ASSAM ELECTRICITY GRID CORPORATION LIMITED

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BID IDENTIFICATION NO: AEGCL/DGM/LAC/TT/TLS-69/2025/794 ; Dated: 08-07-2025

Bidding Document
For

Supply of Bay terminal equipment and communication equipment for switchyard extension at 132KV Baghjap GSS for catering power to TATA Semiconductor Project at Jagiroad.

DEPUTY GENERAL MANAGER,
LOWER ASSAM T&T CIRCLE, AEGCL
NARENGI, GUWAHATI-26.

Bidder's Signature & Seal

SECTION - 1

INSTRUCTION TO BIDDER

1.1.0 INTRODUCTION :-

1.1.1. The **Deputy General Manager, Lower Assam, T&T Circle, AEGCL** on behalf of **Assam Electricity Grid Corporation Ltd,** hereinafter referred to as AEGCL or Purchaser invites e-tenders in prescribed form, from reputed firms/ contractors/ manufacturers with sound technical and financial capabilities for the following work. A single-stage two envelope procedure (**Techno-Commercial and Price Bid**) will be adopted for this tender.

a) NAME OF WORK :- **Supply of Bay terminal equipment and communication equipment for switchyard Extension at 132KV Baghjap GSS for catering power to TATA Semiconductor Project at Jagiroad.**

b) ESTIMATED VALUE FOR THE WORK :- Rs. 20,76,674.00 (Rupees Twenty Two Lakh Seventy Seven Thousand Eight Hundred and Fifty Seven) only including taxes and F&**I.**

c) Fund: AEGCL own source subject to recoupment from Deposit fund of AIDC/ TATA.

d) Key Dates: Refer to NIT.

e) Bidders may obtain further information from the office of the Deputy General Manager, Lower Assam T&T Circle, AEGCL, Narengi, Guwahati - 781026, Assam.

1.2.0 BIDDING PROCEDURE :-

1.2.1 The bidders must register themselves at **https://assamtenders.gov.in** as per the guidelines laid on the website.

1.2.2 The bidder shall submit the techno commercial & price bid through the e-tendering portal https://assamtenders.gov.in. All documents as required by this bidding document shall be scanned and uploaded in the portal.

1.2.3 **Price schedule should be submitted in the format provided in the online portal**. Bidders are also requested to submit the information in the format provided in this bidding document where applicable.

1.2.4 AEGCL has the right to cancel the tender at any moment, without assigning any reason thereof. Bidder will not be entitled to claim any expenses and AEGCL will not be responsible for any costs or expenses incurred on the preparation and submission of the Bids.

1.2.5 ***In addition to the online bid submission, Bidder should submit , one hour prior to bid submission end date and time, hard copies of the documents mentioned above alongwith*** *- (i) Receipt of online payment for Bid fee and EMD, (ii) Duly filled and signed Letter of technical bid and (iii) Authorization letter of bid signatory must be submitted in a sealed envelope superscribed with the name of bidder, full address, Bid Identification reference, name of work etc. at the office Deputy General Manager, Lower Assam T&T Circle, AEGCL, Narengi, Guwahati - 781026, Assam*

1.3.0 TENDER PAPER COST AND MODE OF PAYMENT:-

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

1.3.2 Bidder has to pay Non-refundable tender processing fee of **Rs.2000.00 (Rupees Two Thousand) only** via e-tender portal www.assamtenders.gov.in.

1.4.0 SCOPE OF WORK :-

1.4.1 The brief description of the scope of work covered under this bidding document is furnished below:

a. Design, manufacture, supply of reputed make 132kV Lightning Arrestor with terminal connectors etc. as per BoQ and bid specifications. Also, supply of LA support structures, foundation bolts, nuts, bolts etc as per site requirement, BoQ and bid specifications.

b. Design, manufacture, supply of reputed make 132kV isolator without earth switch with insulators, terminal connectors, structures complete as per BoQ and bid specifications.

c. Design, manufacture, supply of reputed make 132kV, 800A wave trap for 40kA for 1 sec as per site requirement (Wave trap may be CVT mounted type/ Pedestal mounted type/ suspension type) BoQ and bid specifications.

Bidder's Signature & Seal

d. Design, manufacture, supply of reputed make power line carrier communication equipment such as HF coaxial cable 75 ohms (balanced), LMU and LMDU as per site requirement, BoQ and bid specifications.

e. Design, manufacture, supply of reputed make UPG clamps suitable for Zebra to Panther and Panther to Panther conductors and T-clamps suitable for Panther to Panther conductor as per site requirement, BoQ and bid specifications.

f. Supply of 100W LED lights (reputed make such as – Havells/ Phillips/ Crompton/ Bajaj or equivalent) for switchyard illumination, including fitting and fixing as per site requirement, BoQ and bid specifications.

g. Loading at manufacturer's works, transportation and delivery at the substation site, including unloading at destination site.

h. Freight & Transit Insurance, storage at site and site insurance of all materials at site shall be in the scope of the contractor.

i. Arrangements of any permits required for transportation and movement of supplied materials. However, AEGCL shall assist as far as practicable in the process.

1.4.2 The Bill of Quantities for indicative purposes is furnished in Price Schedules.

1.4.3 The bidder on its own responsibility may visit and examine the Site of Works and its surroundings and obtain information that may be necessary for preparing the bid. Any permits or licenses that may be required to execute the works should also be obtained by the contractor.

1.4.4 The items mentioned in these Annexure shall only be used while quoting the bid prices. Any other items not specifically mentioned in the specification but which are required for installation, testing, commissioning and satisfactory operation of the equipment as per Indian Standards/IE Rules/IE Act and concerned authority regulations are deemed to be included in the scope of the specification and no deviation in this regard shall be accepted.

1.4.5 No modifications/additions/ deletions shall be made by the bidder to the items and quantities given in these schedules.

1.5.0 TIME SCHEDULE:

The successful bidder will be expected to complete the works within **4 (Four) months from the date of drawing approval.**

1.6.0 ELIGIBILITY CRITERIA OF THE BIDDER:

1.6.1 A Bidder may be a private entity or a government-owned entity or any combination of such entity with the intent to enter into an agreement supported by a letter of intent or under an existing agreement in the form of a joint venture, consortium or association.

1.6.2 **Joint venture bid will not be accepted**

1.6.3 A Bidder shall have Indian nationality. A Bidder shall be deemed to have the nationality of a country if the Bidder is a national or is constituted, incorporated, or registered and operates in conformity with the provisions of the laws of Republic of India.

1.6.4 AEGCL 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, and that such conflict of interest may contribute to or constitute a prohibited practice under Anticorruption Policy of Government of India and Government Of Assam. In pursuance Anticorruption Policy's requirement that Employer as well as bidders, suppliers, and contractors observe the highest standard of ethics. AEGCL will take appropriate actions if it determines that a conflict of interest has flawed the integrity of any procurement process.

1.6.5 A firm that is under a declaration of ineligibility by the AEGCL or any Government Entity or PSU at the date of the deadline for bid submission or thereafter i.e. on or before contract signing date shall be disqualified. Bidders shall provide such evidence of their continued eligibility satisfactory to the AEGCL, as the Employer shall reasonably request.

1.7.0 FINANCIAL CAPABILITY

1.7.1 Bidder will require to submit along with the bid the audited balance sheets and other legal financial statements acceptable to AEGCL, for the last 3 (three) years to demonstrate the current soundness of the Bidders financial position and its prospective long term profitability. As a minimum, an Applicant's net worth calculated as the difference between total assets and total liabilities should be positive. Wherever necessary the Employer may make enquiries with Bidder's bankers.

1.7.2 Average Annual Turnover : Minimum average annual turnover INR 10,45,000.00 calculated as total certified payments received for contracts in progress or completed, within the last 3 (Three) Years.

1.7.3 Financial Resources: Bidder need to demonstrate access to, or availability of, financial resources such as liquid assets, unencumbered real assets, lines of credit, and other financial means, other than any contractual advance payments to meet:

(1) the cash-flow requirement of atleast 70% of the work value and

(2) the overall cash flow requirements for this contract and its current works commitment.

1.7.4 Bidder must keep GST liabilities up to date and non-payment of GST liabilities and non-filing of relevant GST return more than 3 (three) months shall be reckoned as GST defaulter and this may be considered a cause for disqualification of a bidder and the bid may be rejected.

1.7.5 The Contractor must furnish recent dated **Bank Solvency Certificate** to show the bidder's financial position indicating the amount by concerned authority in necessary format as per their banks

1.8.0 EXPERIENCE:

1.8.1 Experience in similar nature of works under contracts in the role of manufacturers, contractor, subcontractor, or management contractor for at least the last 7 (seven) years prior to the bid submission deadline.

1.8.2 Participation as manufacturer/ contractor Experience having successfully completed similar works during last 7 years ending last day of the month previous to the one in which applications are invited should be either of the following:

(a) Three (3) similar completed works costing not less than 40% of total estimated cost.
(b) Two (2) similar completed works costing not less than 50% of total estimated cost.
(c) One (1) similar completed works costing not less than 80% of total estimated cost.

1.8.3 **Bidder may be manufacturer of the offered products or a firm/company having authorisation from a manufacturer. In case the bidder is <u>not</u> a manufacturer of the offered products, bidder must submit manufacturer's authorisation using for that purpose Form-MA provided in Section-3 Bidding forms.** Offered product's manufacturer must have least Five years of experience in design, manufacture and supply of 33kV or above rating equipment as specified in this bid. The offered product's manufacturer must have supplied such equipment which are in successful operation for atleast three years. Bidder shall submit copy of orders and performance certificates to establish its eligibility

1.8.4 The Bidder must have experience of executing work of similar nature previously in any Govt. organization/ PSU. The bidder must submit experience and completion certificate for scrutiny by AEGCL. Each of such project/ works should consist of completion certificate.

1.9.0 LITIGATION HISTORY

Bidders shall submit details of all litigation, arbitration or other claims, whether pending, threatened or resolved in the last five years, with the exception of immaterial claims with a cumulative impact of not more than 10% of their total assets. The Employer may disqualify bidders in the event that the total amount of pending or threatened litigation or other claims represent more than 50% of their total assets.

1.10.0 DOCUMENTS COMPRISING THE BID

1.10.1 The bid submitted by the bidder shall comprise two envelopes submitted simultaneously, one containing only the technical proposal and the other the price proposal.

1.10.2 **The Technical Bid submitted by bidders shall contain the following:**

a) Bid Submission Sheet

b) Documentary evidence to establish that the Bidder meet the qualifying requirements in accordance with Clause 1.5.0.

c) Documents to be furnished as per Clause 1.9.3

d) The Bid Guarantee (Bid Security) in accordance with Clause 1.20.0 & its sub-clauses of this Section.

e) All Bidding Schedules properly filled up including Price Bid Schedules.

f) All other information and documents such as Guaranteed and Technical Particulars, type test reports, drawings, technical leaflets etc, as required in the Technical Specification

1.10.3 To establish its eligibility and qualifications to perform the contract, the bidder shall provide along with the above-mentioned documents the following additional documents (mandatory) on qualifying requirements such as:

a) *Copies of original documents defining the constitution or legal status, place of registration, and principal place of business, written power of attorney of the signatory of the Bid to commit the Bidder.*

b) *Copies of valid Trade License issued by competent authority in the State of Assam (wherever applicable) or in the State where the bidder's business is registered.*

c) *Copies of PAN, GST Registration Certificate as per Goods & Services Tax laws.*

d) *Total monetary value of similar work performed by the bidder in each of the last three years.*

e) *Experience in works of a similar nature and volume for each of the last three years, and details of works under way or contractually committed in AEGCL or any other Govt. entity/PSU who may be contacted for further information on those contracts.*

f) *Qualifications and experience of key site management and technical personnel proposed for the Contract.*

g) *Reports on the financial standing of the Bidder, such as profit and loss statements and audited annual accounts certified by CA of the company for the last three years including IT return duly acknowledged by the tax department for the last three years.*

h) *Evidence of adequacy of working capital for this contract (access to line (s) of credit and availability of other financial resources).*

i) *Information regarding any litigation, current or during the last five years, in which the Bidder is involved, the parties concerned, and disputed amount.*

1.10.2 Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements.

1.10.3 Notwithstanding anything stated herein above, AEGCL reserves the right to assess the capacity and capability of the bidder to execute the work, should the circumstance warrant such assessment in the overall interest of AEGCL.

1.11.0 DOCUMENTS ESTABLISHING CONFORMITY OF THE GOODS AND SERVICES

1.11.1 The documentary evidence of the conformity of the goods and services to the Bidding Document may be in the form of literature, drawings and data, and shall furnish:

a) A detailed description of the essential technical and performance characteristics of the goods and services, including the functional guarantees of the Goods, in response to the Specification;

b) A commentary on the Purchaser's Specification and adequate evidence demonstrating the substantial responsiveness of the plant and services to those specifications. Bidders shall note that standards for workmanship, materials and equipment designated by the Purchaser in the Bidding Document are intended to be descriptive (establishing standards of quality and performance) only and not restrictive. The Bidder may substitute alternative standards, brand names and/or catalog numbers in its bid, provided that it demonstrates to the Purchaser's satisfaction that the substitutions are substantially equivalent or superior to the standards designated in the Specification.

1.12.0 SITE VISIT

The interested bidders are advised to visit any grid substation of AEGCL and examine the site of works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid. The costs of visiting the Site shall be at the bidder's own expense.

1.13.0 AMENDMENT OF BIDDING DOCUMENTS

1.13.1 At any time prior to the deadline for submission of bids, the AEGCL may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the bidding documents by issuing addenda.

1.13.2 Any addendum thus issued shall be part of the bidding documents pursuant to Sub-Clause, and shall be communicated in writing or by fax to all purchasers of the bidding documents. Prospective bidders shall acknowledge receipt of each addendum by fax to AEGCL.

1.14.0 LANGUAGE OF BID

1.14.1 The bid, and all correspondence and documents related to the bid, exchanged between the bidder and AEGCL shall be written in the English language. Supporting documents and printed literature furnished by the bidder shall also be in English language.

1.15.0 BID PRICES

1.15.1 Bidders shall give a breakdown of the prices in the manner and detail called for in the **Schedules of Prices**.

1.15.2 In the Schedules, Bidders shall give the required details and a breakdown of their prices, including all taxes, duties, levies, and charges payable as of twenty eight (28) days prior to the deadline for submission of bids, as follows:

(a) Plant and equipment (**Schedules of Prices**) shall be quoted on an EXW (ex-factory, ex-works, ex-warehouse or off-the-shelf, as applicable). All taxes and duties taxes as applicable and freight and insurance shall be indicated separately.

1.15.3 Price Adjustment: Prices quoted by the Bidder shall be FIRM during performance of the contract. Duties and Taxes shall be adjusted, except there is variation due to changes in legislation of the Country.

