firms works and these sealing details shall be invariably mentioned in the selection Memo by the nominated officers of Nigam.

iii) The tests in the Nigam Testing laboratory (CTL) shall be conducted in the presence of representative of supplier for which a 7 days notice shall be issued through Fax / Speed Post stating Date & Time to the firm, so that supplier can depute their representative to witness the test. In case the supplier or his representative does not turn up the testing shall be proceeded & completed. The payment shall be released only after receipt of successful test reports for the samples selected at purchaser's stores for mandatory test checking on the samples to be selected from material received at Nigam's stores by officers to be nominated by Circle SE's for testing at CTL.

iv) SAMPLING:

One number Drum out of each lot / sub-lot of 25 Nos. Drums or part thereof for the material received in Stores of Nigam.

v) TESTS: The following tests shall be carried out as per relevant clause of latest IS on each selected drum by drawing sample of 10 Mtr. at CTL from random distance during re-winding:

- a) Rewinding test (Measurement of Length) & Checking of Manufacturing defects.
- b) Measurement of Resistance of conductor.
- c) Tensile strength & Elongation at Break Test for Insulation & Sheath
- d) Test for Thickness of Insulation & Sheath
- e) Hot Set Test
- f) Test for Armour:
 - i) Verification of Dimension of Wire / Strip.
 - ii) Tensile Strength & elongation at break.
 - iii) Uniformity of Zinc Coating.
 - iv) Weight of Zinc Coating.
 - v) Winding Test on Armour.
 - vi) Resistivity Test on Armour.
- g) Verification of Marking

In addition to above tests remaining acceptance tests as per relevant IS shall also be conducted at CTL provided the testing facility is available at CTL for these tests time to time. Only those tests shall be conducted for which testing facilities are available in NIGAM's Lab.

vi) CRITERIA FOR ACCEPTANCE:

a) If the measured of conductor resistance of the sample(s) exceeds beyond 2% as per the resistance specified in the contract, the material shall be rejected and the same shall have to be replaced by the supplier.

b) If the measured conductor resistance of the sample(s) exceeds the value specified in the contract but does not exceed by more than 2% of the resistance value specified in the contract, the material contained in the lot / sub-lot to which the sample belongs shall be accepted with a deduction @ 1.5% of the cost of cable for increase in resistance for every 1% or part thereof.

c) If the sample(s) fails in any other test, the material shall be rejected and shall have to be replaced by the supplier.

d) If the contractor / supplier fails to lift the material declared rejected or any part thereof from the consignee within a period of 15 days from the date of dispatch of information from the purchaser, the purchaser shall be entitled to effect recovery along with other actions as per Clause No. 1.62 of Section-II (General Condition of Contract).

e) The results of measurement of length test shall be made applicable to all drums contained in each lot / sub lot by making deduction of less length of cable in a Sample Drum.

8.9 TEST CHARGES :

All test charges incurred towards test checking of the material received in our stores shall be borne by the NIGAM.

9 IDENTIFICATION:

10.1 The manufacturer shall be identified throughout the length of cable as per Clause No.20.1 of IS:7098(Part-II)/ 1985.

10.2 The cable code employed shall be as per Clause No.20.3 of IS:7098 (Part-II) /1985.

10.3 EMBOSSING:

The cable shall also be required to be embossed with the word `Name of manufacturer or Trade name, ELECTRIC/ Voltage Grade/ NAME OF DISCOM/ TN-cable code, size of cable & year of manufacture at every meter length for which no extra charges shall be paid. The cable should be ISI marked & same should be embossed on the outer sheet of every meter length of HT Cable.

11. MARKING:

The progressive length of cable in meter shall be marked on the outer sheath of every meter length of HT Cable.

12. PACKING AND MARKING:

12.1 The cable shall be wound on a non returnable wooden drum conforming to IS: 10418/1982 of suitable size. The ends of cables shall be sealed by means of non-hygroscopic material. Only one cable length shall be supplied on a drum. The cable can also be supplied on M-Steel Drums as per relevant ISS as applicable.

12.2 The cable drums shall carry the following information either stenciled or painted.

- i) Manufacturer's name, Brand or trade mark.
- ii) Type of cable and voltage grade.
- iii) Number of cores.
- iv) Nominal cross-sectional area of the Conductor.
- v) Cable Code.
- vi) Length of cable on the drum.
- vii) Direction of rotation of drum (by means of an arrow).
- viii) Gross mass.
- ix) Year of manufacture.

- x) ISI Certification mark.
- xi) Purchase order/bid No. and
- xii) Name of Consignee.

13. STANDARD LENGTH:

The cable shall be supplied in standard length of 250 Mtrs. in one Drum for size 3CX185 Sq.mm. & 500 Mtrs. in one Drum for size 3CX70 Sq.mm.

13.1 A tolerance of (+/-) 5% shall be allowed on standard length.

14. DRAWINGS & DOCUMENTATIONS:

The bidder is required to furnish the detailed constructional drawing of cable clearly showing shape of core, type, size of fillers/ interstices along with Center Filler etc. The calculations of weights of different components of the cable along with weight of armouring and calculation of number of armour strips indicating Lay Ratio & Lay Factor shall also be furnished. In absence of this, the bids are likely to be ignored. The drawing of drums shall also be furnished as per relevant applicable ISS.

TECHNICAL SPECIFICATION FOR ACSR WEASEL AGAINST

1. SCOPE

1.1 This section provides for manufacture of Aluminum Conductor, Galvanized Steel reinforced (ACSR) and for satisfactory operation in various lines and sub-stations. The conductor should conform to latest IS.

1.2 Aluminum Conductor with galvanized Steel re-enforcement shall be conforming to IS: 398(Pt.2)/1996 with latest amendments if any, supplied on non returnable strong wooden drums generally conforming to IS: 1778/1981 (Latest).

The firms (manufacturers) must possess valid ISI License for the offered Conductor.

2. CLIMATIC CONDITIONS:

| S. No. | Particulars | Value |
|--------|-----------------------------------|----------|
| 1. | Peak ambient temperature in shade | 50 deg C |

| | | |
|-----|---|---------------|
| 2. | Maximum average ambient temperature in a 24 hours period in shade | 40 deg C |
| 3. | Min. ambient air temperature in shade | (-) 5 deg.C |
| 4. | Maximum temperature attainable by an object exposed to sun. | 60 deg.C |
| 5. | Maximum relative humidity | 100% |
| 6. | Average number of thunderstorms days per annum | 40 |
| 7. | Average number of rainy days per annum | 100 |
| 8. | Average annual rainfall | 10 to 100 cm |
| 9. | Number of months of tropical Monsoon conditions | 4 months |
| 10. | Maximum wind pressure | 100 Kg/sq mtr |
| 11. | Altitude not exceeding | 1000 M |

3 “PRINCIPAL PARAMETERS”.

The ACSR conductor shall comply in all respect with IS: 398(Part.2)/1996 with latest amendment, if any from the date of its applicability.

3.1 MATERIAL

The material offered shall be of the best quality and workmanship. The conductor shall be constructed from hard drawn aluminum and galvanized steel wires which have the mechanical and electrical properties specified in Tables 1 & 2 of IS:398(Part.2)/1996 with latest amendment, if any, The Zinc coating on the galvanized steel wires may be applied in accordance with IS:4826/1979 with latest amendment if any. The EC Grade Aluminum rods for use in the manufacture of Aluminum Wires shall conform to IS:5484/1978 amended up to date. The zinc used for galvanizing shall be Electro type High Grade Zinc not less than 99.95 percent purity. It shall conform to and satisfy all the requirements of IS:209/1992 amended up to date. Galvanized Steel Wire should comply mechanical properties as per Table 2 of IS:398 (Part.2)/1996 amended up to date. The chemical composition is as per Annexure-C of IS:398 (Part.2)/1996 amended up to date.

3.2 PRINCIPAL PARAMETERS:

The details of ACSR Conductor are tabulated below:-

| PARTICULAR | ACSR Weasel |
|--|---------------------------|
| a) Stranding and wire diameter (mm) | 6/2.59 Al. 1/ 2.59 St. |
| b) Number of strands Central Steel wire Aluminum | 1 6 |
| c) Sectional area of Aluminum (Sq. mm) | 31.61 |
| d) Total Sectional area (Sq. mm) | 36.88 |
| e) Overall diameter (mm) (Approx.) | 7.77 |

| | |
|---|-------------------------|
| f) Weight (Kg/Km) (Approx.) | 128.00 |
| g) Calculated max. DC resistance at 20 Deg. C (Ohm./ Km.) | 0.9289 |
| h) Approx. calculated breaking load (KN) | 11.12 |
| i) Modulus of elasticity (GN/Sq. meter) | 79 |
| j) Coefficient of liner Expansion per deg C. | 19.1 x 10 ⁻⁶ |

3.3 The details of aluminum strands are as follows:

| PARTICULAR | ACSR Weasel |
|--|----------------------|
| a) Min. Breaking load of strand before stranding (KN) | 0.89 |
| b) Min. Breaking load of strand after stranding (KN) | 0.85 |
| c) Max. D.C. Resistance of strand at 20 Deg. C (ohm/Km.) | 5.490 |
| d) Diameter mm Nominal Minimum Maximum | 2.59 2.56 2.62 |
| e) e) Mass (Kg/Km.) | 14.24 |

3.5 The details of steel strands are as follows:

| PARTICULAR | ACSR Weasel |
|--|---|
| i) Min. Breaking load of strand before stranding (KN) | 6.92 |
| ii) Min. Breaking load of strand after stranding (KN) | 6.57 |
| iii) Diameter mm a) Nominal b) Max./Min | 2.59 2.64/2.54 |
| iv) Zinc coating testing | 2 dips of 1 min. each & 1 dip. of ½ min |
| v) Min. weight of zinc coating GM/ Sq. Mtr | 218.50 |
| vi) Mass of strand at normal diameter of strand(Kg./Km.) | 41.09 |

3.5 Tolerance on normal sizes:

The tolerance in diameter of aluminum wires and steel wire used in the manufacture of ACSR shall be allowed as per IS: 398/ (Part-2) /1996 amended up to date.

3.6 Stranding :

3.6.1 The wires used in the construction of a galvanized steel reinforced aluminum conductor shall before stranding, satisfy all the relevant requirements of this specification and relevant IS.

3.6.2 The lay ratio of the different layers shall be within the limits given:

NOTE: For the purpose of calculation, the mean lay ratio shall be taken as the arithmetic mean of the relevant minimum and maximum value given in this table.

5. TESTS :

TESTS BEFORE DESPATCH: The ACSR Conductor shall be subjected at manufacturer's works before dispatch, to the tests mentioned here-under as per IS: 398 (Part-2)/1996 with latest amended.

5.1 ROUTINE TESTS:

The following tests shall be conducted before and after stranding on each drum of the conductor by the manufacturer at his works as per relevant standard IS: 398 (Part-2)/ 1996 (latest amended)

- a) Visual & dimensional check on drum as per specification.
- b) Visual check for joints, scratches etc. and length of conductor by re-winding of conductor on empty drum as per Specification/ IS.
- c) Measurement of dia-meter of individual Aluminum and steel wires. (Clause-13.2)
- d) Measurement of Lay Ratio. (Clause-13.8)
- e) Breaking load of individual wires (Clause-13.3.1)
- f) Ductility Test (Clause-13.4)
- g) Wrapping Test(Claue-13.5)
- h) Resistance Test (Clause-13.6)
- i) Galvanizing Test (Clause-13.7)
- j) Any other test as per relevant IS

5.2 ACCEPTANCE TESTS:-

The following tests shall be conducted on samples taken at random from a lot as per relevant standard IS: 398 (Part-2)/1996 (Latest amended) in presence of purchaser's representative:-

- a) Visual & dimensional check on drum as per specification.
- b) Visual check for joints, scratches etc. and length of conductor by re-winding of conductor on empty drum as per Specification / IS.
- c) Measurement of dia-meter of individual Aluminum and steel wires. (Clause-13.2)
- d) Measurement of Lay Ratio. (Clause-13.8)
- e) Breaking load of individual wires (Clause-13.3.1)
- f) Ductility Test (Clause-13.4)
- g) Wrapping Test(Claue-13.5)

- h) Resistance Test (Clause-13.6)
- i) Galvanizing Test (Clause-13.7)

7.0 TYPE TESTS

The type test in respect of ACSR Weasel Conductor is already covered under Acceptance Tests, thus requirement of furnishing type test for ACSR Weasel Conductor is not essential along with Bid.

8.0 SAMPLING PLAN

8.1 Samples for Acceptance Tests: Samples shall be taken as per relevant IS i.e. IS-398 (Part-2)/1996 or IS-398 (Part-4)/1994 with latest version as the case may be.

8.2 Apart from the sample selected for carrying out Acceptance Tests at the works of the firm during inspection, one more sample from each length be also selected out of one drum under re-winding for carrying out various Acceptance Tests as per relevant IS. If any of the sample so selected from each length failed in any acceptance test the entire lot under inspection is not acceptable.

8.3 TOLERANCE ON TEST RESULTS:

Tolerance on test results shall be allowed as per relevant IS/Spec. whichever is more stringent.

9.0 INSPECTION

9.1(a) The conductor shall be manufactured in accordance with latest edition of IS: 398 (Part.2) / 1996 with all subsequent amendments issued from time to time for ACSR Conductor. All the tests as laid down in the above mentioned specification on individual aluminum wire and steel wire or Aluminum Alloy Wire as the case may be shall be carried out. The testing shall also include the tests on manufactured finished conductor. Moreover the supplier shall also furnish test certificate(s) of raw materials to the inspecting officer at the time of inspection. General Condition of Contract.

(b) The supplier / manufacturer must offer conductor for inspection through a letter of offer mentioning size and quantity of the conductor along with Packing List duly signed indicating drum Serial No. individual lengths total length, net weight & gross weight in DUPLICATE. This letter of offer shall be addressed to this office. The packing list shall also be furnished to the Inspecting Officer prior to carrying out the inspection at the works.

(c) The Manufacturer shall provide all adequate facilities at his works for inspection of at least one number conductor drum or 5% conductor

drums offered for inspection whichever is higher selected at random by the authorized representative of the purchaser for checking / verification of conductor length/ manufacturing defects by transferring the conductor from one drum to the another empty drum and at the same time measuring the length and lay ratio of each conductor length so transferred by means of the standard calibrated and sealed meter.

(d) If the firm is not having the necessary facilities for carrying out the required tests as per relevant IS / Purchase Order, the supplier will arrange such testing facilities in some other Government laboratory and shall bear the cost so incurred. But in such cases firm shall inform to the purchaser in advance before commencement of supplies.

(e) The supplier shall provide adequate facilities for weighment of all the drums offered for inspection.

9.2 In case of testing after re-offering as per Clause No.15 of IS:398 (Part.2)/1996 as the case may be, the lot under reference will be subject to 100% checking, if required by the purchaser.

9.3 The supplier shall present the latest Calibration Certificate(s) of testing instruments / equipments to be used for the testing of the material covered in the Purchase Order to the authorized inspecting officer / inspecting agency of the purchaser. The testing instruments / meters/ apparatus etc. should be got calibrated by the supplier from time to time from Govt. Lab or Independent test laboratory / house having valid accreditation from National Accreditation Board for Testing and Calibrating Laboratories for the testing equipments or original

manufacturer having traceability to NABL / NPL or equivalent accredited lab.

The calibration certificate(s) should not in any case be older than one year at the time of presenting the same to the inspecting officer / inspecting agency of the purchaser. The testing instruments / equipments should be duly sealed by the Calibrating Agency and mention thereof shall be indicated in the calibration certificate(s).

9.4 The manufacturer will provide certificates as per the Clause No.7 of IS: 398((Part.2) /1996 "Freedom from defects" and clause No.9 "Joint in Wires" of IS:398 (Part 2) /1996 for ACSR Conductors

10.0 STANDARD LENGTH & VARIATION IN LENGTHS:

10.1 The ACSR Conductor shall be supplied in the standard length. The standard length of ACSR Conductor shall not less than the value specified below with a tolerance of (-) 5%. More than the standard length shall be acceptable.

a) ACSR Weasel - 1500 Mtrs.

10.2 Short length(s), if any shall not measure less than 80% of standard length as specified above in any case. The total quantity of such short length(s) shall not exceed 5% of the quantity of the lot offered for inspection.

10.3 The maximum permissible length per drum shall be as under subject to condition that the manufacturer while packing the conductor in drum shall ensure that after winding complete quantity of conductor in drum a uniform space of not less than 100 mm. remains between outer layer of conductor and inner surface of the external protective lagging of the drum. This is

essential to ensure that the conductor does not get closer to the lagging and to avoid damaged during transportation/ reeling / unreeling or rolling on the undulated ground / fields:

ACSR WEASEL--- 7.5 Kms.

11.0 PACKING FORWARDING AND MARKING:

11.1 The packing shall have to be done as per standard practice worthy of road transport. The conductor shall be wound in strong wooden drums so as to withstand all stresses due to transportation, handling and stringing operation so that there is no damage caused to the conductor during the process of these operations. The wooden drums shall be non-returnable and shall generally conform IS:1778/1981 with latest amendments, however, the main parameters of the drum shall be as under:

| S.NO. | PARTICULARS | DIMENSION FOR ACSR WEASEL CONDUCTOR |
|-------|------------------|-------------------------------------|
| 1. | Flange Dia | 1250 mm (+/- 5%) |
| 2. | Flange Thickness | 2x25 mm (+/- 5%) |
| 3. | Barrel Dia | 500 mm (+/- 10 mm) |
| 4. | Traverse | 510 mm (+/- 10 mm) |
| 5. | Number of Bolts | 4 Nos. |
| 6. | Dia of Bolts | 12 mm |
| 7. | Bore Dia | 80 mm |

However, use of seasoned wood shall not be insisted, provided wood used should be of good quality to withstand transportation hazards. The drums shall be having inside flanges painted with Aluminum Paint and with Ordinary White Enamel paint from outside. The conductor on each drum shall be securely fastened at each end. The outer end of the conductor shall be fastened inside the drum against one of the sides of the flanges while it is under tension and shall be such that no looseness is transmitted to the internal layers. The conductor shall be snugly, tightly and uniformly spooled on the drums. The wrapping of conductor on the drums shall be laid snugly against side of the preceding wrap and the first and last wrap in each layer shall fit snugly against the sides of the flanges. Drums shall be lagged with sufficient strong wooden laggings to support the full drum without crushing. The wooden drums after providing lagging shall be fastened by two steel wires of min. 3 mm. Dia over the lagging on the two sides of adequate size to keep the lagging intact and to prevent the drum from crushing/ damage.

Although the various dimension of the drums such as flanges, stretches, traverse and barrel diameter shall depend on the quantity of conductor as offered and agreed upon, on one drum. The manufacturer while packing the conductor in drum shall ensure that after winding complete quantity of conductor in drum a uniform space of not less than 100 mm. remains between outer layer of conductor and inner surface of the external protective lagging of the drum. This is essential to ensure that the conductor does not get closer to the legging and to avoid damaged during transportation/ reeling / unreeling or rolling on the undulated ground / fields.

11.2 Water proof material shall be wrapped round the barrel and inner surface of flange before winding the conductor and also wrapped round over the conductor completely wound and under the laggings.

11.3 The drums shall be marked clearly in block letters with water proof mark having the marking attached to them so that there is no possibility of goods being lost or wrongly dispatched due to faulty marking. The marking shall constitute the following:-

- a) Name & full address of the consignee.
- b) Destination station.
- c) Serial number of drum.
- d) Size of Conductor with its code name.
- e) Total length of Conductor in drum, with individual length (s).
- f) Number of length(s) in each drum.
- g) Gross mass of drum including the tare mass of drum.
- h) Tare mass of the empty drum with lagging.
- i) Net mass of conductor.
- j) BIS standard mark.
- k) Name of the supplier.
- l) Purchase order reference/TN number.
- j) Date of expiry of warranty / guarantee period.

Besides above, an arrow shall be put on the drum so as to indicate the direction in which the drum can be unwound. The manufacturer shall also provide his own lead seal with distinguishing mark at the outer end of the conductor on each drum before dispatch of the material.

12.0 TEST CHECKING OF MATERIAL AT STORES:

- i) Sample drums from the material received at stores shall be selected for testing at CTL as per sampling plan given hereunder in presence of firm's representative.
- ii) The selected sample drum for CTL testing shall be identified by the seals provided by Inspecting Officer / Inspecting Agency during pre-dispatch inspection at firm's works and these sealing details shall be invariably mentioned in the selection Memo by the nominated officers of Nigam.
- iii) The tests in the Nigam Testing laboratory (CTL) shall be conducted in the presence of representative of supplier for which a 7 days notice shall be issued through Fax / Speed Post stating Date & Time to the firm, so that supplier can depute their representative to witness the test . In case the supplier or his representative does not turn up the testing shall be proceeded & completed. The payment shall be released only after receipt of successful CTL test reports for the samples selected at purchaser's stores for mandatory test checking the samples to be selected from material received at Nigam's stores by officers to be nominated by Circle SE's for testing at CTL.