1.16.0 INSURANCE

The Bidder shall insure the Works/Materials (in transit and at the site) in accordance with the requirements of General Conditions of Contract. The Bidder shall provide details of the policies that he intends to take out as part of his Bid submission. **The bid price shall include all costs in pursuance of fulfilling insurance liabilities under the contract.**

1.17.0 BID VALIDITY

1.17.1 Bids shall remain valid for a period of **180 (One Eighty)** days after the date of opening of Technical Bids.

1.17.2 In exceptional circumstances, prior to expiry of the original bid validity period, AEGCL may request that the bidders extend the period of validity for a specified additional period. The request and the responses thereto shall be made in writing. A bidder may refuse the request without forfeiting its bid security. A bidder agreeing to the request will not be required or permitted to modify its bid, but will be required to extend the validity of its bid security for the period of the extension, and in compliance with Clause 1.19.0 in all respects.

1.18.0 CLARIFICATION OF BIDS

To assist in the examination, evaluation, and comparison of the Technical and Price Bids, and qualification of the Bidders, the Purchaser may, at its discretion, ask any Bidder for a clarification of its bid. Any clarification submitted by a Bidder that is not in response to a request by the Purchaser shall not be considered. The Purchaser's request for clarification and the response shall be in writing. No change in the substance of the Technical Bid or prices in the Price Bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered

1.19.0 BID SECURITY (EARNEST MONEY)

1.19.1 For participation in bidding procedure, participants must compulsorily pay the Bid Security of **Rs.41,500.00 (Rupees Forty One Thousand Five Hundred) only via e-tender portal www.assamtenders.gov.in.**

1.19.2 Any bid not accompanied by an acceptable bid security shall be rejected as non-responsive.

1.19.3 The bid securities of unsuccessful bidders will be returned as promptly as possible, against written request from the unsuccessful bidders.

1.19.4 The bid security of the successful bidder will be returned when the bidder has signed the Contract Agreement and furnished the required performance security.

1.19.5 The bid security may be forfeited

(a) if the bidder withdraws its bid, except as provided in Sub-Clause 1.24.1;
(b) if the bidder does not accept the correction of its bid price, pursuant to Sub-Clause 1.24. or
(c) in the case of a successful bidder, if it fails within the specified time limit to
    (i) sign the Contract Agreement,
    (ii) furnish the required performance security.

1.19.6 No interest shall be payable by AEGCL on the above bid guarantee.

1.20.0 ALTERNATIVE PROPOSALS BY BIDDERS

1.20.1 Bidders shall submit offers, which comply with the Bidding Documents, including the basic AEGCL's Requirements as indicated in the bidding documents. Alternatives will not be considered. The attention of bidders is drawn to the provisions of Clause 1.29.0 regarding the rejection of bids which are not substantially responsive to the requirements of the bidding documents.

1.21.0 FORMAT AND SIGNING OF BID

1.21.1 The bidder shall prepare one original and two copies of the bid proposal, clearly marking each one as: "ORIGINAL- BID PROPOSAL, etc as appropriate. In the event of discrepancy between the original and any copy, the original shall prevail.

1.21.2 The original and all copies of the bid shall be typed or written in indelible ink (in the case of copies, Photostats are also acceptable) and shall be signed by a person or persons duly authorized to sign on behalf of the bidder. All pages of the bid where entries or amendments have been made shall be initialed by the person or persons signing the bid.

1.21.3 The bid shall contain no alterations, omissions or additions, except those to comply with instructions issued by AEGCL, or as necessary to correct errors made by the bidder, in which case such corrections shall be initialed by the person or persons signing the bid.

1.21.4 The Bidders must submit the Bid Guarantee in separate sealed envelope, super-scribed as under:

"BID GUARANTEE (Name of the Package)"

1.21.5 The Bid must contain the name, residence and place of business of the person or persons making the Bid and must be signed and sealed by the Bidder with his usual signature. The names of all persons signing should also be typed or printed below the signature.

Bidder's Signature & Seal

1.21.6 Bids by Corporation / Company must be signed with the legal name of the Corporation/Company by the President, Managing Director or by the Secretary or other person or persons authorized to Bid on behalf of such Corporation/Company in the matter.

1.21.7 A Bid by a person who affixes to his signature the word 'President', 'Managing Director', 'Secretary', 'Agent', or other designation without disclosing his principal will be rejected.

1.21.8 Satisfactory evidence of authority of the person signing on behalf of the Bidder shall be furnished with the Bid.

1.21.9 The Bidder's name stated on the proposal shall be exact legal name of the firm

1.21.10 Bids not conforming to the above requirements of signing may be disqualified.

1.21.11 If the outer envelope is not sealed and not marked as above, AEGCL will assume no responsibility for the misplacement or premature opening of the bid.

1.21.12 The Bid must be accompanied with requisite BID SECURITY in a separate sealed cover.

1.21.13 The Bidders have the option of sending the Bids by post/courier or in person. Bids submitted by Telex/ Telegram/Fax will not be accepted. No request from any Bidder to AEGCL to collect the proposal from Airlines/Cargo Agents etc shall be entertained by AEGCL.

1.22.0 DEADLINE FOR SUBMISSION OF BIDS

1.22.1 Bids must be received by AEGCL at the address specified above no later than refer to NIT.

1.22.2 AEGCL may, at its discretion, extend the deadline for submission of bids by issuing an addendum in accordance with Clause 1.13.0, in which case all rights and obligations of AEGCL and the bidders previously subject to the original deadline will thereafter be subject to the deadlines extended.

1.23.0 LATE BIDS

1.23.1 Any bid received by AEGCL after the deadline for submission of bids prescribed in Clause 1.22.0 will be rejected and returned unopened to the bidder.

1.24.0 WITHDRAWAL OF BIDS

1.24.1 The bidder may withdraw its bid after bid submission, provided that written notice of the withdrawal is received by AEGCL prior to the deadline for submission of bids.

1.24.2 The bidder's withdrawal notice shall be prepared, sealed, marked and delivered with the envelopes additionally marked "WITHDRAWAL".

1.24.3 Withdrawal of a bid during the interval between the deadline for submission of bids and the expiration of the period of bid validity specified in Sub-Clause 1.18.0 may result in the forfeiture of the bid security pursuant to Sub-Clause 1.19.6.

1.25.0 OPENING OF BIDS

1.25.1 The Purchaser shall conduct the opening of Technical Bids through online process at the address, date and time specified in the BDS. Bidders at their discretion may attend the techno-commercial bid opening. Price bid of those bidders shall only be opened whose techno-commercial bids are found to be responsive to the requirement of the bidding document.

1.26.0 PROCESS TO BE CONFIDENTIAL

1.26.1 Information relating to the examination, clarification, evaluation and comparison of bids and recommendations for the award of a contract shall not be disclosed to bidders or any other persons not officially concerned with such process. Any effort by a bidder to influence AEGCL's processing of bids or award decisions may result in the rejection of the bidder's bid.

1.27.0 PRELIMINARY EXAMINATION OF BIDS AND DETERMINATION OF RESPONSIVENESS

1.27.1 The Purchaser shall examine the Techno-commercial Bid to confirm that all documents and technical documentation requested in this bidding document have been provided, and to determine the completeness of each document submitted. If any of these documents or information is missing, the Bid may be rejected.

1.27.2 The Purchaser's determination of a bid's responsiveness is to be based on the contents of the bid itself. A substantially responsive Techno-commercial Bid is one that meets the requirements of the Bidding Document without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that, a) if accepted, would: (i). Affect in any substantial way the scope, quality, or performance of the plant and services specified in the Contract; or (ii). Limit in any substantial way, inconsistent with the Bidding Document, the Purchaser's rights or the Bidder's obligations under the proposed Contract; or b) If rectified, would unfairly affect the competitive position of other Bidders presenting substantially responsive bids. The Purchaser shall examine the Techno-commercial Proposal, to confirm that the requirement of the bidding document have been met without any material deviation or reservation. If a bid is not substantially responsive to the requirements of the

Bidding Document, it shall be rejected by the Purchaser and may not subsequently be made responsive by correction of the material deviation, reservation, or omission.

1.28.0 CLARIFICATION OF BID PROPOSALS AND CONTACTING AEGCL

1.28.1 To assist in the examination, evaluation and comparison of Bids, AEGCL may, at its discretion, ask any bidder for clarification of its bid. The request for clarification and the response shall be in writing or by mail, but no change in the price or substance of the bid shall be sought, offered or permitted except as required to confirm the correction of arithmetic errors discovered by AEGCL in the evaluation of the bids.

1.28.2 Subject to Sub-Clause 1.28.1, no bidder shall contact AEGCL on any matter relating to its bid from the time of opening Bids to the time the contract is awarded. If the bidder wishes to bring additional information to the notice of AEGCL, it should do so in writing.

1.28.3 Any effort by the bidder to influence AEGCL in AEGCL's evaluation of price proposals, bid comparison or contract award decisions may result in the rejection of the bidder's bid.

1.29.0 CORRECTION OF ERRORS

1.29.1 Price Proposals determined to be substantially responsive will be checked by AEGCL for any arithmetic errors. Arithmetic errors will be rectified on the following basis. If there is a discrepancy between the unit rate and the total cost that is obtained by multiplying the unit rate and quantity, the unit rate shall prevail and the total cost will be corrected unless in the opinion of AEGCL there is an obvious misplacement of the decimal point in the unit rate, in which case the total cost as quoted will govern and the unit rate corrected. If there is a discrepancy between the total bid amount and the sum of total costs, the sum of the total costs shall prevail and the total bid amount will be corrected.

1.29.2 The amount stated in the Form of Bid for Price Proposal will be adjusted by AEGCL in accordance with the above procedure for the correction of errors and, shall be considered as binding upon the bidder. If the bidder does not accept the corrected amount of bid, its bid will be rejected, and the bid security may be forfeited in accordance with Sub-Clause 1.19.6 (b).

1.30.0 EVALUATION AND COMPARISON OF BID PROPOSALS

1.30.1 AEGCL will evaluate and compare only the bids determined to be substantially responsive in accordance with Clause 1.27.0.

1.30.2 AEGCL will carry out a detailed evaluation of the bids in order to determine whether the bidders are qualified and whether the technical aspects are substantially responsive to the requirements set forth in the bidding documents. In order to reach such a determination, AEGCL will examine the information supplied by the Bidders and other requirements in the bidding documents, taking into account the following factors:

(a) Qualification

(i) the determination will take into account the Bidder's financial and technical capabilities and past performance; it will be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, well as such other information as AEGCL deems necessary and appropriate; and

(ii) an affirmative determination will be a prerequisite for AEGCL to continue with the evaluation of the proposal; a negative determination will result in rejection of the Bidder's bid.

(b) Technical

(i) overall completeness and compliance with AEGCL's Requirements; the technical merits of materials and equipments offered and deviations from AEGCL's Requirements; suitability of the facilities offered in relation to the environmental and climatic conditions prevailing at the site; quality, function and operation of any process control concept included in the bid;

(c) Commercial

(i) Deviations and omissions from the contractual and commercial conditions as identified in the Bid.

(ii) compliance with the time schedule called for in the Bidding Document and evidenced as needed in a milestone schedule provided in the bid; and

(iii) the functional guarantees of the facilities offered against the specified performance criteria of the plant and equipment.

1.30.3 The Purchaser shall use the criteria and methodologies listed in this Clause. No other evaluation criteria or methodologies shall be used. To evaluate a Price Bid, the Purchaser shall consider the following:

a) The bid price excluding taxes as quoted in the Price Schedules;

b) Price adjustment for correction of arithmetical errors.

c) The following methodology will be practiced for identification and treatment of the Abnormally Low Bids (ALB) in this tender process of AEGCL:

(a) Identification:

For the identification of the Abnormally Low Bids, two approaches as applicable shall be adopted:

i. ***Absolute Approach*** when there is fewer than five substantially responsive bidders and if the bid price is 20% or more below AEGCL's cost estimate then AEGCL's tender evaluation committee should clarify the Bid price with the bidder to determine whether the Bid is abnormally low.

ii. ***Relative Approach*** is a statical comparison method which will be applied when there are more than five nos. of substantially responsive bids. A potential ALB is identified where the low Bid is more than one standard deviation below the average of substantially responsive bids received.
In this approach first the Average bid price is determined and then by deducting the standard deviation from the average bid price, potentially ALB may be determined.

(b) In case of ALB, the tender evaluation committee of the respective tenders shall undertake the following three stage review which are as follows:

i. Identify ALB as per the step mentioned in Clause No.(a).(i) and 10.b).(ii) whichever is applicable.
ii. Clarify and analyse the bidders resource inputs and pricing, including overheads, contingencies and profit margins. In that respect committee may seek the reference of the guidelines of World Bank, AIIB, ADB etc.
iii. Decide whether to accept or reject the tender.

(c) Additional Performance Security in case of acceptance of ALB:

i. If any abnormally low bid is accepted under point no. (b) (iii), after taking of additional performance security as per the assessment of the committee, however the total performance security should not have to exceed 20% of the total contract value.

ii. The additional performance security shall be treated as part of the original performance security and shall be valid for a period coextensive with the applicable defect liability period of the contract.

iii. Non submission of the additional performance security shall constitute sufficient ground to rejection of the bid and similar assessment shall be initiated for the next ranked bidder identified as ALB.

1.30.6 AEGCL reserves the right to accept or reject any variation or deviation. Variations, deviations, and other factors which are in excess of the requirements of the bidding documents or otherwise result in the accrual of unsolicited benefits to AEGCL shall not be taken into account in bid evaluation.

1.31.0 AWARD CRITERIA

1.31.1 AEGCL will award the Contract to the bidder whose bid has been determined to be the lowest substantially responsive bid provided that such bidder has been determined to be qualified in accordance with the provisions of the Bid. However, the AEGCL reserves the right to not award contract to the lowest substantially responsive bidder without thereby incurring any liability to Bidders

1.32.0 EMPLOYER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS

1.32.1 Notwithstanding Clause 1.31,0, AEGCL 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 AEGCL's action. AEGCL is not bound to accept the offer of the lowest bidder.

1.33.0 NOTIFICATION OF AWARD

1.33.1 Prior to expiration of the period of bid validity prescribed by AEGCL, AEGCL will notify the successful bidder by fax, confirmed by letter, that its bid has been accepted. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") shall name the sum which AEGCL will pay the Contractor in consideration of the execution, completion and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Conditions of Contract called "the Contract Price").

1.33.2 The notification of award will constitute the formation of the Contract.

1.34.0 SIGNING OF CONTRACT AGREEMENT

1.34.1 At the same time that it notifies the successful bidder that its bid has been accepted, AEGCL will send the bidder the Form of Contract Agreement incorporating all agreements between the parties.

1.34.2 Within **15 (fifteen) days** of receipt of the Form of Agreement, the successful bidder shall sign the Form and return it to AEGCL.

1.35.0 WARRANTY

1.35.1 The contractor warrants that all goods are new, unused and of the most recent or current models, and that they incorporate all recent improvements in design and materials, unless provided otherwise in the Contract. The term period of warranty shall mean the period of 18 months from the date of the materials are received at site in good and acceptable condition. If during the period of warranty, any defect is found, the Contractor shall rectify all defects in design, materials and workmanship that may develop under normal use of the equipment upon written notice from the Purchaser who shall indicate in what respects the equipment is faulty. The rectification / free replacement must be carried out within a reasonable time period and at free of cost.