12.1 SAMPLING

Selection of samples from the material received at stores shall be done as soon as material received in stores in the presence of representative of supplier.

One number Drum out of each lot / sub-lot of 20 Nos. Drums or part thereof for the material received in Stores of Nigam. The selected sample drum / drums shall be transported to CTL by concerned ACOS / SS.

In case of selection of sample for type test the length of the sample shall be of 15 Mtrs. The selected and sealed sample for type test shall be identified by providing polycarbonate seals on both ends of conductor and after forming the coil of conductor two stickers seals provided around the coil.

12.2 TESTS

12.2.1. The following tests shall be carried out as per relevant Clause of latest IS-398 (Part2)/1996 on each selected drum by drawing sample of 5 Mtrs. at CTL from random distance from any length of the selected drum of ACSR Conductor during rewinding:

- a) Rewinding test (Measurement of Length and weight) & Checking of Manufacturing defects.
- b) Measurement of lay ratio during rewinding of Conductor Drum.
- c) Dia. of Aluminum Strands and Steel Wires.
- d) Breaking load test.
- e) Resistance Test.
- f) Galvanization of steel wire (Uniformity) and Mass of Zinc Coating.
- g) Verification of Water Proof marking on Drum as per Specification.

NOTE: (a) In addition to above tests remaining acceptance tests as per relevant IS shall also be conducted at CTL provided the testing facility is available at CTL for these tests time to time. Only those tests shall be conducted for which testing facilities are available in NIGAM's Lab.

(a) The Officer In charge of central Testing Lab (CTL) of Nigam shall send copies of test reports to the Purchasing Officer / Sr. AO (CPC), consignee and the supplier.

(b) The payment of every lot shall be released after receipt of successful test report from Nigam's Lab (CTL) on the samples selected from the material received in Nigam stores.

20.3 CRITERIA FOR ACCEPTANCE:

(a) Rewinding Test (Measurement of Length and weight): The results of measurement of length test shall be made applicable to all drums contained in each lot/sub-lot by making deduction of less length of conductor in a sample drum. In case short length is observed more than one percent of the length contained in lot / sub-lot , then the lot / sub-lot shall liable to be rejected.

The net calculated weight of various type of conductor corresponding to minimum prescribed diameter in IS of Aluminum Strand, Steel Strand ACSR Conductor shall be as under:

a) ACSR WEASEL 124.32 Kg./Km.

If weight of conductor corresponding to minimum prescribed diameter as per IS found less up to 2% in respect to measured length the lot shall be acceptable otherwise the entire lot for which sample drum represents shall be rejected and to be replaced by the supplier.

(b) If the sample(s) fail in any test other than length measurement, the entire material in the Lot shall be rejected and shall have to be replaced by the supplier.

(c) If the contractor / supplier fails to lift the material declared rejected or any part thereof from the consignee within a period of 15 days from the date of dispatch instruction from the purchaser, the purchaser shall be entitled to effect recovery along with other actions as per Clause No. 1.62 of Section-II (General Condition of Contract).

21.0 TEST CHARGES:

All test charges incurred towards test checking of the material received in our stores shall be borne by the NIGAM.

22.0 DETAILS OF PAST EXPERIENCE:

The details of past orders executed by the bidder may be indicated in the relevant Schedule-VII & VII A . The bidder must furnish the documentary evidence like copy of purchase order placed for detailing of past supplies.

23.0 CHALLENGE TESTING CLAUSE:

The other manufacturer can also request challenge testing for any test based on specification. The challenger would request for testing with testing fee. The challenge test fees are proposed at least three times cost of testing. This is likely to deter un-necessary challenges. The challenger would have the opportunity to select the sample from the store and any such challenge should be made within the guarantee period. The party challenged, the challenger & the utility could witness the challenge testing. The challenged testing would cover all the type tests as per relevant IS.

The challenge test could be conducted at NABL Accredited Laboratory like ERDA, CPRI, Bangalore / Muradnagar / Bhopal. If the values are within limit the product gets confirmed else not confirmed. If the product is not confirmed the manufacturer would pay the challenge fee and challenger would get the fee refunded. However, as a redressal system the challenger would be asked for fresh selection of two more samples from the stores and the same be tested in a NABL Laboratory (which shall be other than previously selected NABL Accredited Lab) at the cost of supplier in presence of party challenged, challenger and the utility. If any one or both samples does not confirmed the tests then the product is said to have failed the tests. In such cases, the manufacturer will be declared as unsuccessful manufacturer for the said product and balance supply shall not be availed and the order shall be cancelled with levy of maximum penalty.

. TECHNICAL SPECIFICATION FOR PURCHASE OF 3.15 & 5.0 MVA 33/11 KV POWER TRANSFORMERS

3.01 SCOPE :

This specification covers the design, manufacture, stage inspection and testing at the manufacturer's works before dispatch, supply and delivery at the destination in area of Ajmer Discom, of 33/11KV Power Transformer having ratings of 3.15 & 5.0 MVA

3.02 CLIMATIC CONDITIONS :

| | |
|---|-------------------------------------|
| Max. ambient air temperature. | 50 degree C. |
| Max. daily average ambient temp. | 45 degree C. |
| Max. yearly weighted ambient temp. | 35 degree C. |
| Min. ambient air temp. | (-) 5 degree C. |
| Max. humidity. | 100% |
| Average number of thunder storm days per annum. | 40 |
| Average annual rain fall. | 15 cm to 100 cm. |
| No. of months during which tropical monsoon conditions prevail. | 4 months (June to Sept.) |
| Maximum wind pressure | 195 Kg./Sq.M |
| Altitude above MSL | Varies from 61 meters to 815 meters |
| Average number of rainy days per annum. | 120 days. |

3.03 GENERAL REQUIREMENTS :

The intention of the specification is to provide information for the design of the above mentioned 33/11 KV power transformers to be fully suitable in every respect for the functions designated. It is required that the supplier in accepting the contract agrees to furnish all apparatus, appliance and material whether specifically mentioned or not, but which may be found necessary to complete, perfect, or test any of the herein specified units in compliance with the requirements implied in this specification without extra charges.

3.03.1 All terminal screws, studs, nuts and bolts shall be in accordance with the Indian Standards.

3.03.2 All electrical and mechanical equipments shall be designed and manufactured so that no damage will result from transportation, installation and operation of the equipment under the climatic conditions to which it will be subjected.

3.03.3 All materials used shall conform to this specification and appropriate standards and shall be new in all respects.

3.03.4 Consideration may be given to alternatives which the supplier considers advisable by reason of his own manufacturing requirements and experiences, provided descriptive matter is submitted and the recommended device or arrangement equal to, or superior to that required by the accompanying specification and if the purchaser is convinced of the quality and/or superiority of the equipment.

3.04 STANDARDS :

The power transformers, their accessories and fittings, transformer oil, etc. shall conform to the latest edition of the following standards (as amended upto date) except where specified otherwise in this specification:

| | |
|---|--|
| IS:5/1961: | Colour for ready mixed paints |
| IS 2026 (Part 1): 2011 | GENERAL (Second Revision); |
| IS 2026(Part2):2010 | Temperature Rise (First Revision); |
| IS 2026 (Part 3): 2009 | Insulation Levels, Dielectric Tests and External clearance in Air (Third Revision); |
| IS :2026 (Part IV)-1977 | Reaffirmed 2011 – Terminal Markings, Tapping and Connections; |
| IS 2026 (Part 5):2011 | – Ability to withstand short circuit. |
| IS:6600/1978: | Guide for loading of oil immersed Transformers |
| IS:335/2018: | New insulation oils for Transformers |
| IS:3347(PART-III/Sec-1 & 2): | Dimensions of Porcelain parts & Metal parts for Transformer bushing (17.5 KV). |
| IS:3637: | Gas & Oil operated Relay. |
| IS:3639/1966: | Fittings & accessories for Transformers |
| IS:1866/1978: | Code of practice for maintenance & supervision of insulating oil in service. |
| IS:9335: | Specifications for insulating craft paper. |
| IS:1576: | Specifications for solid insulating press Boards for electrical purposes. |
| IS:104: | Ready mixed paint, brushing zinc chromate, painting |
| IS:649: | Testing of steel sheets and strips for magnetic circuits. |
| IS:2362: | Determination of water content in oil for porcelain bushing transformers. |
| IS:4257: | Dimensions for clamping arrangements for bushings. |
| IS:6160: | Rectangular conductor for electrical machines. |
| IS:10028: | Selection, Installation and maintenance of transformers |
| IS:3401 : | Silica gel |
| IS:5561: | Terminal Connector |
| IS:2070: | Method of impulse voltage testing |

3.04.1 Equipment meeting the requirements of any other authoritative standards which ensures a quality equal to or better than that as per the standards mentioned above, shall also be acceptable. Where the equipment conforms to any other standards, salient points of difference between the standards adopted and the specified standards shall be clearly brought out in the tender.

TYPE AND RATING :

3.08.1 The transformers shall be of 3 phase, copper wound, core type construction, oil immersed and shall be suitable for outdoor service as step down transformers (At times however these may be required to work under reversal of power also).

3.08.3 These transformers may be required to run in parallel with existing transformers of the similar capacity. The technical particulars of transformers required are as under:

- i) Maximum continuous rating at reference : 3.15 MVA
ambient temperature specified under clause 3.02
- ii) Frequency : 50 Hz
- iii) No. of phases : 3 phase
- iv) Rated primary Voltage on principal tapping : 33 KV
- v) Rated secondary Voltage : 11 KV
- vi) Winding connections:
 - a) HV side : Delta
 - b) LV side : Star
 - c) Vector group reference : Dyn11
- vii) Type of cooling : ONAN
- viii) Percentage impedance at normal voltage & 75 deg.C average winding temp.(on 20 MVA base) between HV-LV at.-

| Tap No. | 3.15 MVA | Tolerance |
|---------------------------|----------|-----------|
| a) Normal tapping(Tap-3) | 7.00 % | ± 10% |
| b) At max. tapping (+5%) | 6.65% | ± 15% |
| c) At min. tapping (-10%) | 7.70% | ± 15% |

- ix) Off circuit tap changer : Having 6 equal steps (7 position)
of 2.5% of each, to have voltage
variation of +5% to -10% on HV
side.
- x) Neutral unbalance current : Not exceeding 2.0%
- xi) Type of terminal : Vertical take off type
suitable for ACSR
"Panther" conductor on
both sides.
- xii) Max.current density in all parts:
of HV and LV windings including 3Amp./Sq.mm
tapped winding. for minimum tap in HV & LV.
- iii) Bushing metal part for HV & LV : M -20 size (copper/
bushing. brass)

3.09 EFFICIENCY :

The percentage loading for the max. efficiency shall be clearly stated in the tender at unity power factor as well as 0.8 p.f. lagging.