1.35.2 In the event of any emergency, where in the judgment of AEGCL, delay would cause serious loss or damages, repairs or adjustment may be made by the engineer or a third party chosen by the engineer without advance notice to the contractor and the cost of such work shall be paid by the contractor. In the event such action is taken by the engineer, the contractor will be notified promptly and he shall assist wherever possible in making necessary corrections. This shall not relieve the contractor of his liabilities under the terms and conditions of the contract.

1.35.3 If it becomes necessary for the contractor to replace or renew any defective portions of the works, the provision of this clause shall apply to portion of the works so replaced or renewed until the expiry of eighteen (18) months from the date of such replacement or renewal.

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

1.35.5 The acceptance of the equipment by the Employer shall in no way relieve the contractor of his obligation under this clause.

1.35.6 In the case of those defective parts, which are not repairable at site but are essential for the commercial operation of the equipment, the contractor and the engineer shall mutually agree to a programme of replacement or renewal, which will minimize interruption to the maximum extent in the operation of the equipment.

1.36.0 PERFORMANCE SECURITY (Contract Performance Guarantee)

1.36.1 As a Contract Performance Security, the successful Bidder, to whom the work is awarded, shall be required to furnish a Performance Guarantee from a Nationalized Bank, in the form attached with the Bidding Document (Section –5) in favour of the AEGCL. The guarantee amount shall be equal to ten percent (10%) of the Contract Price and it shall guarantee the faithful performance of the contract in accordance with the terms and conditions specified in these documents and specifications. The guarantee shall be valid up to 90 (ninety) days after the end of Warranty Period.

1.36.2 In case the bidder fails to submit the Performance Security in the form of Bank Guarantee, an amount equivalent to 10% of the Contract Price shall be retained as Security Deposits which shall be retained up to 90 (ninety) days after the end of Warranty Period

1.36.3 The performance guarantee shall cover additionally the following guarantees to the owner:

a) The successful Bidder guarantees the successful and satisfactory operation of the equipment furnished and erected under the contract, as per the specifications and documents.

b) The successful Bidder further guarantees that the equipment/material provided and installed by him shall be free from all defects in design, material and workmanship and shall upon written notice from the Owner fully remedy must be guaranteed.

1.36.4. The Contract performance Guarantee will be returned to the Contractor without any interest at the end of warranty period and written request from the contractor.

1.37.0 TERMS OF PAYMENT

The terms of payment for the supply work shall be as follows

i. No advance payment shall be made in this contract.
ii. No claim for interest shall be entertained by AEGCL
iii. The price is firm and no price variation shall be applicable.
iv. Final bill must contain the original site register.
v. Payment shall be released subject to receipt of specific fund. The Bidder / Firm will have to be submitted the following Net Banking details.
    a) Banker's Name & Branch
    b) Account No
    c) Banker's address
    d) Banker's IFSC Code
    e) Banker's RTGS Code

1.38.0 CORRUPT OR FRAUDULENT PRACTICES

1.38.1 It is required that bidders/suppliers/contractors observe the highest standard of ethics during the procurement and execution of the contracts. In Pursuance of this Clause AEGCL;

(a) defines, for the purposes of this provision, the terms set forth below as follows:

(i) "corrupt practice" means behavior on the part of officials in the public or private sectors by which they improperly and unlawfully enrich themselves and/or those close to them, or induce others to do so, by misusing the position in which they are placed, and it includes the offering, giving, receiving or soliciting of anything of value to influence the action of any such official in the procurement process or in contract execution; and

(ii) "fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition;

(b) will reject a proposal for award if it determines that the bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;

(c) will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a contract by AEGCL if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, a contract.

1.39.0 PENALTY FOR DELAYED EXECUTION

In the event of delay in completing the work extending beyond the date of completion or beyond the extended date, if any, permitted by the Board, the contractor shall pay as agreed liquidated damage and not as a penalty a sum equal to 1% of the contract price under this contract for each week of delay or part thereof subject to a maximum of 10% of the contract price.

1.40.0 FORCE MAJEURE

Force Majeure shall be considered as any circumstances beyond the reasonable control of the party claiming relief, including but not limited to strikes lockout, civil commotion, riot, insurrection, hostilities, war, fire, flood, earthquake, delay in delivery of equipments or part thereof by AEGCL, would entitle contractor to extension of time.

1.41.0 SETTLEMENT OF THE DISPUTE & ARBITRATION

Any dispute arising out of the contract will first be discussed and settled bilaterally between the Assam Electricity Grid Corporation Limited and firms/ contractors. In case, the dispute cannot be settled bilaterally, it will be referred to arbitration by an arbitrator to be appointed by the AEGCL, The contractor shall not stop the work during settlement of any arbitration case. All disputes arising out of the agreement so made shall be subjected to the jurisdiction of district court of Kamrup District.

Bidder's Signature & Seal

SECTION-2

PURCHASER'S REQUIREMENTS

2.1.0 SCOPE OF WORK:

2.1.1 This section of the specification deals with the technical information & criteria for various equipment/ material. The Contractor's proposal shall be based on the use of materials complying fully with the requirements specified herein. The work involves design, engineering, manufacture, assembly, inspection, testing at manufacturer's works before dispatch, packing, supply, including insurance during transit, delivery at site of various equipment and materials including substation steel structures as specified in subsequent Clauses and Sections.

2.1.2 It is not the intent to specify completely herein all details of design and construction of the equipment and accessories. However, the equipment and accessories shall conform in all respects to high standards of engineering, design and workmanship and be capable of performing in continuous operation up to the bidder's guarantees in a manner acceptable to the Purchaser. The Purchaser will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgment is not in full accordance therewith.

2.1.3 The various items of supply are described very briefly in the schedule of Bid Form, Prices & Other Schedules and annexure. The various items as defined in these schedules shall be read in conjunction with the corresponding section in the technical specifications (whichever is applicable) including amendments and, additions if any.

2.2.0 CONTRACTOR TO INFORM HIMSELF FULLY

2.2.1 The contractor should admit that he has examined the general condition of contract, specifications and schedule and has satisfied as to all the conditions and circumstances affecting the contract prices and fixed his price according to his own views on these matters and acknowledge that no additional allowances except as otherwise provided therein will be levied. The purchaser shall not be responsible for any misunderstanding or incorrect information obtained by the

2.3.0 STANDARDS

2.3.1 The equipment covered under this bidding document shall, unless otherwise stated be designed, constructed and tested in accordance with the latest revisions of relevant Indian Standards and shall conform to the regulations of local statutory authorities. In case of any conflict between the standards and this specification, this specification shall govern.

2.3.2 Equipment conforming to other international or authoritative Standards which ensure equivalent or better performance than that specified under Clause 3.6.0 above shall also be accepted. In that case relevant extracts of the same shall be forwarded with the bid.

2.4.0 ENGINEERING DATA

2.4.1 The furnishing of engineering data by the Contractor shall be in. accordance with the Bidding Document. The review of these data by the Employer will cover only general conformance of the data to the specifications and not a thorough review of all dimensions, quantities and details of the materials, or items indicated or the accuracy of the information submitted. This review by the Employer shall not be considered by the Contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications.

2.4.2 All engineering data submitted by the Contractor after review by the Employer shall or part of the contract document.

2.5.0 DRAWINGS AND DOCUMENTS FOR APPROVAL

2.5.1. All necessary drawings and documents required for completion of the project is to be submitted by the contractor for approval. The drawings provided with bid (if any) are for indicative purpose only and fresh drawings are to be prepared by the contractor as per actual site condition after survey. The drawings and documents are to be approved by AEGCL before procurement or commencement of work.

2.5.2 All drawings submitted by the Contractor including those submitted at the time of Bid shall be with sufficient detail to indicate the type, size, arrangement, dimensions, material description, Bill of Materials, weight of each component break-up for packing and shipment, fixing arrangement required, the dimensions required for installation and any other information specifically requested in these specifications.

2.5.3 Each drawing submitted by the Contractor shall be clearly marked with the name of the Employer, the specification title, the specification number and the name of the Project. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be to the scale and in S.I. units.

2.5.4 **The drawings submitted for approval to the Employer shall be in quadruplicate**. One print of such drawings shall be returned to the Contractor by the Employer marked "approved/approved with corrections". The contractor shall there upon furnish the Employer additional prints as may be required along with one reproducible in original of the drawings after incorporating all corrections.

2.5.5 The Contractor shall perform the work strictly in accordance with these drawings and no deviation shall be permitted without the written approval of the Employer, if so required.

2.5.6 All manufacturing, fabrication and erection work under the scope of Contractor prior to the approval of the drawings shall be at the Contractor's risk. The contractor may make any changes in the design which are necessary to conform to the provisions and intent of the contractor and such changes will again be subject to approval by the Employer.

2.5.7 The approval of the documents and drawings by the Employer shall mean that the Employer is satisfied that:

a) The Contractor has completed the part of the Works covered by the subject document (i.e. confirmation of progress of work).

b) The Works appear to comply with requirements of Specifications.

2.5.8 In no case the approval by the Employer of any document does imply compliance with neither all technical requirements nor the absence of errors in such documents. If errors are discovered any time during the validity of the contract, then the Contractor shall be responsible of their consequences.

2.5.9 For equipment and items in the scope of supply:

a) General arrangement drawing with full dimensions.
b) Electrical schematic diagram, where applicable.
c) Wiring diagram, where applicable.

All Designs/Drawings/Calculations/Data submitted by the contractor, from time to time shall become the property of the Employer and Employer has the right to use or replicate such designs for future contracts / works without the permission of the Contractor. The Employer has all rights to use/ offer above designs/drawings/data sheets to any other authority without prior Permission of the Contractor.

2.6.0 FINAL DRAWINGS AND DOCUMENTS

2.6.1 The successful Contractor shall require to provide following drawings and documents in printed form:

a) All approved drawings (AS BUILD) of equipment in three (3) copies.
b) Instruction manuals of the equipment in three (3) copies. These instruction manuals shall generally consist of-
   i) Operation Manuals,
   ii) Maintenance Manuals and
   iii) Spare Parts Bulletins.
c) Copies of routine test reports (in triplicate) of relevant equipment.
d) Final Guaranteed and Other technical particulars of relevant equipment.
e) In addition to the above the Contractor shall provide five (5) sets of all the drawings and documents to Employer in printed form for his reference and record.

2.7.0 QUALITY ASSURANCE DOCUMENTS

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

2.7.2 The Employer or his duly authorized representatives reserves the right to carry out Quality Audit and quality surveillance of the systems and procedures of the Contractors/his vendors Quality Management and Control Activities.

2.8.0 EMPLOYER'S SUPERVISION

2.8.1 To eliminate delays and avoid disputes and litigation it is agreed between the parties to the Contract that all matters and questions shall be resolved in accordance with the provisions of this document.

2.8.2 The manufacturing of the product shall be carried out in accordance with the specifications. The scope of the duties of the Employer, pursuant to the contract, will include but not be limited to the following:-

a) Interpretation of all the terms and conditions of these Documents and Specifications.
b) Review and interpretation of all the Contractors drawings, engineering data etc.
c) Witness or authorize his representative to witness tests at the manufacturer's works or at site, or at any place where work is performed under the contract.
d) Inspect, accept or reject any equipment, material and work under the Contract, in accordance withthe Specifications.
e) Issue certificate of acceptance and/or progressive payment and final payment certificate.
f) Review and suggest modification and improvement in completion schedules from time to time, and
g) Supervise the Quality Assurance Programme implementation at all stages of the works.

2.9.0 INSPECTION AND INSPECTION CERTIFICATE

2.9.1 The Employer, his duly authorized representative and/or outside inspection agency acting on behalf of the Employer shall have, at all reasonable times, access to the premises and works of the Contractor and their sub-contractor(s)/sub-vendors and shall have the right, at the reasonable times, to inspect and examine the materials and workmanship of the product during its manufacture.

2.9.2 All routine and acceptance tests whether at the premises or works of, the Contractor or of any Sub Contractor, the Contractor except where otherwise specified shall carry out such tests free of charge. Items such as labour, materials, electricity, fuel, water, stores apparatus and instruments as may be reasonably demanded by the Employer/inspector or his authorized representative to carry out effectively such tests in accordance with the Contract shall be provided by the Contractor free of charge.

2.9.3 If desired by the Employer, the Contractor shall also carry out type tests as per applicable Standards for which Employer shall bear the expenses except in cases where such tests have to be carried out. The Contractor is required to quote unit rates of type test charges in a separate Schedule (if such schedule is provided in the Bidding Document) in pursuance to this Clause. However, these type test charges shall not be taken into account in comparing Price Bid.

2.9.4 The inspection by Employer and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed Quality Assurance Programme forming a part of the Contract.

2.10.0 TESTS

2.10.1 The type, acceptance and routine tests and tests during manufacture to be carried-out on the material and equipment shall mean as follows:

a) Type Tests shall mean those tests, which are to be carried out to prove the process of manufacture and general conformity of the material to this Specification. These tests shall be carried out on samples prior to commencement of commercial production against the order. The Bidder shall indicate his schedule for carrying out these tests.

b) Acceptance Tests shall mean those tests, which are to be carried out on samples taken from each lot offered for pre-dispatch inspection, for the purposes of acceptance of that lot.

c) Routine Tests shall mean those tests, which are to be carried out on the material to check requirements, which are likely to vary during production.

d) Tests during Manufacture shall mean those tests, which are to be carried out during the process of manufacture and end inspection by the Contractor to ensure the desired quality of the end product to be supplied by him.

e) The norms and procedure of sampling for these tests will be as per the Quality Assurance Programme to be mutually agreed to by the Contractor and the Employer.

2.10.2 The standards and norms to which these tests will be carried out are specified in subsequent Sections of this Specification. Where a particular test is a specific requirement of this Specification, the norms and procedure of the test shall be as specified or as mutually agreed to between the Contractor and the Employer in the Quality Assurance Programme.

2.10.3 For all type and acceptance tests, the acceptance values shall be the values specified in this Specification or guaranteed by the Bidder or applicable Standards, as applicable.

2.11.0 **TYPE TEST REPORTS**

2.11.1 Materials, which have never been tested for critical performance, shall not be accepted. In such cases, a promise or agreement by a bidder to have the equipment tested after award of a contract is not acceptable.

2.11.2 All Bids must be accompanied by the Type Test Certificates of materials offered (refer Clause 3.13.5 below). Such type test certificates shall be acceptable only if:-

a) Tests are conducted in an independent testing laboratory with NABL accreditation, or

b) Tests are conducted in manufacturer's own laboratory.

In case of (a) the laboratory must have NABL accreditation; and

In case of (b) tests have been witnessed by technically qualified representatives of earlier clients or purchaser.

2.11.3 Test reports to be acceptable must be related directly to the equipment offered i.e. it is fully identical in design, rating and construction with the equipment for which the type test certificates have been submitted. Test reports for higher class (by capacity/voltage etc.) of equipment are acceptable with commitment to perform the type tests free of any charge on the particular equipment after the award of contract.

2.11.4 Type Test Reports older than ten (10) years on the date of Technical bid opening shall not be accepted.

2.12.0 GUARANTEED TECHNICAL PARTICULARS

2.12.1 The Guaranteed Technical Particulars of the various items shall be furnished by the Bidders with the Technical Bid in the prescribed Schedules of the bidding document. The Bidder shall also furnish any other information's as in their opinion is needed to give full description and details to judge the item(s) offered by them.

2.12.2 The data furnished in Guaranteed Technical Particulars should be the minimum or maximum value (as per the requirement of the specification) required. A Bidder may guarantee a value more stringent than the specification requirement. However, for testing purpose or from performance point of view, the material shall be considered performed successfully if it achieves the minimum/maximum value required as per the technical specification. No preference what so ever shall be given to the bidder offering better/more stringent values than those required as per specification except where stated otherwise.

2.13.0` MATERIALS HANDLING AND STORAGE

2.13.1 All the supplies under the Contract as well as Employer supplied items (if any) arriving at site shall be promptly received, unloaded and transported and stored in the stores by the Contractor.

2.13.2 Contractor shall be responsible for examining all the shipment and notify the Employer immediately of any damage, shortage, discrepancy etc. for the purpose of Employer's information only. The Contractor shall submit to the Employer 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 at site. Any demurrage, and other such charges claimed by the transporters, railways etc., shall be to the account of the Contractor.

2.13.3 The Contractor shall maintain an accurate and exhaustive record-detailing out the list of all items received by him for the purpose of erection and keep such record open for the inspection of the Employer.

2.13.4 All items shall be handled very carefully to prevent any damage or loss. The materials stored shall be properly protected to prevent damage. The materials from the store shall be moved to the actual location at the appropriate time so as to avoid damage of such materials at Site.

2.13.5 All the materials stored in the open or dusty location must be covered with suitable weather-proof and flameproof covering material wherever applicable.

2.13.6 The Contractor shall be responsible for making suitable indoor storage facilities, to store all items/materials, which require indoor storage.

2.13.7 The Contractor shall have total responsibility for all equipment and materials in his custody, stored, 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.

2.14.0 SERVICE CONDITIONS

The materials supplied shall be suitable for operation under the following climatic and other conditions:

1. Peak ambient day temperature in still air: 45 ^{0}C
2. Minimum night temperatures : 0 ^{0}C
3. Ground temperatures: 40 ^{0}C
4. Reference ambient day temperature : 45 ^{0}C
5. Relative Humidity : i). Maximum - 100 % ii). Minimum - 10 %
6. Altitude : Below1000 M above MSL
7. Maximum wind pressure : As per IS: 802
8. Seismic Intensity: ZONE-V as per IS 1893.

2.15.0 COMMISSIONING SPARES

2.15.1 It will be the responsibility of the Contractor to provide all commissioning spares required for initial operation till the Employer declares the equipment as ready for commissioning. All commissioning spares shall be deemed to be included in the scope of the Contract at no extra cost to the Employer.

2.15.2 These spares shall be received and stored by the Contractor at least 1 month prior to the schedule date of commencement of commissioning of the respective equipment and utilized as and when required. The unutilized spares and replaced parts, if any, at the end of successful completion of performance and guarantee test shall be the property of the Contractor and he will be allowed to take these parts back at his own cost with the permission of Employer's Representative.

2.16.0 SPECIFICATION FOR DESIGN AND FABRICATION OF SUBSTATION STEEL STRUCTURES

2.16.1 SCOPE

This section covers the design parameters and specification for fabrication and galvanizing, of steel structures, bolts & nuts, tower accessories etc. for Substations covered under this Bid Document.

2.16.2 MATERIALS

Structural Steel

The structures shall be of structural steel conforming to any of the grade, as appropriate, of IS 2062 (latest edition) Steel conforming IS 8500 may also be used.
Medium and high strength structural steels with known properties conforming to any other national or international standards may also be used.

Bolts

Bolts used shall conform to IS12427 or bolts of property class 4.6 conforming to IS 6639 may also be used.
High strength bolts, if used (only with steel conforming to IS 8500) shall conform to property class 8.8 of IS 3757.
Foundation Bolts shall conform to IS 5624.
Step bolts shall conform to IS 10238

Nuts

Nuts shall conform to IS 1363 (Part 3). The mechanical properties shall conform to property class 4 or 5 as the case may be as specified in IS 1367 (Part 6) except that the proof stress for nuts of property class 5 shall be as given in IS 12427.
Nuts to be used with high strength bolts shall conform to IS 6623.

Washers

Washers shall conform to IS 2016. Heavy washers shall conform to IS 6610. Spring washers shall conform to type B of IS 3663
Washers to be used with high strength bolts and nuts shall conform to IS 6649.

Galvanization

Structural members, plain and heavy washers shall be galvanized in accordance with the provisions of IS 4759.
Spring washers shall be hot dip galvanized as per service grade 4 of IS 4759 or IS 1537.

Other Materials

Other materials used in the construction of the supporting structures shall conform to appropriate Indian Standards wherever available.

2.16.3 DESIGN PARAMETERS

Switchyard structures such as columns, beams and equipment mounting structures shall be designed as per actual site requirement. The drawings are to be submitted for approval prior to supply/execution.
Note: Structures with earth peak shall assume to have four earth wires for design purpose in normal condition.

Spans

Following Spans shall be considered in design of all structures as applicable: -
a) Line gantries (structures to terminate lines):
(i) For 33 KV Switchyard: 50 Meter, wind & weight span.

b) All other Structures
(i) For 33 KV Switchyard: 20 Meter, wind & weight span.

Deviation Angle

The design of line gantries shall only be checked for a maximum deviation angle of 300 from normal at center of gantries to Dead End Tower.

2.16.4 DESIGN DRAWINGS

a. The relevant drawings for all the towers, beams and equipment mounting structures shall be furnished by the Supplier to the Purchaser which shall include structural/fabrication drawings, Bill of Materials including nuts and bolts.
b. The structural drawings, Bill of materials and shop fabrication drawings for all the structures shall be submitted in four copies and will be finally approved by the Purchaser.
c. The fabrication shall be taken up from the approved shop drawings.
d. The overall responsibility of fabricating structure members correctly lies with the Supplier only and the Supplier shall ensure that all the members can be fitted while erecting without any undue strain on them.

2.16.5 ACCESSORIES

a) Step Bolts

Each column/tower shall be provided with step bolts conforming to IS: 10238 of not less than 16mm diameter and 175mm long spaced not more than 450mm apart and extending from 2.5 meters above the ground level to the top. Each step bolt shall be provided with two nuts on one end to fasten the bolt securely to the tower and button head at the other end to prevent the feet from slipping away. The step bolts shall be capable of withstanding a vertical load not less than 1.5 KN.

b) Insulator Strings and Conductor Clamps Attachments

Single suspension and tension insulator string assemblies shall be used for stringing busbars for the attachment of Suspension Insulator string, a suitable strain plate of sufficient thickness for transferring the load to the tower body shall be provided. To achieve requisite clearances, if the design calls for providing extra D-shackles, link plate etc. before connecting the insulator string the insulator string the same shall be supplied by the Supplier.

At tension points strain plates of suitable dimensions placed on the beams, shall be provided for taking the hooks or D-shackles of the tension insulator strings. To achieve requisite clearances, if the design calls for providing extra D-shackles, link plate etc. before connecting the insulator string the same shall be supplied by the Supplier.

c) Earth wire Clamps Attachment

Suspension Clamp

The detailed drawing shall be submitted by the Supplier for Purchaser's approval. The Supplier shall also supply U- bolts, D-shackles wherever required.

Tension Clamps

Earth-wire peaks of tension towers shall be provided with suitable plates to accommodate the shackle of tension clamps. The Supplier shall also supply the U-bolts wherever required and take Purchaser's approval for details of the attachments before the mass fabrication.

2.16.6 FABRICATION

2.16.6.1 The fabrication of substation steel structures shall be in conformity with the following:

a. Except where hereinafter modified, details of fabrication shall conform to IS: 802 (Part-II) or the relevant international standards.
b. The tower structures shall be accurately fabricated to connect together easily at site without any undue strain on the bolts.
c. No angle member shall have the two leg flanges brought together by closing the angle.
d. The diameter of the hole shall be equal to the diameter of bolt plus 1.5mm.
e. The structure shall be designed so that all parts shall be accessible for inspection and cleaning. Drain holes shall be provided at all points where pockets of depression are likely to hold water.
f. All identical parts shall be made strictly inter-changeable. All steel sections before any work are done on them shall be carefully levelled, straightened and made true to detailed drawings by methods which will not injure the materials so that when assembled, the adjacent matching surfaces are in close contact throughout. No rough edges shall be permitted in the entire structure.
g. Minimum Thickness of Tower Members shall be as follows: -

ITEM	Minimum thickness (in mm)
Leg members & main chords of beams in compression	5
Other members	4

2.16.6.2 **Drilling and Punching**

Before any cutting work is started, all steel sections shall be carefully strengthened and trued by pressure and not by hammering. They shall again be trued after being punched and drilled.
Holes for bolts shall be' drilled or punched with a jig but drilled holes shall he preferred. The punching may be adopted for thickness up to 16mm. Tolerances regarding punch holes are as follows:

Holes must be perfectly circular and no tolerances in this respect are permissible.
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 a punched holes should not exceed 0.8 mm on diameter.
Holes must be square with the plates or angles and have their walls parallel.

All burrs left by drills or punch shall be removed completely. When the tower members are in position the holes shall be truly opposite to each other. Drilling or reaming to enlarge holes shall not be permitted.

2.16.6.3 **Erection mark**

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

2.16.7 GALVANIZING AND PAINTING

2.16.7.1 Galvanizing of the various members of the structures shall be done only after all works of sawing, shearing, drilling, filling, bending and matching are completed. Galvanizing shall be done by the hot dip process as recommended in IIS: 2629 or other such authoritative international standards and shall produce a smooth, clean and uniform coating of not less than 61 0 gm per square meter. The preparation for galvanizing and the galvanizing process itself must not affect adversely the mechanical properties of the treated materials. No manual Galvanization process will be accepted.

2.16.7.2 All assembly bolts shall be thoroughly hot dip galvanized after threading. Threads shall be of a depth sufficient to allow for the galvanized coating, which must not be excessive at the root of the threads, so that the nut shall turn easily on the completed bolts without excessive looseness. The nut threads shall not be galvanized, but oiled only.

2.16.7.3 The outside surface shall be galvanized. Sample of galvanized materials shall be supplied to the galvanized test set out in IIS 729 or other such authorities international standards.

2.16.8 EARTHING

2.16.8.1 To keep provision in the structures for earthling, holes shall be drilled on two diagonals opposite legs of the towers/columns/mounting structures. The holes shall be suitable for bolting 65 mm X 1 2 mm GII strips and shall be such that the lower hole is about 350 mm above the ground level, clear of the concrete muffing, for connecting the earthling strip.

2.16.9 TEST AND TEST CERTFICATE

2.16.9.1 Each consignment ready for transportation shall be offered to ASEB for inspection before dispatch giving a minimum time of not less than 30 days. Samples of fabricated structure materials shall be subjected to following tests: -

a. **Steel:** The structural steel shall conform to IS 226 and IS 8500, BS 4360-1068 or ISO / R 630 other such authoritative international standards. Manufacturer's test certificate shall be submitted for all used steel.
b. **Galvanising:** The galvanising shall be as per IS 2633 or BS 729 other such authoritative international standards. Zinc coating over the galvanised surfaces shall not be less than 610 gm per square meter.
c. **Bolts and nuts:** Manufacturer's test certificate as per standard practice shall be submitted.

2.16.10 TEST AT SUPPLIER'S PREMISES

2.16.10.1 The Supplier shall fabricate one specimen structure of each type as soon as possible after placement of order and before starting the bulk fabrication of the structures ordered. It shall be assembled on a foundation as nearly similar as practicable to site and tested with suitable test loads as per specified broken wire condition, multiplied by the corresponding factor of safety to ensure that the design and fabrication complies with the requirements. Each structure shall be capable of withstanding the above-mentioned tests without any injury or any permanent deflection at any part. If any member is found to be weak or damaged the design should be suitably modified and the tower re-tested.

2.16.10.2 After the first lot of the structures manufactured, the members forming one structure of each type shall be selected at random from the lots of similar member and assembled in exactly the same manner as to be done at site. The structure then shall be set on foundation as nearly similar as practicable to site and tested with equivalent test load for which the structure has been designed.

2.16.10.3 No structure or any member thereof, which failed the test shall be supplied.

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2.17.0 TECHNICAL SPECIFICATION FOR SURGE ARRESTERS FOR 132KV SYSTEMS.

2.17.1 SCOPE

2.17.1.1 This Section covers the specifications for design, manufacture, testing, transportation delivery at site, erection, and commissioning of class heavy duty, gapless metal (zinc) oxide Surge Arrestors complete with fittings & accessories for 132 kV systems.

2.17.2 STANDARDS

2.17.2.1 The design, manufacture and performance of Surge Arrestors shall comply with IS: 15086 Part-4 / IEC: 60099-4 unless otherwise specifically specified in this Specification

2.17.3 GENERAL REQUIREMENT

2.17.3.1 The surge arrestor shall draw negligible current at operating voltage and at the same time offer least resistance during the flow of surge current. **The surge arrester shall be used in solidly earthed system**.

2.17.3.2 The surge arrestor shall consist of non-linear resistor elements placed in series and housed in electrical grade porcelain housing of specified creepage distance.

2.17.3.3 The assembly shall be hermetically sealed with suitable rubber gaskets with effective sealing system arrangement to prevent ingress of moisture.

2.17.3.4 The surge arrestor shall not operate under power frequency and temporary over voltage conditions but under surge conditions, the surge arrestor shall change over to the conducting mode.

2.17.3.5 The surge arrestor shall be suitable for circuit breaker performing 0-0.3sec.-CO-3min-CO- duty in the system.

2.17.3.6 Surge arrestors shall have a suitable pressure relief system to avoid damage to the porcelain housing and providing path for flow of rated fault currents in the event of arrestor failure..

2.17.3.7 The reference current of the arrestor shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltage.

2.17.3.8 The Surge Arrestor shall be thermally stable and the bidder shall furnish a copy of thermal stability test with the bid.

2.17.3.9 The arrestor shall be capable of handling terminal energy for high surges, external pollution and transient over voltage and have low losses at operating voltages.

2.17.4 ARRESTOR HOUSING

2.17.4.1 The arrestor housing shall be made up of porcelain housing and shall be homogenous, free from laminations, cavities and other flaws of imperfections that might affect the mechanical and dielectric quality. The housing shall be of uniform brown colour, free from blisters, burrs and other similar defects. Arrestors shall be complete with insulating bases, fasteners for stacking units together, surge counters with leakage current meters and terminal connectors.

2.17.4.2 The **housing shall be so coordinated that external flashover shall not occur due to application of** any impulse or switching surge voltage up to the maximum design value for arrestor. The arrestors shall not fail due to contamination. The arrester housings shall be designed for pressure relief class as given in Technical Parameters of the specification.