3.10 INSULATION :

3.10.1 The dielectric strength of the winding, given insulation and the bushings shall conform to the values given in IS:2026(Part.3)/2009 (or its latest amendment) for highest system voltage of 36KV,12KV and shall be suitable for the following impulse test \ power frequency test voltages.

SYSTEM VOL. H.SYSTEM VOL. IMPULSE TEST VOL. PF TEST VOL.

| | | | |
|-------|-------|---------|-------|
| 33 KV | 36 KV | 170 KVp | 70 KV |
| 11 KV | 12 KV | 75 KVp | 28 KV |

H.V. & L.V. Winding of Transformer shall have uniform insulation.

3.11 TEMPERATURE RISE :

Each transformer shall be capable of operating continuously at their normal rating without exceeding temperature rise limits as specified below :

| Type of cooling. | Temp.rise | External cooling medium (Air) |
|--|-----------|---|
| 1. Winding(measured by method) | ONAN | 50 degree C. When the oil circulation is natural non directed |
| 2. Oil (measured by thermometer method) | As above. | 45 degree C. - |

The reference temperature conditions for which the transformers shall be designed are as under (as per clause 3.02).

- a) Maximum ambient temperature. : 50 degree C.
- b) Maximum daily average ambient temp. : 45 degree C.
- c) Maximum yearly weighted ambient temperature : 35 degree C.

The hottest spot temperature shall not exceed 98 degree C when calculated over an annual weighted average ambient temperature of 35 degree C when transformer is loaded to

its rated capacity. The transformer shall be capable of being over loaded to 150% of its rating in accordance of IS 6600-1972.

i) Bushing and its terminal connectors shall have minimum continuous current rating corresponding to 120% rated current of transformer at lowest tap.

3.12 PARALLEL OPERATION :

The transformers covered by this specification are to run in parallel with transformers which are either already installed or are being installed (for same rating) and as such the characteristics of the transformers covered in this specification for the sub station will be identical so as to enable these transformers to run in parallel.

3.13. IMPEDANCES :

Suppliers shall indicate the guaranteed impedances and tolerances taking into account the limits at minimum and maximum tap position so as to fulfill requirements of clause 3.12.

3.14. GUARANTEED LOSSES:

3.14.1. The Losses shall not exceed the values given below:

| Rating | No load losses in KW | Load losses at 75 deg.C.in KW (At normal tap condition) |
|-----------------|---------------------------------|--|
| 3.15 MVA | 3 KW | 16 KW |
| 5.0 MVA | 4 KW | 23 KW |

The above mentioned losses are maximum permissible and there shall not be any plus tolerance above this limit. Design calculations of No-load and load losses along with complete Technical details and factors assumed will be enclosed Along with the GTP in tender documents.

3.14.2 In case during testing, the actual loss (es) are found within guaranteed figure, the transformers shall be accepted without any advantage to contractor for lower losses.

3.14.3 Measurements of losses shall form part of type test/ routine test.

3.14.4 The losses on transformer supplied shall also be guaranteed at the time of pre-commissioning test and transformers having losses exceeding figures mentioned in clause 3.14.1 above shall stand rejected.

3.14.5 The supplier shall supply two copies of the Routine test certificate to consignee with each transformer on receipt of despatch instructions.

3.14.6 The supplier shall provide along with the tender the design details of core assembly showing the construction details, core diameter, net/ gross sectional area of the core assembly etc. The information must also be given in respect of volts per turn at principal tap for normal voltage. The loss curves for type/grade of steel laminations being used for the core shall also be provided along with the tender.

3.15 COOLING :

3.15.1 Each transformer shall be provided with ONAN type cooling as specified under the schedule of requirements.

3.15.2 The ONAN cooling of the transformers shall be by natural circulation of air while the circulation of oil shall be effected by natural convection, the maximum oil flow being assured by a method whereby the return flow of cooled oil is made to enter the tank at a level coinciding with the bottom of the hot columns of oil thus avoiding centre heads of cold oil at the bottom of the tank. Out flow shall be arranged to coincide as nearly as possible with the hot oil level at the top of the tank so that the total available difference will be fully employed in circulating the oil round the shortest possible paths.

3.15.3 The windings of the transformers shall be designed to deliver continuously rated MVA corresponding to ONAN cooling.

Radiators shall be provided for cooling purpose. These shall be directly mounted on the tank on both sides in a balanced manner & not on one side only.

3.15.4 The Radiator to be used should be of PSR type for all three type of rating.

3.15.5 For heat dissipation calculation for tank surface at 45 Degree, 500 watt per Sq. meter will be considered and for Radiator, heat dissipation will be worked out as per manufacturing chart provided by manufacturer, firm will enclose the chart.

3.15.6 The cooling arrangement shall consist of detachable radiators which may be directly mounted on the transformers. Connections between the radiators and tank shall be made with flanges provided with gaskets and an indicating sheet valve provided at both connection ends, which can be fastened in either open or closed position.

3.15.7 The radiators shall be so arranged that these can be detached from the tank or bank without disturbing the oil in transformer. These shall be designed to withstand the vacuum and pressure specified for the tank.

3.15.8 Radiators shall be so designed as to be for cleaning & painting to prevent accumulation of water on the outer surface to completely drain oil from the tank or bank and to ensure against formation of gas pockets when the tank is being filled. All connections between the radiators and tank or bank and between the bank & tank shall be provided with flanges when the particular item is detached. Each radiator shall have a lifting eye, an oil drain and vent at top.

3.15.9 The height of the radiator should not be above the transformer tank & All the Radiator shall be so arranged that they can be directly be connected to tank without any bend.

3.15.10 The indication regarding state of opening/ closing of radiator valve should be clearly identified through paint-marking.

3.16 TRANSFORMER CORE :

3.16.1 The core shall be built up with thin lamination of high grade, non ageing, low loss, high permeability, cold rolled, grain oriented silicon steel specially suitable for transformer core. The particulars of laminated steel to be employed shall be supplied with the tenders along with DC magnetization, B-H and iron loss curves.

3.16.2 After being sheared the laminations shall be treated to remove all burrs and shall be re-annealed to remove all residual stresses. At least one side of each lamination shall be coated with a double baked enamel insulation coating which will not deteriorate due to pressure and the action of hot oil. The nature of insulation shall be specified in the tender.

3.16.3 Every care shall be exercised in the selection, treatment and handling of core steel to ensure that as far as practicable, the laminations are flat and the finally assembled core is free from distortion.

3.16.4 The design of the magnetic circuit shall be such as to avoid discharges, development of short circuit paths within itself or to the earthed clamping structure and the production of flux components at right angles to the plane of the laminations which may cause local heating.

3.16.5 The core shall be rigidly clamped to ensure adequate mechanical strength and to prevent vibration during operation. The core/clamping bolts shall not pass through Core/Yoke and clamping structure shall be so constructed that eddy currents will be minimum.

3.16.6 The core shall be provided with lugs suitable for lifting the complete core and coil assembly of the transformer. The core and the coil shall be so fixed in tank that shifting will not occur when the transformer is moved or during a short circuit.

3.16.7 The core shall be of high grade cold rolled grain oriented annealed steel laminations, having low loss and good grain properties, coated with hot oil proof insulation, bolted together to the frames firmly to prevent vibration or noise. All core clamping bolts shall be effectively insulated. The complete design of core must ensure the permanency of the core losses with continuous working of the transformers. The value of the flux density allowed in the designs and grade of laminations used shall be clearly stated in the offer, along with the curves. The transformer core shall be constructed out of the prime class of materials. The transformer core shall be of prime quality CRGO steel. The bidder shall import the core directly or shall purchase directly from the imported and he will furnish the following documents at the time of stage inspection of the transformer:-

- a) Invoice of supplier.
- b) Mill's test certificate.
- c) Packing list.
- d) Bill of landing
- e) Bill of entry certificate by custom.

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

3.16.8 FLUX DENSITY :

The flux density in any part of the core built from cold rolled grain oriented steel shall not exceed 16000 lines per sq. cm. at any tap position necessary to maintain No Load terminal voltage of 11KV on LV side as required. The transformer shall also be suitably designed to withstand upto 10% upward primary voltage variation at normal tap continuously without saturation and excessive heating of the core and windings. Due regard shall also be given to limiting the flux density based on the characteristics of the material used.

The tenderer shall furnish magnetization curve for material indicating max working flux density without saturation. The tenderer shall indicate max. flux density in core/yoke at rated voltage to establish that the max. flux density at 10% over voltage (with reference to nominal voltage) does not cause core saturation.

The design calculations in support of flux density shall be furnished by the tenderer along with drawing of cores steps and calculations of effective cross sectional area of the core. For finding out no load current, average values of all the three limbs and phases should be taken into consideration.

3.17 WINDING :

3.17.1 The windings shall be so designed that all coil assemblies of identical voltage ratings shall be interchangeable and field repairs to the windings can be made readily, without special equipment. The coils shall be supported between adjacent sections by insulating spacers and bracers. Bracings and other insulation used in the assembly of the windings shall be arranged to ensure a free circulation of the oil and to reduce hot spots in the windings. The windings shall be designed to reduce to a minimum the out of balance forces in the transformer at all ratios.

3.17.2 The insulation of the coils shall be suitable to develop the full electrical strength of the windings. All materials used in the insulation and assembly of the windings shall be insoluble, non catalytic, and chemically inactive in the hot transformer oil, and shall not soften or otherwise be adversely effected under the operating conditions.

3.17.3 All threaded connections shall be provided with locking facilities. All leads from the windings to the terminal board and bushings shall be rigidly supported to prevent injury from vibration. Guide tubes shall be used where practicable.

3.17.4 The windings shall be clamped securely in place so that they will not be displaced or deformed during short circuits. The assembled core and windings shall be vacuum dried and suitably impregnated. The electrolytic copper conductor used in the coil structure shall be best suited to the requirements and all permanent current carrying joints in the windings and the leads shall be welded or braced except compression type which may be used for terminal connections. Bolted connection may be used at the bushings and at terminal board with suitable locking device. The drying out procedure of the core coil assembly shall be indicated in the tender.