2.17.4.3 Sealed housings shall exhibit no measurable leakage.

2.17.5 FITTINGS & ACCESSORIES

2.17.5.1 The surge arrestor shall be complete with insulating bases, fasteners for stacking units together, surge counters with leakage current meters and terminal connectors.

2.17.5.2 The terminals shall be non-magnetic, corrosion proof, robust and of adequate size and shall be so located that incoming and outgoing connections are made with minimum possible bends. The top metal cap and base of surge arrestor shall be galvanized. The line terminal shall have a built-in clamping device which can be adjusted for both horizontal and vertical takeoff.

2.17.5.3 Grading corona control rings if necessary, shall be provided on each complete arrestor pole for proper stress distribution.

2.17.6 SURGE MONITOR

2.17.6.1 A self-contained discharge counter suitably enclosed for outdoor use and requiring no auxiliary or battery supply for operation shall be provided for each single pole unit. Leakage current meter with scale range **of 0 to 5mA peak/root 2 to** measure leakage current of surge arrestor shall also be supplied within the same enclosure. The number of operations performed by the arrestor shall be recorded by a suitable non-resettable cyclometric counter and surge monitor shall be provided with an inspection window. There shall be a provision for putting ammeter to record the current/alarm contacts suitable for communication to SCADA in the control room if the leakage current exceeds the permitted value. Similar provision shall be considered for surge counter also.

2.17.6.2 Surge monitor shall be mounted on the support structure at a suitable height so that the reading can be taken from ground level through the inspection window and length of connecting leads of **minimum 5kV rating** up to grounding point and bends shall be minimum.

2.17.7 TESTS

2.17.7.1 Test on Surge Arrestors

The Surge Arrestors offered shall be type tested and shall be subjected to routine and acceptance tests in accordance with IS: 15086 (Part-4). In addition, the suitability of the Surge Arrestors shall also be established for the following:

- Residual voltage test
- Reference voltage test
- Leakage current at M.C.O.V
- P.D. test
- Sealing test
- Thermal stability test
- Aging and Energy capability test
- Watt loss test

2.17.7.2 Each metal oxide block shall be tested for guaranteed specific energy capability in addition to routine/acceptance test as per IEC/IS.

2.17.7.3 The surge arrestor housing shall also be type tested and shall be subjected to routine and acceptance tests in accordance with IS: 2071.

2.17.7.4 Galvanization Test

All Ferrous parts exposed to atmospheric condition shall have passed the type tests and be subjected to routine and acceptance tests in accordance with IS: 2633 & IS 6745.

2.17.8 NAME PLATE

2.17.8.1 The name plate attached to the arrestor shall carry the following information:

Rated Voltage
Continuous Operation Voltage
Normal discharge current
Pressure relief rated current
Manufacturers Trade Mark
Name of Sub-station
Year of Manufacturer
Name of the manufacture
Purchase Order Number along with date.
Energy Absorption Capability

2.17.9 PRE-COMMISSIONING TESTS

2.17.9.1 Contractor shall carry out following tests as pre-commissioning tests. Contractor shall also perform any additional test based on specialties of the items as per the field instructions of the equipment Supplier or Employer without any extra cost to the Employer. The Contractor shall arrange all instruments required for conducting these tests along with calibration certificates and shall furnish the list of instruments to the Employer for approval.

(a) Operation check of LA counters.
(b) Insulation resistance measurement.
(c) Third harmonic resistive current measurement (to be conducted after energisation.)

2.17.10 TYPE AND RATINGS may be read as:

Sl. No.	Particulars	Voltage Level
		145 kV
I	II	III
1	Rated voltage of arrester, kV	120
2	Continuous operating voltage, kV	102
2	Rated frequency, Hz	50
3	Nominal discharge current of arrester, kA	10
4	(i) Min. switching surge residual voltage (2kA),kVp	IEC

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	(i) Max. switching surge residual voltage (500 kA),kVp	IEC
5	Maximum residual voltage at,	
	(i) 5 kA nominal discharge current, kV (peak)	IEC
	(ii) 10kA nominal discharge current, kV (peak)	IEC
	(iii) 20kA nominal discharge current, kV (peak)	IEC
	(iv) Steep fronted wave residual voltage, kV (peak)	IEC
6	One minute power frequency withstand voltage of arrester housing, kV (rms)	275
7	1.2 / 50 □ second impulse withstand voltage of arrester housing, kV (peak)	650
8	Switching impulse withstand voltage (250/2500 micro second) of arrester housing dry and wet, kV (peak)	-
9	Creepage distance of insulator housing (mm)	4495
10	Line discharge class	3
11	Short time current rating, kA for 3 sec	40
12	Pressure Relief Class	A
13	Minimum cantilever strength (upright)	6KN

2.18.0 TECHNICAL PARTICULARS OF 132 kV ISOLATOR

2.18.1 SCOPE

This specification provides for design, manufacturer, testing at manufacturer's Works and delivery, supervision of erection, commissioning (if required) of outdoor station type 132KV Isolator with/ without earth switches, with electrical/**mechanical** interlock, insulators and complete in all respect with bimetallic connectors arcing horns operating mechanism, auxiliary switches, indicating devices, fixing detail etc. as described hereinafter.

2.18.2 STANDARDS

Disconnecting switches covered by this specification shall conform to latest edition IEC-129/IEC 62271-102 I.S.1813 and IS: 9921, IS-325 and unless specifically stated otherwise in this specification.

2.18.3 TYPE

The 132 KV Isolators shall be outdoor type with centre break type/Pantograph type as required [Single(SI)/ Double(DI)] Isolators suitable for electrical as well as manual operation and local/ remote operation; but 33KV Isolators (SI or DI) shall be outdoor type with three phase double break center rotating manual as well as motor operated type with local/remote operation. They shall have crank and reduction gear mechanism.

All Isolators offered shall be suitable for horizontal upright mounting on steel structures. Each pole unit of the multiple Isolators shall be of identical construction and mechanically linked for gang operation.

Each pole of the Isolator shall be provided with two sets of contacts to be operated in series and the moving contact blades shall rotate in horizontal plane.

The design shall be such that the operating mechanism with the linkages shall be suitable for mounting on any of the outer pole ends without much difficulty and with minimum shifting of parts.

Moving contacts of all isolators shall rotate through 90 deg. from their "fully closed position" to "fully open position so that the break is distinct and clearly visible from ground level.

The Isolators offered by the Bidder shall be designed for Normal rating current for Isolator as follows:

132kV
2000/1600/1250A

It should suitable for continuous service at the system voltages specified herein. The Isolators shall be suitable to carry the rated current continuously and full short circuit current of 40 KA for 132KV respectively for 3 second at site condition without any appreciable rise in temperature. These shall also be suitable for operation at 110% rated (normal) voltage. The Isolators shall be suitable for Isolating low capacitive / inductive currents of 0.7amp at 0.15 power factor. The isolators shall be so constructed that they don't open under the influence of short circuit conditions.

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The Isolators and earthing switches are required to be used on electrically exposed installation and this should be taken into account while fixing the clearance between phases and between phase and earth. so that de-energized isolator and earth switch also can be manually operated when the parallel circuit is energized.

2.18.4 MAIN CONTACTS

All Isolators shall have heavy duty, self-aligning and high-pressure line type **dust-free jaw** contacts made of high conductivity, corrosion resistant, hard-drawn electrolytic copper strips of proper thickness and contact area. Fixed contact should consist of loops of above copper strips suitable for 2000 Amps ratings for 132KV Isolators respectively. The hard dawn electrolytic copper strips should be silver plated 25micron thickness and fixed contacts should be backed by powerful phosphor bronze/stainless steel springs of suitable numbers. The main contacts should be preferably of tulip type design. However, the thickness and contact area of the contact should conform to the drawing approved during type test. Moving contact with moving arm should be of hard- drawn electrolytic copper of proper thickness and contact area.

These fixed and moving contacts shall be able to carry the rated current continuously and the maximum fault current of 40 KA for 132KV respectively for **3 seconds** without any appreciable rise in temperature. The Isolator blades shall retain their form and straightness under all conditions of operation including all mechanical stress arising out of operation as well as under rated short circuit condition.

Fixed guides shall be provided so that even when the blades are out of alignment, closing of the switches, proper seating of the blades in between contacts and adequate pressure to give enough contact surface is ensured. The contact shall be self-cleaning by the wiping action created by the movements of the blades.

The Isolator shall be self-cleaning type so that when isolators remain closed for long periods in a heavily polluted atmosphere, binding does not occur. No undue wear or scuffing shall be evident during the mechanical endurance tests, contacts and springs shall be designed so that adjustment of contact pressure shall not be necessary throughout the life of the isolator. Each contact or part of contacts shall be independently sprung so that full pressure is maintained on all contact at all times.

2.18.5 ARCING HORN AND GRADING HORN

Suitable arcing horn made of tinned electrolytic copper which are required for guiding contacts shall be provided on the fixed and moving contacts of all Isolators. The contacts shall be of 'make before and break after" type. Aluminium alloy grading ring are to be provided for 132kV voltage level.

2.18.6 ELECTRICAL INTERLOCK / MECHANICAL INTERLOCK

The disconnecting switches whenever required shall be with an approved type electrical interlock for interlocking with the associated circuit breakers and earth switch.

Electrical interlock shall ensure reliable operation. The design should be such that the electrical circuit for the interlocking mechanism **will remain energised as per operation of the isolator with integrated earth switches.**

2.18.7 AUXILIARY SWITCHES

All isolators and earthing switches shall be provided with 110/220VDC auxiliary switches for their remote position indication on the control board and for electrical locking with other equipment. The auxiliary switch shall be provided with a minimum of six auxiliary contacts- 10 normally open and 10 normally closed and 10 normally open and 10 normally closed for earth switch. Separate auxiliary switches shall be provided for isolating and earth switches. 6 additional NO and NC contact to be provided as spare in each case.

The auxiliary switches and auxiliary circuits shall have a continuous current carrying capacity of at least 10 Amps. Auxiliary switches shall not be used as limit switches. Details of make, rating and type of limit switch shall be furnished in the offer.

2.18.8 EARTH SWITCH

Line earth switch shall consist of three earthing blades for Isolator which normally rest against the frame when the connected Isolator is in closed position. The earthing blades for three phases shall be mechanically linked to a coupling shaft which shall be capable of being fitted on either side of the Isolator. The earthing blades shall match and be similar to the main switch blades and shall be provided at the hinge; with suitable flexible conductors with terminal lugs for connecting to the station ground bus. The earthing blades shall be operated by a separate mechanism but shall be mechanically interlocked with the main switch so that the earthing blades can be closed only when the main switches are in open position and vice-versa. The earthing blades shall be gang operated and all the three blades will operate simultaneously.

2.18.9 OPERATING MACHANISM

The operating mechanism shall be simple and shall ensure quick and effective **10000** mechanical operation. The design shall be such as to enable one man to operate it with nominal effort. The operating mechanism box shall be made out of aluminium extruded (Aluminium alloy) sections of minimum 3.0 mm thickness. The operating mechanism shall be strong rigid and not subject to rebound.

The Isolator blades shall be in positive continuous control throughout the entire cycles of operation. The operating rods and pipes shall be rigid enough to maintain positive control under most adverse conditions and to withstand all torsional and bending stresses arising from operation. Operation of the switches at any speed should not result in improper functioning, in displacement of parts / machines after final adjustment has been made. All holes in cranks, linkages etc. having moving pins shall be fitted accurately so as to prevent slackness and lost motion.

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Provision shall be made for padlocking the operating mechanism of disconnecting and earth switches in both open and closed positions.
Bearings shall be ball and roller type shall be protected from weather and dust by means of cover and grease retainers. Bearings pressures shall be kept low to ensure long life and care of operation.
Each power operated isolator shall be motor driven as well as manually operated and shall be complete with local / remote selector switch and open /close push buttons.
Provision shall be made in the control cabinet to disconnect power supply to prevent local / remote power operation. **Limit switches shall be provided with required number of contacts for isolators and earth switches.**
All the terminal blocks to be used in the operating mechanism should of **Ring type** of Poly-amide/Melamine material of make like Elmex/Connectwell.

2.18.10 DESIGN, MATERIALS AND WORKMANSHIP

The live parts shall be designed to eliminate sharp points, edges and corona producing surfaces. Where this is impracticable, adequate shields to be provided. All ferrous metal parts shall be hot dip galvanized, as per IS 2629.All metal parts shall be of such materials or treated in such a way so as to avoid rust, corrosion and deterioration due to continued exposure to atmosphere and rain. All current carrying parts shall be made from high conductivity electrolytic copper .
Bolts, screws and pins shall be provided with standard locking device viz. Locknuts, spring washers, keys etc. and when used with current carrying parts, they shall be made of copper silicon or other high conductivity and wear resistant alloys.
The **isolators** should not need lubrication of any parts except at very long interval of five year minimum.

2.18.11 PROTECTIVE COATINGS

All ferrous parts including bolts, nuts and washers of the switches assembly shall be galvanized to withstand at least six one minute dips in copper sulphate solution of requisite strength (Prece tests) except the threaded portions which should withstand four dips.

2.18.12 INSULATORS

Support insulators for all type of isolators shall be of solid core type. The insulator 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, **seismic** forces etc. Glazing of the porcelains shall be of uniform dark brown colour with a smooth surface arranged to shed away raise 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 ports 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 under internal stresses which may affect the mechanical or electrical strength or rigidity. The assembly shall not have excessive concentration of electrical stresses in any section or across leakage surfaces. The cement used shall not give rise to chemical reaction with metal fittings. The insulator shall be suitable for water washing by rain or artificial means in service condition. Profile of the insulator shall also conform to IEC-815. Caps 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 shall have four numbers of tapped holes spaced on a pitch circle diameter of 127mm. The holes shall be suitable for bolts with threads having anti corrosive 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 and shall have radio interference level **as specified in table below** of Casing shall be free from blow holes cracks and such other defects.

2.18.13 CONTROL CABINET:

The control cabinet of the operating mechanism shall be made out of minimum 3mm thick aluminium alloy sheet. Hinged door shall be provided with pad locking arrangement. Sloping rain hood shall be provided to cover all sides. 15 mm thick neoprene or better type of gaskets shall be provided to ensure degree of protections of at least IP 55 as per IS 2147/IS-3947. The cabinet shall be suitable for mounting on support structure with adjustment for vertical, horizontal and longitudinal alignment. Details of these arrangements shall be furnished along with the offer.

2.18.14 MOTOR:

Motors rated 0.5 KW and above shall be **provided with** suitable for operation on 3 phase, 415 V, 50 Hz supply. Motors of lower rating shall be single phase type suitable for 240V, 50Hz system. It shall be totally enclosed type if mounted outside the control cabinet. The motor shall withstand without damage stalled torque for at least 3 times the time lag of the tripping device. The motor shall, in all other respects, conform to the requirement of I.S. 325**. Suitable relay/device shall be provided to prevent over loading of the motor. Single phase preventer (for 3 phase meter) shall be provided to operate on open circuiting of any phase and shall trip off the motor. Complete details of the devices shall be furnished in the offer.**

2.18.15 GEAR:

The dis-connector / isolator may be required to operate occasionally, with considerably long idle intervals. Special care shall be taken for selection of material for gear and lubrication of gears to meet this requirement. The gear shall be

made out of aluminium bronze or any other better material lubricated for life with graphite or better-quality non-drawing and non-hardening type grease. Wherever necessary automatic relieving mechanism shall be provided.

2.18.16 SPACE HEATERS:

Space heaters suitable for 1 phase 240V AC supply shall be provided for each motor operated operating mechanism to prevent condensation and shall be operated by MCB.

2.18.17 TERMINAL BLOCK AND WIRINGS

Each operating mechanism shall be provided with 1100V grade **ring** type terminal block. All auxiliary switches, **spare contact of the contactors**, interlocks and other terminals shall be wired up to terminal block. The terminal block shall have at least 20% extra terminals. All wiring shall be carried out with 1.1KV grade **PVC** insulated 2.5 sq.mm. copper wires.

2.18.18 INTERIOR ILLUMINATION:

A holder suitable for a 240 V lamp shall be provided in each of the motor operated mechanism of three poles & shall be door operated type.

2.18.19 CONTROL AND AUXILIARY SUPPLY:

A 3-phase switch with MCB for phases and link for neutral, shall be provided for power supply and a 2 pole MCB shall be provided for control supply.

2.18.20 POSITION INDICATOR:

A position indicator to show the isolator is in ON or OFF position to be provided.

2.18.21 NAME PLATE:

Isolator, earthing switches and their operating devices shall be provided with name plate. The name plate shall be weatherproof and corrosion proof. It shall be mounted in such a position that it shall be visible in the position of normal service and installation. It shall carry the following information duly engraved or punched on it.

A. Isolator Base

Name: AEGCL
Name of manufacturer –
Order No. –
Type Designation –
Manufacturers serial No. –
Rated voltage –
Rated normal current –
Rated short time current (rms) and duration –
Rated short time peak current (KAP)
Weight-
Manufacturing Standard-

B. Earthing Switch

Name: AEGCL
Name of manufacturer –
Order No. –
Type Designation –
Manufacturers serial No. –
Rated voltage –
Rated normal current –
Rated short time current (rms) and duration
Rated short time peak current (KAP)
Weight

C. Operating Device

Name – AEGCL
Name of manufacturer –
Order No.
Type Designation –
Reduction gear ratio –
AC motor
i) Rated auxiliary voltage
ii) Starting current
iii) Designation of AC motor as per IS 4722/325
iv) Starting torque at 80% of supply voltage
v) Over travel in degrees after cutting off supply

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Total operating time in seconds
i) Close operation – Electrical
ii) Open operation – electrical
iii) Open operation – manual

2.18.21 PAINTING GALVANIZING AND CLIMATE PROOFING:

At interiors and exteriors of enclosures, cabinets and other metal parts (other than made up of aluminium) shall be thoroughly cleaned to remove all rust, scales, corrosion, grease and other adhering foreign matter and the surfaces treated by phosphating (e.g. seven tank phosphating sequence). After such preparation of surfaces, two coats of zinc oxide primer shall be given by suitable stoving and air drying before final painting **with epoxy paint.** Colour of the final paints shall be of shade no. 697 of IS:5. The finally painted cubicle shall present aesthetically pleasing appearance free from any dent or uneven surface.

Paint inside the metallic housing shall be of anti-condensation type and the paint on outside surfaces shall be suitable for outdoor installation.

All components shall be given adequate treatment of climate proofing as per IS:3202 so as to withstand corrosive and severe service conditions.

All metal parts not suitable for painting such as structural steel, pipes, rods, levers, linkages, nuts and bolts used in other than current path etc. shall be hot dip galvanized as per IS –2629. Galvanization test will be carried out during routine test.

Complete details of painting, galvanizing and climate proofing of the equipment shall be furnished in the offer.

2.18.22 TYPE AND RATING:

Sl no	**Type:**	**132 kV**
I	**II**	**III**
1	Main switch	Horizontal Centre Break
2	Service	
3	Applicable standard	IS : 9921 / IEC-62271-102
4	No. of Phases	3 phase
5	Design Ambient temperature	50°C
6	Type of operation	Mechanically Ganged
7	Rated voltage (kV)	In KV
	a) Nominal	132
	b) Maximum	145
8	Rated current (Amps)	1250
9	Short time current for 3 sec.(kA)	40
10	Rated frequency	50 HZ ± 5%
11	System earthing	Effectively earthed
12	Temperature rise	As per relevant IS/IEC standards
13	Lightening Impulse withstand voltage (kVp)	
	(a) Across Isolating distance	750
	(b) To earth	650
14	1-minute power frequency withstand voltage	
	a) Across Isolating distance	315
	b) To earth	275
15	Switching Impulse withstand voltage (kVp)	
	a) Across Isolating distance	-
	b) To earth	-
16	Max. RIV for frequency between 0.5MHz and 2MHz (micro-volt)	500 at 92kV
17	Corona Extinction Voltage (kV)	-
18	Operating mechanism	
	a) Isolator	Motor
	b) Earth switch	Motor
19	Auxiliary voltage	
	a) Control & Interlock	
	b) Motor voltage	
	c) Heater, lamp & socket	
20	Safe duration of overload	
	150% of rated current	5 minute
	120% of rated current	30 minute

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Sl no	Type:	132 kV
I	II	III
21	Minimum creepage distance of insulator (mm)	31mm/kV
22	Mounting structure	Tubular/ Lattice
23	Operating time	Less than 12 secs
24	Insulator Data	
	a) Bending Strength (kgf)	800
	b) Height (mm)	1500
	c) Bottom PCD (mm)	184
	d) No. of holes & hole dia.	4x18
	e) Top PCD	127
	f) No. of holes & hole dia.	4xM16
	g) Minimum creepage distance (mm) 31mm/kV	4495
25	Working clearance (live part to ground) (in mm)	4900
26	Phase Spacing (mm.)	3000
27	Minimum clearances (mm.)	
	a) Phase to Phase	1300
	b) Phase to earth	1300
	c) Sectional clearance	4000

2.18.23 TESTS:

Type Tests:

Isolators offered, shall be fully type tested as per the relevant standards. The Bidder shall furnish Three sets of the following valid type test reports for their different type of offered Isolators along with the offer. The AEGCL reserves the right to demand repetition of some or all the type tests in the presence of AEGCL's representative. For this purpose, the Bidder may quote unit rates for carrying out each type test and this will be taken during bid price evaluation, if required.

a) short time withstand & peak withstand current test for Isolator & Earth Switch.
b) power frequency (Dry & Wet), Lightening Impulse dry withstand Test
c) Mechanical endurance Test
d) IP-55 test
e) Seismic test
f) Temperature Rise test

During type tests the isolator shall be mounted on its own support structure or equivalent support structure and installed with its own operating mechanism to make the type tests representative. Drawing of equivalent support structure and mounting arrangements shall be furnished for Purchaser's approval before conducting the type tests.

The type tests shall be conducted on the isolator along with approved insulators and terminal connectors. Mechanical endurance test shall be conducted on the main switch as well as earth switch of one isolator of each type.

Acceptance and Routine Test:

All acceptance and routine test as stipulated in the relevant standards shall be carried out by the supplier in presence of Purchaser's representative.

Mechanical operation test (routine test) shall be conducted on isolator (main switch and earth switch) at the supplier's works as well as purchaser's substation site.

Immediately after finalization of the programme of type / acceptance, routine testing the supplier shall give sufficient advance intimation (clear 20 days advance intimation), along with shop routine test certificates, valid calibration reports from Govt. approved **(NABL)** test house for the equipment, instruments to be used during testing for scrutiny by the AEGCL to enable him to depute his representative for witnessing the tests. If there will be any discrepancies in the shop routine test certificates and calibration reports furnished by the firm then after settlement of the discrepancies only, purchaser's representative will be deputed for witnessing the tests. Special tests proposed to be conducted (if decided to conduct) as type test on isolators, are given at Annexure- II. Thesespecial type test charges shall be quoted along with all other type tests as per relevant IEC standard and these charges shall be included in the total bid price

Test certificates of various items including but not limited to the following shall be furnished at the time of routine tests.

a) Chemical analysis of copper along with a copy of excise certificate indicating genuine source of procurement of electrolytic grade copper.
b) Bearings
c) Fasteners
d) Universal / swivel joint coupling
e) Insulators
f) Motor
g) Gears
h) Auxillary switch
i) Limit switch
j) Timer
k) Overload / single phase preventer relay

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l) Interlocking devices
m) Terminal block
n) Any other item

2.18.24 INSPECTION:

i) The Purchaser shall have access at all times to the works and all other places of manufacture, where the disconnectors, earth switches and associated equipment are being manufactured and the supplier shall provide all facilities for unrestricted inspection of the works raw materials manufacture of all the accessories and for conducting necessary tests as detailed herein.
ii) The supplier shall keep the purchaser informed in advance of the time of starting of the progress of manufacture of equipment in its various stages so that arrangements could be made for inspection.
iii) No material shall be dispatched from its point of manufacture unless the material has been satisfactorily inspected and tested.

b) The acceptance of any quantity of the equipment shall in no way relieve the supplier of his responsibility for meeting all the requirements of this specification and shall not prevent subsequent rejection if such equipment is later found to be defective.

2.18.25 QUALITY ASSURANCE PLAN:

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

(i) Names of sub suppliers for raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials in presence of Supplier's representative, copies of test certificate
(ii) Information and copies of test certificates as in (i) and (ii) above in respect of bought out accessories.
(iii) List of manufacturing facilities available
(iv) Level of automation achieved and lists of areas where manual processing still exists.
(v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
(vi) List of testing equipment with calibration certificates from Govt. approved **(NABL)** test house available with supplier for final testing equipment and test plant limitation if any, vis-à-vis the type, special acceptance and routine test specified in the relevant standards. These limitations shall be very clearly brought out in the specified test requirements.
(vii) QAP shall include acceptance criteria mentioning clause no. of applicable standard against each parameter.

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

i) List of raw material as well as bought out accessories and the names of sub-suppliers selected from the lists furnished along with offer.
ii) Type test certificates of the raw material and both bought out accessories.
iii) Quality Assurance Plan (QAP) withhold points for purchaser's inspection.

The supplier shall submit the routine test certificates of bought out accessories and raw material viz. Copper, aluminum conductors, lubricating material, gear material etc. at the time of routine testing of the fully assembled isolator.

2.18.26 DOCUMENTATION:

All drawings shall conform to relevant international standards organization (ISO). All dimensions and data shall be in S.I. Units.

List of Drawings and Documents

The Bidder shall furnish **four** sets of following drawings / documents along with his offer.

a) General outline and assembly drawings of the dis-connector operating mechanism, structure, insulator and terminal connector.
b) Sectional views and descriptive details of items such as moving blades, contacts, arms contact pressure, contact support bearing housing of bearings, balancing of heights, phase coupling pipes, base plate, operating shaft, guides, swivel joint operating mechanism and its components etc.
c) Loading diagram
d) Drawings with structure for the purpose of type tests.
e) Name plate.
f) Schematic drawing.
g) Type test reports.
h) Test reports, literature, pamphlets of the bought-out items and raw material.
i) Deviation sheet/compliance sheet if applicable

Six sets of the type test report, duly approved by the Purchaser shall be submitted by the supplier for distribution, before commencement of supply Adequate copies of acceptance and routine test certificates, duly approved by the Purchaser shall accompany the dispatched consignment.

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 risk.

The supplier shall within 2 weeks of placement of order submit four sets of final versions of all the above said drawings for AEGCL's approval. The purchaser shall communicate his comments / approval on the drawings to the supplier. The supplier

shall, if necessary, modify the drawings and resubmit four copies of the modified drawings for AEGCL's approval within two weeks from the date of comments.

2.18.26 INSTRUCTION MANUALS:

Fifteen copies of the erection, operation and maintenance manuals in English to be supplied for each type of disconnector one month prior to dispatch of the equipment. The manual shall be bound volumes and shall contain all drawings and information required for erection, operation and maintenance of the disconnector including but not limited to the following particulars.

(a) Marked erection prints identifying the component parts of the disconnector as shipped with assembly drawings.
(b) Detailed dimensions and description of all auxiliaries.
(c) Detailed views of the insulator stacks, metallics, operating mechanism, structure, interlocks, spare parts etc.

2.18.27 PACKING AND FORWARDING:

The equipment 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.

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.

The supplier shall ensure that the bill of material is approved by the purchaser before dispatch.

2.18.28 SUPERVISION OF ERECTION TESTING AND COMMISSIONING (ET&C):

Purchaser proposes to utilize the services of the supplier for supervision of testing and commissioning of the equipment being supplied by him, if it is required. For this purpose, the supplier should make available the services of trained personnel (Engineers) who shall correct in the field, any errors or omissions in order to make the equipment and material properly perform in accordance with the intent of this specification. The Engineer shall also instruct the plant operators in the operation and maintenance of the commissioned equipment. The supplier shall be responsible for any damage to the equipment on commissioning the same, if such damage results for the faulty or improper ET&C. Purchaser shall provide adequate number of skilled / semi-skilled workers as well as ordinary tools and equipment and cranes required for equipment erection, at his own expenses. Apart from the above, the Purchaser shall not be responsible for providing any other facilities to the supplier. Special tools if required for erection and commissioning shall be arranged by the supplier at his cost and on commissioning these shall be supplied to the purchaser free of cost for future use.

APPENDIX – I (Isolators)

LIST OF SPECIAL TESTS TO BE CARRIED OUT IF DECIDED BY THE PURCHASER

Sl.No.	Name of the Test	Standard to which it conforms.
1.	Test for visible Corona and Radio interference voltage (RIV) on disconnectors and terminal connector	NEMA Pub No. 107-1964 ISRI Pub No. 1-1972
2.	Tests on insulators	IS-2544 IEC. 168
3.	Tests on terminal connectors	IS:5561
4.	Tests on galvanized components	IS:2633
5.	Stalled torque test on motor operating mechanism	At 110% of supply voltage

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2.19.0 TECHNICAL SPECIFICATION OF POWER LINE CARRIER COMMUNICATION EQUIPMENTS WITH LINE TRAP, 48 V DC PLCC BATTERY, CHARGER

2.19.1 SCOPE

This specification provides design, manufacture, inspection, testing at manufacturer's works, delivery at site, installation and commissioned of indoor and outdoor Power Line Carrier Communication Equipments as specified herein for or as mentioned in the bid price schedule. The specification shall be complete for speech communication in dialling mode and/or through 4 wire Express Telephone, data communication and carrier aided protection for 400KV, 220KV & 132KV Transmission Lines. All communication equipment shall be suitable for good quality voice communication among new & existing Sub- Stations, reliable tele-protection and also data communication from RTU and SAS (via GATEWAY) to SLDC, Kahilipara.

2.19.2. SERVICE CONDITIONS

2.19.2.1 The materials supplied shall be suitable for operation under the climatic and other conditions mentioned in chapter2.