3.18 FAULT WITHSTANDING CAPACITY OF WINDINGS :

All the windings shall be suitably designed to withstand short time rating for not less than 2 seconds by feeding the fault level of 1000 MVA on HV side, 750 MVA on 11 KV side respectively from both ends and considering the severe most form of system faults that can arise in service. Tenderer(s) should furnish the detailed calculations for thermal as well as dynamic ability of windings to withstand short circuits as prescribed above, failing which their quotations are likely to be ignored. The max. temp. attained for short time rating shall not exceed 250 degree C.

3.19 INSULATING OIL :

3.19.1 The oil for first filling shall be supplied with each transformer. The oil shall be EHV grade-I and shall comply IS:335/2018 (Type-2) latest version & amendment.

3.19.2 Particular attention shall be paid to deliver the oil for topping up free from moisture having uniform quality through out in the non-returnable new steel drums.

3.19.3 The quantity of oil for first filling of each transformer shall be stated in the tender. Quantity of oil required for filling of conservator and radiators shall be stated in the guaranteed technical particulars.

The Break Down Voltage Value of the fresh oil after filtration and before filling in the transformer should be above 70 KV and after filling in the transformer it should be above 40 KV.

3.19.4 The transformer oil purchased from M/s. Savita Chemical, M/s. Apar, M/s. Raj Lubrichem, M/s. Raj Petroleum, M/s Tashkant, M/s Sharavathy, M/s Rinki/M/s Madras Petrochem and M/s. Lubrichem, M/s Columbia shall only be supplied. Invoice and test certificates of manufacturer of transformer oil shall have to be furnished as and when desired by the Nigam.

3.20 TANK :

3.20.1 The transformer tank and cover shall be fabricated from good commercial grade low carbon steel suitable for welding and of adequate plate thickness. The tank and the cover shall be of welded construction. All seams shall be welded and where practicable they shall be double welded. The transformer tank shall have sufficient strength to withstand without permanent distortion. The punching on all 4 sides of Power Transformer tank with letter size of 10x5mm will be carried out. The details to be punched are as under:-

- i) TN No.
- ii Serial No.
 - i) Make
 - ii) Rating.

The thickness of tank sheet shall be as under:-

| S.No. | Dimensions of | 3.15 MVA |
|-------|---------------|----------|
| i. | Top Cover | 8mm |
| ii. | Side Cover | 6mm |
| iii. | Bottom Cover | 8mm |

3.20.2 At least one manhole/inspection cover with a welded flange and a bolted cover shall be provided on the tank cover. The manhole shall be of a sufficient size to afford easy access to the lower ends of the bushings, terminals etc.

3.20.3 All bolted connections to the tank shall be fitted with suitable oil tight gaskets which shall give satisfactory service under the operating conditions. Special attention shall be given to the methods of making the hot oil tight joints between the tank and the cover as also between the cover and the bushing and all other outlets to ensure that the joints can be remade satisfactorily and with ease , with the help of semi-skilled labour. Where

compressible gaskets are used, steps shall be provided to prevent over compression. Suitable guides shall be provided for positioning the various parts during assembly or dismantling.

3.20.4 Lifting eyes or lugs shall be provided on all the parts of the transformers requiring independent handling during assembly or dismantling. In addition the transformer tank shall be provided with lifting lugs and bolts properly secured to the sides of the tank, for lifting the transformer either by cranes or by jacks.

3.20.5.1 The design of the tank, the lifting lugs and bosses shall be such that the complete transformer assembly filled with oil can be lifted with the use of these lugs without any damage or distortions. The tank shall be provided with two suitable copper alloy, lugs for the purpose of groundings.

3.20.5.2 The main body of the tank shall have sufficient strength to withstand and without permanent distortion

- i) A vacuum of 760mm of mercury.
- ii) Continuous internal gas pressure of 0.7 atmosphere above atmosphere pressure with oil at operating level i.e. the transformer tank should be able to withstand 100% vacuum and also one atmosphere pressure above atmosphere internal pressure.

3.20.5.3 The tank cover shall be belled to the tank and the transformer design shall be such that at the tank will not split between the lowest and upper cooler connections.

3.20.5.4 Each tank shall be provided with the following

- a) Lifting lugs suitable for lifting the transformer complete with oil accessories lifted with oil by cranes.
- b) A minimum of four jacking lugs, in accessible position to enable the transformers complete with oil to be raised or lowered using hydraulic or screw jacks.

The minimum height of jacking lugs above base shall be

- i) Transformer above 10 tonnes weight : 500 mm
- ii) Transformer upto and including 10 tons weight: 300 mm.

Horizontal plates with 50mm dia drew holes drilled therein shall be fitted adjacent to each corner of the rectangular tank at more than 750 mm from the base to permit haulage in any direction. On the rounded tanks drew holes shall be located on the diagonals of the rectangular formed by the overall boundaries of the tank.

3.20.6 Each tank cover shall be adequate strength and shall not distort when lifted. Inspection opening shall be provided to give easy access to lower ends of bushings, terminals etc. for changing ratio or winding connection or testing to each connections. These shall be of adequate to size not less than 450mm x 350mm

3.20.7 Suitable guides shall be provided for positioning the various parts during assembly or dismantling. Adequate space should be provided between the cores and winding and the bottom of tank for collection of any sediment.

3.20.7.1 The base channel for transformer shall be 250 x 6 x 82 mm.

3.20.7.2 Prismatic oil level gauge indicator on transformer tank shall be provided to indicate level of oil in Transformer tank at a suitable place on LV bushing side.

3.20.8 UNDER CARRIAGE :

3.21.1 The transformer tank shall be supported on a structural steel base.

3.21.2 Pulling eyes shall be provided to facilitate moving the transformer and they shall be suitably braced in a vertical direction so that bending does not occur when the pull has a vertical component.

3.22 OFF LOAD TAP CHANGER MECHANISM:

3.22.1 The off circuit tap changer shall be of high quality and robust in construction. It shall be located at a convenient position so that it can be operated from ground level by a standing operator. The handle of OCTC shall be provided with a locking arrangement, thus enabling the OCTC to be locked in position. Arrangement for indicating of tap position shall also be provided. It shall be suitable for local manual operations. The tap changer shall be capable of permitting parallel operation with other transformer of the same type. When one unit is in parallel with another of same type as mentioned in clause No.3.12 under normal condition, the tap changer shall not become out of step. The OFF Load Tap Changer should be of following makes only:-

- i) M/s Paragone Associates, Thane.
- ii) M/s Always, Bangalore.

3.22.2 The OCTC shall be capable of carrying rated MVA on all taps. The breaking capacity of the OCTC shall be compatible with the highest system voltage and current based on maximum over loading permissible under IS:6600 -1972 (150% of rated value). The voltage rating for each step shall be 2.5% on HV side. However, each step of OCTC shall withstand voltage not less than 115% of rated step voltage. The rated through current of OCTC at this voltage will not be less than 150% of rated current of HV winding at lowest tap.

3.23 CONSERVATOR:

3.23.1. Oil preserving equipment shall be conventional conservator tank type. The minimum oil level in the conservator tank shall not be below the level of the bushing flanges.

3.23.2 Oil conservator tank shall be located well clear of the bare connection of the transformer terminals. The conservator tank shall have adequate capacity between highest and lowest permissible levels to meet the requirement of expansion of the total cold oil

volume in the transformer and cooling equipment from min. amb. temperature to highest oil temp. as per desired.

- 3.23.3 The total volume of the conservator shall be min. 10% of the total quantity of oil in transformer. The inside diameter of the pipe connecting the conservator to the main tank shall be min.50mm and it should be projected into the conservator in such a way that its end is projected 30mm above the bottom so as to create sump for collection of impurities. The min. oil level should be above the sump level.
- 3.23.4 A conservator complete with sump and drain valve shall be provided in such a position as not to obstruct the electrical connections to the transformer, having a capacity between highest and lowest visible levels to meet the requirement of expansion of the total cold oil volume in the transformer and cooling equipment from the minimum ambient temperature shall be with 0 Deg. C to 90 Deg.C. The minimum indicated oil level shall be with the feed pipe from the tank covered with not less than 15mm depth of oil and the indicated range of oil level shall be minimum to maximum.
- 3.23.5 The oil connection from transformer tank to the conservator vessel shall be arrange at a rising angle of 3 Deg. to 9 Deg. to the horizontal up to gas and oil actuated relay and shall consist of 50mm inside diameter pipe.
- 3.23.6 Each conservator vessel shall be fitted with a breather in which silica gel is the dehydrating agent and designed so that
- a. The passage of air is through silica gel.
 - b. The external atmosphere is continuously in contact with silica gel.
 - c. The moisture absorption indicated by a change in colour of the tinted crystals can be observed from distance.
 - d. Breathers shall be mounted at approx. 1400 mm above ground level.

3.24 TEMPERATURE INDICATING DEVICE:

- 3.24.1 The tripping contacts of above temperature indicators shall be adjustable to close between 60 Deg.C and 120 Deg.C and alarm, contacts to close between 50 Deg. C & 10 Deg.C and both shall reopen when the temperature has fallen by above 10 Deg.C.

3.25 MARSHALLING BOX OR KIOSK

- 3.25.1 A sheet vermin proof well ventilated and weather proof marshalling box of the suitable construction shall be provided for the transformer ancillary apparatus. The box shall have domed or sloping roofs and the interior and exterior painting shall be in accordance with specification.
- 3.25.2 The marshalling box, wherever provided shall accommodate the following equipments alternatively weather proof instruments can be mounted outdoor.
- a) Temperature indicators.
 - b) Terminal boards and gland plates for incoming and out going cables.

- 3.25.3 All the above equipments except (b) shall be mounted on panels and back of panel wiring shall be used for inter connection.
- 3.25.4 The temperature indicators shall be so mounted that the dials are not more than 1600 mm from ground level and the door (s) are of adequate size.
- 3.25.5 To prevent internal condition an approved type of metal clad heater shall be provided controlled by a suitable switch. Ventilation louvers shall be provided.
- 3.25.6 All incoming cables shall enter the kiosk from the bottom and the gland plate shall be not less than 450mm from the base of box. The gland plate and associated compartment shall be sealed in suitable manner to prevent the ingress of moisture from the cable trench.

3.26 DIAGRAM AND RATING PLATE

Each transformer shall be provided with a non-detachable brass or stainless steel plate mentioning complete information as given in clause 7 of latest version of IS 2026 (Part 1): 2011 and diagram of winding connection and taps shall be provided. The property of respective Discom and specification no. shall be engraved on the plate Guaranteed values of No-Load loss and Load loss at 75 Deg.C without and plus tolerance along with measured values as well as temperature rise figures should also be inscribed on the diagram and rating plates.

3.27 BUSHINGS :

3.27.1 All main winding and neutral leads for 33/11 KV transformers shall be brought out through outdoor type bushings. The electrical characteristics of bushing shall be in accordance with IEC-137 as well as IS-3347/8603 and IS-2099. The bushing shall be rated for highest voltage and current rating of the respective windings. The current ratings of bushing shall be at least 150% of the rated current at minimum tap to permit overloading.

3.27.2. The bushings shall have high factor of safety against leakage to ground and shall be so located as to provide adequate electrical clearances between bushings and between the bushings and ground parts. The spacing between the bushings shall be adequate to utilize full flashover strength preventing flashover between the phases or between phase and ground parts under all conditions of operation. The creepage distance of bushing shall not be less than 25 mm per KV.

3.27.3. All bushings shall be equipped with suitable solder less terminals of approved type. The type and size shall be specified in the tender. All external current carrying contact surfaces shall be placed adequately.

3.27.4. Bushings of identical voltage ratings shall be interchangeable .

3.27.5 Special adjustable arcing horns shall be provided with HV & LV bushings. Each bushings shall be so coordinated with the transformer insulation that all flashover occur outside the tank.

3.27.6. All porcelain used in bushings shall be of the wet process homogeneous impervious to moisture and free from cavities or other flaws and throughout

vitrified and smoothly glazed. The glazing shall be of the uniform colour and free from blisters, burns and other defects. All bushings shall have puncture strength greater than the dry flashover voltage.

- 3.27.7. The creepage distance of 33 KV bushing surfaces shall not be less than 900 mm & for 11 KV shall not be less than 300 mm.
- 3.27.8. Terminal conductor of HV & LV shall be vertical take off type and suitable for ACSR PANTHER.

3.28 (A) SUPPRESSION OF HARMONICS:

The transformer shall be designed with particular attention to the suppression of harmonics voltages especially in the third & fifth harmonics so as to eliminate wave form distortion and any possibility of high frequency disturbances.

3.28 (B) MARKING

All transformers shall have the marking in paint on the body for identification as per Indian Standards or as instructed by purchaser.

3.29 CENTRE OF GRAVITY.

The centre of gravity of the assembled transformer shall be low and as near the vertical centre line as possible. The transformer shall be stable with or without oil. If the centre of gravity is eccentric relative to track either with or without oil its location shall be shown in the outline drawing in all the views showing their position of Transformer track also.

3.30. FITTINGS AND ACCESSORIES :

3.30.1. Each transformer shall be provided with the following fitting and accessories in accordance as specified in IS:2026:

- (i) Oil Temperature Indicator (OTI)

The transformer shall be provided with one 150 mm dial type, oil Temperature Indicator for indicating top oil temperature. The indicator shall have adjustable electrically independent ungrounded alarm and trip contacts with **Micro Switches** and maximum reading pointer. The temperature-sensing element shall be suitably located in a pocket on the top of the transformer and shall be connected to the oil temperature indicator by means of capillary tubing protected with a metal sheath. The accuracy class of the OTI shall be +/- 1%

Suitable contacts shall also be provided for remote indication of oil temperature.

- (ii) Winding Temperature Indicator:-

The Transformer shall also be provided with a device for indicating the temperature of winding (HV and LV separately). It shall comprise the following:-

- a) Temperature sensing element suitably located on the top cover of the transformer.

b) 150 mm dial, local indicating instrument with maximum reading pointer, mounted in the cooler control cabinet and two adjustable electrically independent ungrounded contacts with **Micro switches** (beside that required for control of cooling equipment). The tripping contacts shall be adjustable to close between 60 Deg. C and 120 Deg.C and alarm contacts to close between 50 Deg. C and 100 Deg. C and both shall reopen when the temperature has fallen by a desired amount between 5 Deg. C and 50 Deg.C. All contacts shall be adjustable on a scale. They shall be accessible on removal of the cover and it shall be possible to check the operation of the contacts and associated equipments. Connections from the contacts shall be brought down to the terminal Block, placed inside the marshalling box. The accuracy class of the WTI shall be +/- 1%.

c) Calibration device:

Suitable contacts shall also be provided for remote indication of oil temperature.

iii) One filter valve located at the top of the tank on the LV side. The opening of this valve shall be baffled to prevent aeration of oil.

iv) One drain cum filter valve with sampling valve for main tank with plug or core plate of suitable size with locking arrangement located near the bottom of the tank on the HV side of the transformer but diagonally opposite to LV side.

The above filter/drain valves shall be located on non-bushing side of the Transformer. It should be placed on bottom side of tap changer and on top of the diagonally opposite side.

v) Air release device. It shall be of adequate capacity and shall be provided to release the trapped air during/after filling of the oil.

vi) Explosion vent (Pressure release device).

vii) One No. double float Buchholz relay shall be provided with alarm and tripping contacts to detect accumulation of gas and sudden changes of oil pressure, complete with shut-off valves on either side and flange coupling to permit easy removal without lowering oil level in the main tank, a bleed valve for gas venting and a test valve. The Buchholz relay shall be of best indigenous make having ISI certification. Buchholz relay must be made of cast iron/ aluminum.

viii) Detachable radiators complete with shut off valves as necessary for cooling as per clause 3.15.

ix) An oil conservator having detachable end plates, with following provisions.

a) Magnetic type oil level gauge:-

The conservator shall be fitted with one magnetic oil level gauge with nitro-phyll float having:

i) Dial with minimum, maximum & normal (at 30 Deg.C) Oil level marking and a pointer.

- ii) Low Oil level alarm contacts of 0.5 Amp. 110V/ 30V DC.
- b) One oil filling hole with plug and drain valve on the conservator.
- c) one prismatic oil level gauge having painted/embossed marking as min., normal, and max. oil level.
- d) Silica gel breather with Oil seal and Dehydrating agent.
- x) Eye bolts and lugs on all parts for ease of handling.
- xi) Two grounding terminals as per clause No.3.20.5.
- xii) Rating, Diagram and terminal marking plates :

Rating, diagram and terminal marking plates of stainless steel or brass for transformers and other accessories giving details as per IS:2026 shall be provided. Value of full wave (1.2/50 micro second) impulse level, short circuit current. its duration, weights of all important items, Impedances, loss values at normal/extreme taps and Postal address. Performance guarantee clause 3.43 shall also be indicated.

xiii) All transformers shall have the marking in paint on the body for identification as per Indian Standard or as instructed by purchaser. Further, the following should be embossed at the top of the tank cover.

- a) Sr. No. of the transformer.
- b) The details of P.O. i.e. Order No. & Date.
- c) Name of the firm.
- d) Month and year of manufacture.

xiv) Bimetallic terminal connectors suitable for "ACSR Panther" for HV and LV bushing and earthing clamps should be as per IS:5561.

xv) Suitable weather proof cubicles (Marshalling box) for housing the local control equipment for fans, terminal blocks, for current transformer secondary and for mounting winding temperature indicators and oil temperature indicator as (i) and (ii) above.

xvi) HV and LV bushings with adjustable arcing horns 3 Nos. and 4 Nos. respectively.

xvii) Triple pole type off load tap changer as per cl.no.3.22

xviii) Skids :

xix) Hauling Eyes : Hauling eyes shall be provided on all the four sides of the transformer base.

xx) Jacking Pads :Four, sturdy jacking pads shall be provided for lifting complete transformer. Lifting height and safe capacity of jacks shall be specified in Bid.

xxi) Lifting Lugs : Two sets of forged or tested mild steel plate lifting lugs, one set for top cover, core and coil assembly and other set of complete transformer shall be provided. Lifting lugs shall be of adequate strength and size for attaching steel rope slings. Should lugs for lifting complete transformer be located on the base, sling guides shall be provided on cover.

xxii) Inspection Covers :One inspection covers of sufficient size for access to the interior of the tank shall be provided on the cover. The inspection covers shall be provided with suitable lifting arrangements.

All type of valves shall be of gun metal except radiator shut off valves which may be of cast iron/steel. All valves shall be provided either with blind companion flanges or with pipe plugs for protection.

The makes of fitting & accessories will be as under:-

| S.No. | Fitting & Accessories | Makes |
|-------|---|--|
| 1 | Buchholz relay | Atvus, Sukrat, Suvidha. |
| 2 | Winding Temperature Indicator/ Oil Temperature Indicator | OTI/WTI Model integrated RTD Scheme for ROTI/RWTI with remote indicator of M/s Preci Measure Control Pvt. Ltd./Thermal System, Belltek |
| 3 | Magnetic type oil level gauge | Atvus, Sukrat, Instrument & Control |
| 4 | Radiator Valve | Hari Industries, Atvus, Vinayak, Vimal Techno, Petsun, Kailash |
| 5 | Filter valve & Drain valve | Zolote, L&T, G.G., Leader, Uttam, Punjab Metal (ELMS mark), Leader, Hari Ind., Newman Ind. |

Radiator valves shall have clear & distinct OPEN/CLOSE indication embossed/ casted as well as painted on the both sides of main body of valve. Radiator valve should have zero leakage with cap remove.

The new makes of fitting & accessories may be accepted with the approval of ACE (CSS), AVVNL, Ajmer on the basis of ISI approval certificate/ tests reports from any NABL accredited Lab./Govt. Lab./ performance report from utilities.

3.30.2 LOCKING ARRANGEMENT

To curb the theft of oil from power transformers, the following parts are either required to be blocked/ plugged or provided under provisions of locking:-

| S. No. | Transformer Part | Mode of blocking |
|--------|---------------------------------|---|
| 1. | Conservator drain plug/ valve | Cap shall be provided as per drawing `b`. |
| 2. | Both oil filtration valves | Cap shall be provided as per drawing `a`. |
| 3. | Transformer Oil drain valve. | Cap shall be provided as per drawing `a`. |
| 4. | Radiator drain plug (Bottom) | Cap shall be provided as per drawing `c`. |
| 5. | Radiator Air release plug (Top) | Locking on top for which provision is to be provided by firm and informed to SE(MM) for approval. |
| 6. | Conservator filling hole. | To provide locking arrangement for which provision is to be provided by firm and informed to SE(MM) for approval. |

| | | |
|----|--------------------------------|--|
| 7. | Air release plug on top cover. | To provide wire mesh cap arrangement so that only air can be released. |
|----|--------------------------------|--|

3.31 FACTORY ASSEMBLY AND TESTS :

3.31.1 The transformer shall be completely assembled and tested at the Factory. It shall be at the option of the purchaser to send a representative(s) for carrying out stage inspection and various tests during actual manufacture and assembly of transformer(s) so as to satisfy regarding the quality of product and material being used.