2.19.2.2 Power Line Carrier Communication will have the following minimum components. However, for more efficient performance of the system the bidder can provide additional item at no extra cost.

a) Capacitor Voltage Transformer (CVT)
b) Wave Trap
c) PLCC Terminal
d) Line Matching Unit/ Line Matching and Distribution unit
e) Tele Protection Coupler
f) Battery and Battery charger
g) EPAX System and Telephone System
h) HF Coaxial cable

2.19.3 STANDARDS :

The equipment shall conform to the following latest Edition of the Indian Standards as amended up to date and as per latest relevant I.E.Cs. :

The details are given below :

1. IEC 353 for line trap
2. IS 8792 for line trap
3. I.E.C. 481 for coupling devices
4. I.E.C. 495 for power line carrier terminals
5. I.S. 8997 for coupling devices
6. I.S. 3156 for CVT
7. I.E.C. 358 for C.C. & CVT
8. I.S. 9348 for coupling capacitor
9. I.S. 11967 for Co-axial Cable
10. I.E.C. for Planning of SSB PLCC system
11. I.E.C. for Surge Arrestors
12. I.E.C. 96 for HF Cable
13. I.E.C834-I Part-I for Performance and Testing of Tele protection equipment
14. I.S. 9428 for Characteristic values of Inputs and outputs of single side band PLC terminals
15. I.S. 9528 for frequency planning of power line carrier equipment

2.19.4 TECHNICAL SPECIFICATION OF LINE TRAP/ WAVE TRAP

This specification provides for design, engineering, manufacture, stage testing, inspection and testing before dispatch, packing and delivery at destination of Line Trap along with all accessories specified herein. The line trap to be inserted into high voltage A.C transmission lines to prevent undue loss of carrier signal power, typical in the range 30KHz to 500KHz, under all power system conditions and to minimize interference from carrier signaling systems on adjacent transmission lines.

2.19.4.1 STANDARDS:

Unless otherwise specified elsewhere in this specification, the rating as well as performance and testing of the line trap shall conform but not limited to the latest revisions and amendments available at the time of placement of order of all the relevant standards as listed hereunder.

Sl No	Standard No.	Title
1	IEC 60353 Second edition, 1989-90	Line Trap for AC Power System
2	IS : 8792-1978	LINE TRAPS FOR AC POWER SPECIFICATION SYSTEMS - (First Revision)

3	IS : 8793-1978	LINE TRAPS FOR AC POWER SPECIFICATION SYSTEMS METHODS OF TESTS -(First Revision)
4	IS-9859 (PART-I)-1981	CODE OF PRACTICE FOR INSTALLATION AND MAINTENANCE OF OUTDOOR POWER LINE CARRIER EQUIPMENT PART I LINE TRAPS (Incorporating Amendment No. 1)
5	IEC 99	Lightning Arresters
6	IEC 99 - 1(1970)	Part-1 , Non-Linear resistor type arresters for AC systems
7	IEC 60099-4/2006	Metal-oxide surge arresters without gaps for a.c. systems
8	IS : 5561-1970	Terminal Clamp / Connector

2.19.4.2 PRINCIPAL TECHNICAL PARAMETERS FOR LINE TRAP:

The Line Trap covered in this specification shall meet the technical requirements listed hereunder. Line traps of different voltage rating shall conform to the following technical particulars:-

TABLE- I

Sl No	Technical Parameters	VOLTAGE LEVEL
		132 kV
I	II	III
2	Type of mounting	Suspension /Pedestal/ CVT mounted
3	Suitable for system Frequency	50 Hz
4	Nominal System Voltage	132 KV
5	Highest System Voltage	145 KV
6	Rated Continuous Current	800 A
7	Rated Short time current for 1 second	40 kA
8	Asymmetrical peak value of the first half wave of the rated short time current	51 KAp
9	Rated inductance	0.5 mH
10	Type of Tuning	Broad Band
11	Blocking Band frequency range	90-150Khz 150-500Khz
12	Minimum Guaranteed resistive component of impedance in Blocking Frequency range	570 ohm
13	Protective device	a) Non-linear resistive type Gapped lightning arresters for a.c. system
14	Nominal discharge current of protective device	10 KA

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Sl No	Technical Parameters	VOLTAGE LEVEL
		132 kV
I	II	III
15	Rated voltage of protective device	4.5 KV
16	Minimum value of power frequency spark over voltage (Dry and wet) of protective device	6.75 KV rms
17	Visual corona extinction voltage	97 KV rms
18	Radio Influence Voltage (RIV)	< 500 micro volt
19	Attenuation in tuned frequency band	>7.5 dB
20	Maximum tapping loss over blocking band I & II stated above	2.6 dB
21	Maximum tapping loss based on blocking resistance	2.6 dB
22	Insulation class	Class F
23	Maximum working stress	Twice the weight of wave trap + 500 Kgs

2.19.4.3 GENERAL TECHNICAL SPECIFICATIONS:

A line trap, consisting of a main coil in the form of an inductor, a tuning device and a protective device, is intended for insertion in a high voltage power transmission line between the point of connection of carrier frequency signals and adjacent power system elements such as busbar, transformers etc. The tuning device connected across the main coil ensures, with proper adjustment, that the line trap presents relatively high impedance at one or more carrier frequencies or carrier frequency bands, whereas the impedance of the line trap at power frequencies is negligible. A line trap may also be used to limit the loss of carrier-frequency at a power system tee point.

Main Coil:

An inductor carries the power frequency current of the high voltage transmission line. Wave trap shall consist of a main coil designed to carry continuously the rated current at the maximum ambient temperature and at full operating line voltage. It shall be supplemented with a protective device and a tuning device.

Tuning Device:

Line traps are to be tuned for a carrier frequency band, which will depend upon the operation carrier frequency pair chosen for transmission lines in question. The resistive component of impedance of the wave trap within its band shall not be less than 570 ohms. The wave traps should be provided with suitable barriers to prevent the entry of birds into the same.

Protective Device:

The device connected across the main coil and tuning device which prevents the line trap from being damaged by transient over voltages which may occur across it. The protective device shall be so designed and arranged that neither a significant alteration in its protective function nor physical damage shall result either from the temperature rise or magnetic field of the main coil at continuous rated current, rated short-time current or from emergency overload current. It shall neither enter into operation as a result of the power frequency voltage developed across the line trap by rated short time current nor shall it remain in operation after a response to a transient over voltage which is immediately followed by the power frequency voltage developed across the line trap by rated short-time current.

The protective device shall be shunt connected to the main coil and the tuning device.

For proper coordination with the lightning arrester installed in the substations and generating stations, the wave traps shall be provided with protective device with nominal discharge current of 10 KA.

2.19.4.4 DESIGN REQUIREMETS:

Ability to withstand rated short-time current: The line trap so designed shall be capable to withstand the mechanical forces produce by asymmetrical peak value of the short-time current.

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Insulation level:
The insulation level for the insulation between the terminals of a line trap is governed by the rated voltage of the protective device. The insulation of the main coil and the tuning device shall be adequately rated for:-
a) The voltage developed across the line trap at the rated power frequency by the rated short-time current. The rated voltage of the protective device shall be higher than this voltage developed across the line trap.
b) the front of wave impulse spark over voltage or the residual voltage caused by the nominal discharge current of the protective device, which ever is higher.

System Voltage insulation:
The system voltage insulation of a line trap is provided by insulator strings or post insulators. The line trap system voltage insulation shall be consistent with the other equipment in the associated high voltage transmission network.

Tensile strength of suspension system:
The suspension system of a line trap shall be designed for a tensile stress of at least twice the mass of the line trap in kilograms, multiplied by 9.81 to convert to newtons, plus 5000 N.

2.19.4.5 ACCESSORIES:

i) **Bird barriers**: The bird barrier design shall be such that no entrance to the line trap shall admit a sphere having a diameter of 16 mm.

ii) **Terminal clamp/connectors**: The clamp shall be suitable for AAAC/ACSR Zebra conductor in case of 220 kV system and AAAC/ACSR Panther conductor in case of 132 kV system. The clamp, connectors, nuts, bolts and hardware shall be of nonmagnetic material and shall conform to IS: 5561. The clamp shall be fitted on incoming and outgoing pad of Line Trap. The incoming and outgoing conductor shall be on either side of the clamp fitted with the help of bolts and nuts arrangements. The clamp shall be designed to carry the continuous load of 800 Amp at 132 KV and 1250 Amp at 220 KV and shall withstand a dynamic short circuit current of 31.5 and 40 KA respectively for 1 second. The temperature rise shall not exceed 35°C over 50°C ambient. All the castings shall be free from blowholes, surface blisters, cracks and cavities. All sharp edges shall be blurred, rounded off and buffed. Clamp and connectors shall be designed to avoid corona formation. The visual corona extinction voltage shall not exceed 97 KV (rms.) for 132 kV and 156 kV (rms) for 220 kV. Radio interference voltage for clamp and connectors shall not exceed 500 microvolts at 97 KV (rms.) for 132 kV and 156 kV (rms) for 220 kV. No current carrying parts of the Clamps and connector shall be less than 10 mm of thickness.

iii) **400KV WAVE TRAP**

The clamp shall be suitable for 4" IPS AL TUBE and TWIN/QUAD ACSR Moose Conductor. The clamps shall be chosen as per requirement of the substation. The clamp, connectors, nuts, bolts and hardware shall be of non-magnetic material and shall conform to IS: 5561. The clamp shall be fitted on incoming and outgoing pad of Line Trap with four Nos. of Nuts & Bolts. The incoming and outgoing conductor shall be on other side of the clamp fitted with the help of six bolts and nuts arrangements. The clamps shall be suitable for horizontal and vertical take off with conductor diameter 31.77 mm for Twin/Quad ACSR Moose conductor. The clamp shall be designed to carry the continuous load of 3150 Amp at 400KV and shall withstand a dynamic short circuit current of 50KA for 3 second. The temperature rise shall not exceed 35 °C over 50 °C ambient. All the castings shall be free from blowholes, surface blisters, cracks and cavities. All sharp edges shall be blurred, rounded off and buffed. Clamp and connectors shall be designed so as to avoid corona formation. The visual corona extinction voltage shall not exceed 320 KV (rms.). All nuts and bolts shall be suitably shrouded. Radio interference voltage for clamp and connectors shall not exceed 1000 microvolt at 305 KV (rms.) at 1 MHz. No current carrying parts of the Clamps and connector shall be less than 10mm thickness including drilled Holes.

iv) **RATING PLATES:**

The main coil, the tuning device and the protective device shall be provided with rating plates of weatherproof material fitted so that they are readily visible.

v) **Line Trap:**

The Line Trap shall be supplied with fitted Tuning Pot and Lightning Arrester. All the type test reports as per relevant IS/IEC of the Line Trap offered shall be invariably enclosed with the offer. Offers without Type Test Report shall not be considered. The Line Trap shall be fitted with top and bottom clamp with Connector etc. complete in all respect for connecting line trap to line side and equipment side respectively. The clamp, connector, nut, bolts, etc. which is affected by magnetic field of line trap shall be of nonmagnetic material. All iron parts shall be hot dip galvanized. The arrangement of minimum three nos. of tie rod assembly shall be required to avoid shearing from thread of tie rod assembly.

2.19.4.6 DRAWINGS:

The following drawings indicating all the dimensions etc. with complete technical details shall be enclosed together with technical bid :

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(i) General arrangement for Line Trap indicating dimensions, technical parameters, weight etc
(ii) Suspension / mounting arrangement indicating dimensions
(iv) Tuning pot ckt arrangement
(v) Details of terminal clamp/connectors suitable for AAAC/ACSR conductor and quac/twin ACSR Moose conductor
(viii) Suspension fittings (hardware) for line trap
(ix) Disc Insulator with general technical specification
(x) Lightning Arrestor as protective device for Tuning Pot
(xi) Bird barriers
(xii) Other accessories of Line Trap
(xiii) Any other components/drawings not covered

2.19.5 TECHNICAL SPECIFICATIONS OF LINE MATCHING UNIT/ LINE MATCHING DISTRIBUTION UNIT (LMU/LMDU)

2.19.5.1 GENERAL REQUIREMENT:

The indoor PLCC equipments are connected to line through co-axial cable – outdoor coupling device – Coupling Capacitors for transmission & reception of carrier frequency signals. Coupling devices are connected in between HF terminal of Coupling Capacitor and indoor PLCC terminals through co-axial cable.

The coupling device proposed to be procured shall perform following functions as a composite unit:

1. Compensate the reactive component of coupling capacitor(s) impedance in order to efficiently transmit the carrier signals with the help of tuning device.
2. It shall match the impedance between power line and coaxial cable end.
3. Two numbers 'phase to earth' type coupling filters shall be used to achieve 'phase to phase'/ ' Inter-circuit coupling'. Connection between secondaries of the two phase to earth type coupling device shall be through a balancing transformer/hybrid such that reliable communication shall be ensured even when one of the coupled phase is earthed or open circuited on the line side.
4. Galvanic isolation of primary & secondary terminals of coupling device.
5. It shall drain the power frequency current derived from coupling capacitor(s) to earth.
6. It shall arrest the voltage surges received from power line at the terminal of coupling device.
7. It shall provide direct & efficient earthing to primary terminals of the coupling device. The equipment shall be of latest components, technology and highly reliable. The equipment offered must have been type tested.

2.19.5.2 SCOPE OF SUPPLY:

Line Matching Unit / Line matching Distribution Unit shall be supplied fully wired complete in all respect with all interconnections and coaxial cable termination facilities with UHF glands. The equipment shall be of latest design with modular construction.

2.19.5.3 SPECIFICATION:

(a) STANDARDS :

The coupling device offered shall confirm to following standards:

1. IS 8997: Specification for coupling devices for PLC system
2. IEC 481: Coupling devices for power line carrier system
3. IS 8998: Methods for tests for coupling devices for PLC System

(b) CONSTRUCTION:

The coupling device offered shall be fully programmable.

The Unit shall be modular in design and should accommodate tunable modules for different use. The bidder will furnish the details of tunable modules, which can be used along with the device. The composite unit shall be housed in waterproof Fibre Box modular construction cabinet with proper ventilation & vermin proofing arrangement. Proper arrangement for mounting the same on G. I. supporting structure shall be made. The equipments shall work satisfactorily under hot humid & polluted atmospheric conditions. Suitable arrangements shall be provided for the connection of co-axial cables in the coupling device and supply of cable connectors shall be in the scope of supply. Cable glands of good quality suitable for co-axial cables shall be provided.

2.19.5.4 FEATURES:

1. The coupling device offered shall be suitable for nominal equipment side impedance of 75 ohms unbalanced and 150 ohm balanced as required.
2. The equipment offered shall work satisfactorily for carrier frequency range of 50-500 KHz.
3. The line side impedance shall be 200 Ohms to 400 Ohms for phase to earth couplings and 400 ohms to 600 ohms for phase to phase coupling.
4. The coupling device shall be suitable for use with coupling capacitor of 2200 to 8800 pf and shall be programmable.
5. Insulation withstand voltage shall be 10 kV RMS for one minute.
6. Impulse withstand voltage for high voltage input side to ground shall be 10 kV and co-axial cable input to ground shall be 3 kV.
7. The nominal peak power of the coupling device shall not be less than 1000W.
8. The coupling device shall have inbuilt three element protective device consisting of drainage coil, Lighting Arrestor and Earthing Switch confirming to relevant standards. The same shall be generally meet the following requirements:

(a) Drainage Coil: The drainage coil shall effectively ground the 50Hz power frequency current received from coupling capacitor(s) but shall not permit HF signal to ground. The power frequency impedance shall be less than 1.5 ohm and continuous current capacity at power frequency shall be 1.5Amp.