3.31.2 All Type and Routine tests as per specification are to be conducted and no deviation in respect of conducting these tests will be acceptable. No extra charges for these tests will be paid. Test charges shall be part of cost of the equipment. Even if charges for such test are indicated elsewhere in the tender, it will be presumed that these tests will be conducted free of cost. If purchaser selects to send a representative, all tests shall be carried out in his presence.

3.32 STAGE INSPECTION :

Before carrying out the stage inspection the following documents shall be given to Inspecting Officer(s) for verification:

- a) Invoice of supplier
- b) Mill's test certificate
- c) Packing list
- d) Bill of landing
- e) Bill of entry certificate by custom
- f) description of material, electrical analysis, physical inspection, certificate for surface defects, thickness and width of the material.

The purchaser's representative may carry out stage inspection of the transformers during manufacturing/ assembling stage. The purchaser shall have absolute right to reject the raw material/ component/ sub assemblies or complete equipment not found to be conforming to the requirement of the specification or being of poor quality/ workmanship. The stage inspection will particularly include following tests/ check besides the general routine tests to be conducted during manufacturing stages as per manufacturer's standard practice.

- a) Physical inspection/checking of winding insulating material, core material and other accessories/fitting of transformer.
- b) Measurement of core area, cross sectional area of winding(s), number of turns in each winding.
- c) Verification of HV and LV Coils, conductor size, I.D., O.D., Axial Length, Weight, Insulation covering etc.

- d) Measurement of thickness of tank plates (Bottom and sides) and to conduct pressure & vacuum tests as per CBIP manual for transformer tests to ensure the adequate strength of tank plates.
- e) Sample testing of core material for checking specific loss, magnetization characteristics (i.e. B.H. Curve plot) and thickness.
- f) Visual and dimensional check during assembly stage of core.
- g) high voltage test(2KV,50Hz for one minute) between all core-bolts if provided and agreed to frame bars/fish plates etc. and ferro-magnetic steel of core.
- h) Check on completed core for measurement iron loss and check for any hot spot by exciting the core so as to induced the design values flux density.
- i) Check for proper provisions of spacers and bracings to arrest the movement of core and winding assembly inside the tank.
- j) Check complete transformer against approved outline drawing, provision for all fittings, finish oil level etc.

The purchaser at his option may collect the sample of the following raw material/ component for independent testing:

| | | |
|----|------------------|--|
| a) | CRGO Laminations | One specimen sheet of 300-500mm length and 50-75mm width (for each lot). |
| b) | HV winding wire | 1250 mm length specimen for each type |
| c) | LV winding wire | 1250 mm length specimen for each type |
| d) | Transformer oil | 2 samples of 5 litres each. |

To facilitate stage inspection, the supplier should intimate complete schedule of manufacturing programme of the transformers at least 15 days in advance to the SE (MM) of respective Discom. At least 50% of the transformers shall be offered in the shape of finished core-coil assembly. (The inspecting Officer during the course of stage inspection shall seal these core-coil assemblies for purpose of identification of the core coil assembly. The manufacturing programme shall not be interrupted in case purchaser's representative does not reach within seven days of the date of intimation.

3.33 ROUTINE TESTS :

Each completed transformer shall be subjected to following routine tests as per IS:2026 Part.I & III (latest amendment). No extra charges for any of the tests shall be paid. No deviation shall be acceptable. If the supplier desires, he may not fix radiators on transformers(other than the one which is to be type tested) during routine testing. However in that case, radiator manufacturer's test certificate shall be furnished for reference of inspecting officer with undertaking that supplier shall be responsible for proper alignment/fixing of radiator on transformer at site.

- a) Measurement of resistance of each winding.
 - b) Measurement of turns ratio between HV-LV windings at each tap.
 - c) Checking of polarity and phase relation-ships for each winding.
 - d) Measurement of no load loss and no load current .
 - e) Positive phase sequence impedance/short circuit impedance between HV-LV windings on minimum ,maximum and normal taps.
 - f) Separate source voltage withstand test.
 - g) Test certificate along with invoice of original manufacture of transformer oil as per IS:335/2018 (Type-2) (latest amended) and to meet the requirement of EHV grade oil shall be furnished and provided to Nigam's representative during inspection & shall be attached with Inspection Report. However, EHV Grade Transformer Oil shall be subject to BDV test.
 - h) Induced over voltage withstand test.
 - i) Measurement of neutral unbalance current.
 - j) Regulation at rated load at unity, 0.90 and 0.80 lagging power factor.
 - k) Load losses measured at rated frequency by applying voltage sufficient to produce the rated relevant current in one winding with the other winding short circuited.
 - l) Measurement of insulation resistance.
 - m) The total losses shall comprise of the No Load Losses, load losses at rated output duly converted at 75 degree C average winding temperature and shall also be indicated in the test report. Load losses shall be that corresponding to rated load on HV & LV winding.
 - n) Routine dielectric tests as per IS:2026 (Part.I & III).
- Sticker/ Poly-carbonate seals will be provided on locking chamber of Top filter wheel valve & Bottom drain/sampling wheel valve by Inspecting Officers and details of seals will be mentioned in their inspection report.

3.34 TYPE TEST CERTIFICATE WITH TENDER :

The detailed legible test certificates for the similar transformers manufactured in the recent past for all the type tests mentioned in the IS:2026 (amended upto date) shall be provided.

3.34.1 The firm (s) having authenticated type tests certificates viz. (a) Impulse test with chopped wave test, (b) Thermal and dynamic ability to withstand short circuit test and (c) Temperature Rise Test, got conducted from a Govt. approved/ Govt. Recognized/ NABL Accredited laboratory/ ILAC i.e. International laboratory Accreditation Corporation (in case of foreign laboratory) of the offered rating/ type and design (having same losses as specified by them under GTP), not older than **Five** years as on date of opening of the tender from the date of conducting type tests shall be considered as meeting the type test criteria and such firm(s) shall not be insisted for arranging fresh type tests. The type test certificate by in house laboratory of bidding firms, even if it is Govt. approved/ Govt. Recognized/ NABL Accredited / ILAC Accredited laboratory shall not be accepted, in case of their own bid. This will not apply if bidding firm is Govt. Company / Public Sector Undertaking. The bidder should furnish documentary evidence in support of laboratory whose type test certificates have been furnished, that the said laboratory is a Govt. approved/ Govt. Recognized/ NABL Accredited laboratory/ ILAC Accredited.

The above Type test shall be carried out by the firm at the Testing house as specified above. Type test carried out by above testing house at firm's works will not be considered.

3.34.2 In case firm(s) are not having type test reports in respect of offered rating/ type and design (not having same losses as specified in GTP) shall have to arrange type tests for i) Impulse Voltage Withstand Test, ii) Short Circuit Thermal & Dynamic Ability Test and iii) Temperature Rise Test on one unit free of cost.

Manufacturer should also furnish the test certificates of bushing from original manufacturer of bushings along with the tender. The detailed certified drawing of such transformers shall also accompany the tender document indicating clearly that the transformers offered are of same tested design.

3.35 TYPE TESTS :

TESTS AT SITE :

After erection at site all transformer(s) shall be subjected to the following tests:

- i) Insulation resistance test.
- ii) Ratio and polarity test.
- iii) Dielectric test on oil.

In case the equipment is not found as per the requirements of the purchase order, all expenses incurred during site testing will be to the tenderer's account and the material shall be replaced by him at site, free of cost.

3.39 FURTHER TESTS :

The purchaser reserves the right of having other reasonable tests carried out at his own expenses either before despatch or at site to ensure that the transformer complies with the requirements of this specification.

3.40 TEST REPORTS :

After all tests have been completed, seven certified copies of each test report shall be furnished. Each report shall supply the following information:-

- i) Complete identification data including serial number of the transformer.
- ii) Method of application, where applied duration and interpretation of results for each tests.
- iii) Temperature data corrected to 75 degree C including ambient temperature.

3.41 FREQUENCY AND SYSTEM VOLTAGE :

The transformer shall be suitable for continuous operation with a frequency variation of plus minus 3% from normal of 50 cycles per second without exceeding the specified

temperature rise. The highest system rated voltage shall be 145 KV. However the flux density requirements shall be as per clause 3.16.8.

3.42 DRAWINGS :

3.42.1 The drawings, calculation and the technical literature list below shall be submitted by each tenderer with the tender.

i) General outline drawings showing front, side elevations and plan views of the transformer and all accessories and external features with detailed dimensions, net and shipping weight, crane lift for untanking and for erection/ removal of bushing, size of lifting and pulling eyes, HV & LV terminal clearances, live terminal to ground clearances, quantity of insulating oil etc.

ii) Assembly drawings of HV and LV bushing.

iii) Wiring diagrams and drawings showing temperature indicator/ recorder circuits alarm circuit.

iv) Drawing showing typical sectional views of the winding with details of insulation, cooling circuit method of coil bracing and core construction along with flux density & current density calculations.

Core assembly drawing showing complete constructional details and flux density calculations.

v) Detailed drawings showing loading for the design of foundations for transformers.

vi) Drawings showing position of variable fittings.

vii) Drawings showing construction and mounting details of marshalling boxes.

viii) Drawing showing loadings and centre of gravity of transformer.

ix) Drawings giving details of name plate, terminal marking and connection diagrams.

x) Drawings of bimetallic terminal connectors with test certificates within 15 days of unless otherwise specified of order.

Thermal/dynamic calculations to provide transformers capability to withstand short circuit under worst conditions.

3.42.2 In the event of an order the supplier shall also supply 3 sets of the above drawings/documents listed at 3.42.1, based on final design to the purchaser for approval within 15 days of receipt of order unless otherwise specified. The purchaser will review the drawings and return one copy to the contractor within 15 calendar days after their receipt.

3.42.3 Each drawing returned by the purchaser will be stamped (a) " Generally Approved" or (b) " Generally approved subject to observation". In case of (a), no further resubmission of drawings shall be required for purchaser's approval. In case of (b), the contractor shall correct his original drawings to conform to the comments made by the purchaser and resubmit in the same manner as stated above within two weeks after the receipt of the marked up print by him.

3.42.4 Should the supplier wish to resubmit a revision or change for approval such resubmission shall be made in three prints. The contractor shall also supply prints of each approved revised drawing(s) within 15 days of receiving the approved revised drawing(s).

3.42.5 Any shop work done prior to approval of the drawing shall be at the supplier's risk. The supplier shall make all such changes in the design as are considered necessary to make the equipment conform to the provisions and intent of this specification without any additional cost to the purchaser.

3.42.6 Each drawing shall be identified by a drawings number and each subsequent resubmission/ revision or addition to the drawings or procedure. All drawings shall be thoroughly checked for accuracy and completeness and signed or initialed by a responsible officer of the contractor.

3.42.7 Checking and approval of the drawings by the purchaser is for the benefit of the supplier and shall not relieve the supplier of full responsibility for ensuring correct interpretation of design drawings and specifications or for completeness and accuracy of the shop drawings and relevant specifications.

3.42.8 The supplier shall report and incorporate only after purchaser's approval, all deviations, concessions, omissions changes etc. occurring through the manufacturing assembly and testing phases and submit a complete set of drawings in reproducible forms within 30 days of the date of the equipment is considered to be placed in satisfactory operating condition.

3.42.9 All drawings shall be in English language and dimensions in metric system.

3.43 PERFORMANCE GUARANTEE :

Performance guarantee of transformer shall be for the period of **36** (Thirty Six) months from the date of receipt in stores of purchaser of such transformer complete in all respect. The period during which transformer remained defective/ failed will not be accounted in this performance guarantee period. The period of defective will be reckoned from the date of first intimation to date of delivery after repair.

3.44 REPAIR GUARANTEE :

The transformer got damaged/failed during the guarantee period due to manufacturing defects or poor workmanship shall be repaired by the supplier within 60 days period from the date of information to the supplier without any liability on the purchaser. In case the transformer warrants return to the firms works the same can be done as per clause 1.32.6 of GCC. The failed Power Transformers shall be mandatorily lifted by the firm from site/ store wherever same is lying failed/ defective.

The GP failed transformer after due repair & inspection by the purchaser, will be routed through Nigam's in-house Testing Laboratory (CTL) and deliver to the store where CTL exists. Mandatory Testing as mentioned at Clause No. 3.46 (B) shall be carried out and transformer will be accepted on the basis of CTL results. In case Excess No Load /Load losses found than Guaranteed losses, penalty will be levied as per provision of clause 3.46 (B). The

difference in penalty on account of excess No Load/Full load losses observed at CTL at the time of original supply and 'GP failed' repaired supply will be recovered.

The repaired transformer shall bear a repair warrantee for further 12 months after repair or unexpired period of 36 months from the date of supply whichever is later.

The firm shall provide non-detachable metallic plate with engraved following details of the repaired transformers for the purpose of identification:-

- 1) Date of first failure
- 2) Date of expiry of GP after 1st repair under G.P.
- 3) Date of second/third failure
- 4) Date of expiry of GP after 2nd /3rd re-repair under G.P.

The above details shall also be punched/embossed on the cover of the transformer. On every re-repair of transformer the date of repair and date of expiry of guarantee period shall have to be engraved on rating plate by the contractor. The original name plate of transformer will be retained on the repaired transformers.

3.45 CLEANING AND PAINTING:

i) Before painting or filling with oil, the external surfaces of transformer tank and structural steel work shall be completely cleaned and made free from rust, scale and grease by applying shot blasting or sand blasting. Cavities on castings shall be filled by metal depositions.

ii) The interior of transformer tank, other oil filled chambers and internal structural steel work shall be cleaned of all the scales and rust by application of standard approved methods. Thereafter these surfaces shall be painted with hot-oil resistant varnish or paint.

iii) Except for nuts, bolts and washers which may have to be removed for maintenance purposes all external surfaces shall receive minimum of four coats of paint. The total paint thickness shall be in the range of 52 to 60 microns.

iv) The 1st and 2nd coats of painting shall be of primer and shall be applied immediately after cleaning. The 3rd coat shall be of an oil and weather resisting quality of a shade or color easily distinguishable from the primary coats and shall be applied after the primary coats have been touched up where necessary. The final coats shall be of glossy oil finish and weather resisting non-fading paint of shade No.632 (Admiral grey) of IS 5 or relevant International Standard Primer paint shall be ready mix Zinc Chromates as per IS 104 or relevant International Standard Intermediate and final coat of paint shall be as per IS:2932 or relevant International Standard.

iii) Metal parts not accessible for painting shall be made of corrosion-resistant material.

iv) Marshalling box shall also be painted with Admiral grey as per shade-632 of IS-5

v) Dry Film Thickness:-

- a) To the maximum extent practicable, the coats shall be applied as a continuous film of uniform thickness & free of pores. Overspray, skips, runs, sags & drips should be avoided. The different coats may or may not be of the same colour.
- b) Each coat of paint shall be allowed to harden before the next is applied as per manufacturer's recommendation.
- c) Particular attention must be paid to full film thickness at the edges.

- d) Except for nuts, bolts and washers which may have to be removed for maintenance purposes, all external surfaces shall receive minimum of four coats of paint. The total paint thickness shall be in the range of 52 to 60 microns.
- viii) Test for painted surface:-
 - a) The painted surface shall be tested for paint thickness.
 - b) The painted surface shall pass the cross hatch adhesion test and impact test as acceptance tests and salt spray test and hardness test as type test as per the relevant ASTM standards.
 - c) Supplier shall guarantee the painting performance requirement for a period of not less than 5 years.

B) MANDATORY TESTING/VERIFICATION AT STORES:-

The supplier shall route the power transformers through specified lab headquarter for testing and checking of No Load, Load Loss, Magnetizing Current, Percentage Impedance & Fitting & Accessories. Every transformer shall be tested for measurement of losses, Magnetizing Current & Percentage Impedance before delivery of the transformer at the respective store/ site destination. The verification of fitting & accessories of each Transformer shall also be carried out at Stores. The inspecting officer shall issue a provisional Form-9 after satisfactory inspection. However, the No Load, Load Loss, Magnetizing Current & Percentage Impedance measured and verification of fitting & accessories at CTL shall be final.

- i) Each & Every Transformer shall route through CTL Testing. In CTL, Transformers will be subjected to the following tests:-
 - a) No Load Losses at 100% & 110% of rated voltage and Magnetizing current will be measured at both voltages.
 - b) Load losses by Resistance Calculation method.
 - c) Percentage Impedance.
 - d) Verification of fittings & accessories.
 - e) Measurement of tank thickness.
 - f) **No load voltage ratio (Transformer turns ratio) shall be checked in CTL with the tolerance as per specification / IS:2026 on the transformer.**
 - g) **The facility is being developed at CTL to test the transformer oil B.D. value, therefore, the same shall be tested at CTL.**
 - h) **Any other test/s may be carried out in CTL for which testing facility is/are available in CTL.**

XEn (CTL) shall provide 2 Nos. Poly-carbonate Seals on diagonally opposite side of Transformer after successful testing in CTL as a token of proof that Transformers have been tested at CTL.

(a) No Load Losses:

10% tolerance is allowable. Penalty shall be leviable @ **Rs.386.00 per watt** for losses exceeding 3000 watts and upto 3300 watts for 3.15 MVA rating.

(b) Load Losses:

3% tolerance is allowable. Penalty @ **Rs.178.00 per watt** on losses exceeding 16000 watts and upto 16480 watts for 3.15 MVA rating.

The transformers having measured No Load Losses/ Load Losses beyond the above permissible limit shall be stand rejected.

(c) Magnetizing Current & Percentage Impedance:

The transformer selected for No Load and Load Losses shall also be subjected to magnetizing current and percentage impedance test and in case found beyond the limit mentioned in specification, the lot shall stand rejected. The tolerance will be as $\pm 10\%$ for Normal Tap and $\pm 15\%$ for any other Taps for percentage impedance.

(d) The following makes of fittings & accessories shall be verified jointly by the concerned ACOS (consignee) & XEn (CTL) at the time of CTL testing of Power Transformers:-

- a. Buchholz Relay
- b. WTI & OTI.
- c. MOG
- d. Radiator Valve.
- e. Filter valve & Drain valve.
- f. Off Circuit Tap Changer.

(e) Measurement of Transformer tank thickness shall be done as follows:-

| | | |
|----|--------------|--|
| 1. | Top Cover | At 2 places to be measured & average is to be taken. |
| 2. | Bottom cover | -do- |
| 3. | Side walls | On all four sides (average is to be taken) |

The nominal value of sheet thickness shall be considered as mentioned in the above specification.

The following rolling tolerance shall be allowed as per IS:1852 with latest amendments and no penalty shall be charged on such measured thickness till tolerance limit of IS:-

Tolerance on Thickness (in mm)

| | | |
|--------------------|--------------------------------------|---------------------------------------|
| Thickness of Sheet | Over 5.0mm upto and including 8.0 mm | Over 8.0mm upto and including 10.0 mm |
| Tolerance in mm | +/- 0.35 | +/- 0.40 |

If the observed values of thickness are within or upto 5% less after allowing rolling tolerance as per above, the Transformer may be accepted with levy of penalty after imposing double the penalty of the approximate amount saved by using thin sheet (e.g. if the observed value of thickness are say 5% less after accounting for rolling tolerance and transformer tank weight is 120 Kg. (say), the penalty imposed will be $5/100 \times 120 \times 80$ (considering present price of sheet steel is Rs.40/- per Kg. approx. $(2 \times 40 = 80) = \text{Rs.}480/-$).

Highest percentage variation on negative side shall be taken for accounting the penalty.

If the tank thickness is found beyond 5% of tolerance limit after allowing rolling tolerance, the transformer will be rejected.

(ii) No Load and Load Losses:

The No Load & Load Losses for various ratings of transformers shall be as under (without tolerance):

| Rating | No Load Losses in Watts | Load Losses in Watts |
|-----------------|----------------------------|-------------------------|
| ----- | ----- | ----- |
| 3.15 MVA | 3000 | 16000 |
| 5.0 MVA | 4000 | 23000 |

3.48 INSTALLATION & COMMISSIONING

Mainly following activities are required to be carried out before commissioning of Power Transformers:-

- a) Assembling of Power Transformer accessories.
- b) Testing activities in presence of XEn (P&EA/AEn (P&EA)/ XEn(O&M /HTM/Proct.)/AEn(O&M/HTM/Proct.)/Feeder Manager or Engineer nominated by concerned SE(O&M/M&P) such as
 - (i) Ratio Test
 - (ii) Megger Value
 - (iii) Magnetic balance.
 - (iv) Oil BDV
 - (v) Earth Resistance
 - (vi) Buchholz Relay checking.
 - (vii) WTI/OTI/MOLG (oil level) checking.
 - (viii) Checking of points of leakage of oil from Transformer body/ Radiator/Valve.
 - (ix) Setting of Relays in Panel & Sealing by Protection Wing.

Installation & Commissioning will be carried out in presence of firm's representative for which concerned AEn (O&M) will intimate to firm and AEn (P&EA)/ XEn(P&EA) XEn(O&M/HTM/Proct.)/ AEn(O&M/HTM/Proct.)/Feeder Manager or Engineer nominated by concerned SE(O&M/M&P) by FAX/Telegram/Telephone.