(b) Lightning Arrestor: The lighting arrestor shall effectively ground the high voltage surges coming from power line side at the terminal of coupling device. The lighting arrestor shall stand spark over voltage of 3.3 kV.

(a) The Earth Switch: The earthing switch shall ground the primary terminal of coupling device when required. The rated current for earthing switch shall not be less than 150 Amp.

9. The interconnections in the coupling device shall be made with special high frequency Liz wires.
10. The impedance matching shall be prefect so that the return loss is minimum.

2.19.5.5 TYPE TESTS:

Valid Type Test reports not more than 5-Year-old performed for following tests along with all test result sheets & reference documents shall be submitted with the offer here under.

- Composite Loss
- Return Loss
- Distortion & Intermodulation
- Lightning Impulse Voltage Withstand
- Power frequency Voltage Withstand
- Drain Coil
- Environmental test
- Degree of protection : IP 55
- Earth switch

2.19.5.6 TECHNICAL PARTICULARS FOR MODULAR COUPLING DEVICE

TABLE-II

Sl No	Description	COUPLING DEVICE
1	Carrier Frequency Range	78-500 kHz
2	Maximum temperature limit for satisfactory operation of coupling device mounted outdoor	**50^0 C or better**.
3	Composite loss	≤ 1 dB
4	Return loss	≥ 12 dB
5	Nominal line side impedance	240/320 ohms (Phase to earth)
6	Nominal carrier equipment side impedance	75ohms unbalanced and 150 ohm balanced, 75ohms unbalanced and 150 ohm balanced (switchable)
7	Nominal Peak Envelop power with Distortion and Inter-modulation Products 80 dB Down)	1000 watts for frequency≥100 kHz
8	Power frequency Impedance between primary terminal and Earth Terminals of Coupling Device	Less than 20 ohm
9	Maximum number of PLC terminals that can be connected in parallel	
	(a) 20 W (P.E.P) PLC Terminals	(a) 8 to 12 nos.
	(b) 40 W (P.E.P.) PLC Terminals	(b) 6 to 8 nos.
	(c) 100 W (P.E.P.) PLC Terminals	(c) 4 to 6 nos.
10	1 Minute Power Frequency Insulation level between Primary and Secondary Terminals of Coupling Device	10 KV rms
11	Impulse (1.2/50 micro-sec) withstand level between Primary and Secondary Terminals of Coupling Device	10 kV peak
12	Drainage Coil :	

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13	(a) Inductance	0.2 to 0.7 mH
	(b) Continuous power frequency current	≤ 1.5 Arms
	(c) Short time rating for 0.2 sec	≤ 50 A
14	Lighting Arrestor :	
15	(a) Type of construction	Non linear resistor type with spark gap
	(b) Rated Voltage	660 V
	(c) Rated discharge current	5 KA_{peak}
	(d) Maximum permissible short time current	30 kA peak
	(e) Impulse spark over voltage (max)	3300 V_{peak}
16	Earthing Switch	
	(a) Rated Current	250 $A_{rms,}$ or better
	(b) Rated Voltage	10kV
	(c) Short time current	16 kA, 1 sec

2.19.6 Technical Specifications Digital Power Line Carrier Equipment

2.19.6.1 General

Power Line Carrier (PLC) System will primarily be used for tele-protection, voice & data communication. The new Power Line Carrier (PLC) circuits in conjunction with existing OPTICAL communication network shall connect the new SAS networks (IEC61850) of existing and new 132KV/220 KV/400KV substations of AEGCL via GATEWAY as per IEC60870-5-101 and IEC60870-5-104 to the nearest Wideband nodes connected to SLDC, Kahilipara for data communication. Digital PLCC (twin channel, 8kHz bandwidth) equipment shall be procured under this project. DPLC shall be applied in analog mode via FSK channels or in digital mode via the implemented data pump to transmit SAS information. For 400kV Lines, bidder shall quote two PLCC Panels for each line where one panel will be for transmission of Speech + Data and the other panel will be for dedicated carrier inter tripping scheme.

2.19.6.2 The PLC equipment shall comply with the standard IEC 60495, second edition, 1993.

2.19.6.3 For safety, the equipment shall conform to IEC 60950-1, 2005.

2.19.6.4 For EMC and EMI, the equipment shall comply with IEC 61000-6-2(Immunity) and IEC610006-6-4 (Emission). In particular, it shall comply with IEC 60255-5, IEC 61000-4-2/-3/-4/-5/-6/-8/-12/-16/-17/-18, IEC 60255-22-1, EN 55022 / CISPR22.

2.19.6.5 The system shall be of modular design and allow for easy upgrading.

2.19.6.6 The PLC equipment shall not use fans or similar for artificial cooling under normal operating conditions.

2.19.6.7 Carrier frequency section

a) The PLC equipment shall support DPLC (Digital PLC) and APLC (Analog PLC) mode of operation in the same platform, software programmable via PC/Notebook.
b) Modulation shall be SSB (Single-Side-Band) for APLC operation MCM (Multi-Carrier- Modulation) with Trellis Coding for DPLC mode operation.
c) Modulation and coding shall be implemented as software functions in DSP (Digital Signal Processor) technology.
d) Transmission mode shall be 2-wire frequency duplex.
e) The nominal carrier frequency shall be programmable from 40 kHz to 500 kHz minimum, preferably however up to 1000 KHz for nominal band widths ≥ 4 kHz.
f) The carrier frequency stability over the stated temperature operating range shall be equal or better than +/- 1 ppm.
g) The nominal bandwidth BN for transmitting or receiving shall be programmable from 4 kHz to 32 kHz in steps of 4 kHz, and to 2 kHz or 2.5 kHz (for single purpose tele protection).
h) Transmit (Tx) and receive (Rx) bands shall be configurable for adjacent or non- adjacent operation.
i) Transmit output power shall be user-programmable through software up to 100 W or more (Peak Envelop Power) to maintain healthy link for line length of at least 250 km. The output power shall be reducible in steps of 1 dB via user interface program (HMI).
j) The nominal output impedance shall be 75 Ohm unbalanced or 150 Ohm balanced as an option.
k) The return loss in the transmit band shall be ≥ 10 dB, according to IEC 60495.
l) The tapping loss shall be ≤ 10 dB, according to IEC 60495.
m) The receiver selectivity shall be > 65 dB at 300 Hz from the band edges.
n) The AGC range of the receiver shall be 40 dB minimum or better to maintain healthy link for line length of at least 250 km.
o) <u>The supplied PLCC Equipment should be in successful operation for at least 3 years for a line length of Minimum 250 km at 400kV or above voltage level. The bidder shall submit the relevant Performance Certificate from STU/CTU at the time of Bidding.</u>

2.19.6.8 **System Operation**

a) The PLC shall be programmable via PC with HMI/GUI (Graphical User Interface) based on MS-Windows.
b) The PLC system shall facilitate the programming and monitoring of the remote terminal from the local terminal using the standard GUI/HMI (Human-Machine-Interface).
c) An EMS (Element Management Service) shall be incorporated in the HMI for monitoring and programming of the PLC terminals in the network. The EMS shall allow remote cyclic alarm polling of all the PLC terminals in a network.
d) Supervision of a PLC network shall optionally be possible using SNMP (Simple Network Management Protocol), serving communication network management systems with alarm and equipment information.
e) Remote access to the equipment over IP networks shall make use of the SSL/TLS protocol for secure communication. Equipment internal user authentication and logging of security relevant data shall be supported.
f) Command and alarm events as well as special system events (e.g. equipment reset) shall be stored by an internal event-recorder in a non-volatile memory. At least 1000 command events and another 1'000 alarm/system events shall be recordable. The latest 1000 events of each type must always be available, even in case of a memory overflow.
g) A clock synchronizing input shall be provided, to synchronize the internal real time clock with the external Station GPS signal. The DPC Panel should have interface for sync with the station GPS Clock. Furthermore, the Bidder shall ensure that the remote end stations, to be connected via PLCC Link, have the necessary equipment and interfaces for synchronizing the internal real time clock of DPC panel with the station GPS and shall ensure the same by providing any additional equipment (if required) without any cost implication to AEGCL. The Bidder may carry out the necessary survey for the same before the submission of the BID.
h) Back-up batteries for preserving the data (configuration, event recorder, etc.) during loss of supply are not accepted.
i) The Workstation or PC/Notebook shall be connectable via a serial RS-232 port (converter shall be provided for serial to USB) or via Ethernet/IP port(s). The bidder should provide serial to USB converter for each supplied PLCC Panel as a mandatory accessory.
j) With the Ethernet/IP interface option it shall be possible to access the PLC terminal via LAN intranet.
k) The PLCC/ DPC should be integrated with an external counter for display of any executed inter tripping commands.
l) The PLCC Panel supplied should be equipped with redundant power supply and CPU Card.

2.19.6.9 **Speech and Audio Frequency (AF) signal transmission**

a) The PLC shall be configurable for providing up to 3 analog AF (audio-frequency) channels with 4 kHz gross bandwidth each.
b) The useful frequency band shall range from 300 Hz to 3720 Hz for each AF channel.
c) For each channel, a speech low-pass filter shall be configurable with a programmable upper cut-off frequency, ranging from 2 kHz to 3.4 kHz in steps of 200 Hz.
d) Speech interfaces shall be configurable as 4-wire E&M, 2-wire FXO and 2-wire FXS.
e) It shall be possible to configure 3 analog speech channels in 8 kHz or in 12 kHz RF-transmission bandwidth.
f) Inter-channel crosstalk shall be compliant with IEC 60495.
g) A compandor according to ITU-T G.162 shall be configurable via HMI for each speech channel. Control inputs shall be provided for compandor switching (on/off) by the PABX.
h) The frequency band above speech shall be available for the transmission of narrowband modem signals from internal or external modems.
i) The level range of the AF-input/output ports shall be in accordance with IEC 60495.
j) Digital transit filters, programmable with respect to bandwidth and center-frequency in steps of 60 Hz, shall be available for each AF channel for the local extraction, insertion and transit-connection of selected teleoperation frequency bands.
k) An equalizer shall be available for each AF channel for equalizing amplitude response distortions of up to +/- 12 dB.
l) The equalizer shall also be configurable for equalizing group delay distortions of up to 2 ms.
m) The frequency response before and after equalization shall be displayed in graphical form by means of the GUI (HMI).
n) Equalization of the channel frequency response in both directions shall be possible from one (either) end.
o) Integrated Digital Compressed Voice shall be available as an option. Up to 16 digital compressed speech channels shall be supported per PLC link.
p) The data rate required for one compressed speech channel shall be less than 7 kbit/s.
q) In a substation, selected compressed voice channels shall be through connectable on a digital basis to other PLC terminals/links.

2.19.6.10 Narrowband Data Transmission

a) The PLC shall provide - as software options – up to four integrated modems for narrowband data transmission.
b) Transmission speed, channel center-frequencies and the spectral bandwidth shall be programmable in steps for commonly used data rates, ranging from 100 bit/s to 9600 bit/s in bandwidth of 240 Hz to 3400 Hz respectively.
c) The narrowband modems shall be designed for low delay and short recovery times following a link disturbance.
d) Adaptive equalizers, individually configurable for each narrowband modem, shall ensure optimum performance over time, by compensating changing channel characteristics. In a 4 kHz channel, it shall be possible to transmit up to 4 x 2400 bit/s, or 2 x 4800 bit/s, or 1 x 9600 bit/s.
e) Data transmission above 2 kHz band-limited speech shall be possible at 2 x 2'400 bit/s or 1 x 4'800 bit/s.

2.19.6.11 Broadband Data Transmission

a) The PLC shall provide – as software option – an integrated modem for broadband / high speed data transmission. Transmission speed and spectral bandwidth shall be programmable via PC/Notebook.
b) The speed and transmission bandwidth shall be programmable for up to 32 kbit/s in 4 kHz spectral bandwidth, up to 128 kbit/s in 16 kHz bandwidth and up to 256 kbit/s in 32 kHz bandwidth.
c) The data rates shall be selectable in steps, compliant with commonly used standardized data rates.
d) The system shall support automatic transmission speed adaptation in five user-defined steps, self-adapting to the prevailing line condition (noise and interference).
e) The broadband modem shall provide a facility for automatic detection and suppression of narrowband interferers.
f) Special operating modes shall allow transferring analog speech (with an upper cut-off frequency of 2 kHz) and a broadband modem (operated in the frequency band above 2 kHz) in channels with nominal bandwidth BN of 4 kHz and 8 kHz. The data rate of the broadband modem using the remaining 2 kHz bandwidth shall be at least 9.6 kbit/s, the data rate of the broadband modem using the remaining 6 kHz bandwidth shall be up to 48 kbit/s.

2.19.6.12 Data Multiplexing

a) The PLC equipment shall provide an internal multiplexer for the time-division multiplexing of up to 6 serial data channels and/or Ethernet/IP traffic.
b) Data ports shall be compliant with V.24/V.28, RS-232 and/or V.11/X.21/X.24.
c) The internal multiplexer shall provide data flow control for the asynchronous ports and speed adaptation for the synchronous ports according to the prevailing aggregate data rate and HV power line condition.
d) All data ports shall be electrically isolated from ground and against each other.
e) Point-point and point-multipoint operation with channel-sharing shall be possible, for polling SCADA protocols.
f) Three Ethernet/IP ports - electrical 10/100 Mbit/s, auto sensing - shall be available as an option. Preferably, a fourth port with exchangeable SFP transceivers for optical connection shall be provided.
g) The Ethernet/IP ports can be used for equipment programming & monitoring and/or for Ethernet/IP traffic switching/routing via the PLC link. No external device(s) shall be required for the latter purpose.
h) IP header compression shall be configurable in order to minimize bandwidth.
i) In switching mode, VLAN support shall be configurable (ID & priority). In routing mode, ≥ 10 IP routes and port-based priority shall be configurable.
j) The bandwidth of the Ethernet/IP service via the PLC link shall follow the automatic speed adaptation of the broadband modem.

2.19.6.13 SALIENT FEATURES OF DIGITAL PLCC

The salient features for the Digital PLCC are detailed out as follows

A. HIGH FREQUENCY CHARACTERISTICS

1. Frequency Range	40-500 KHz as per IEC 60495
2. Center Frequency Programmable	In steps of 1 Hz
3. Nominal Impedance	75 ohm unbalanced (150 ohm balanced as an option)
4. Return Loss in the transmitted band	≥10 dB according to IEC 60495
5. Tapping loss	≤ 1.5 dB according to IEC 60495
6. Image rejection	≥75 dB

B. TRANSMITER / RECEIVER

1. Nominal transmit output power (PEP)	upto 100W or better
2. Nominal Bandwidth	4- 32 kHz (each direction)
3. Output Level Adjustment	In steps of 1 dB (via user interface program (HMI))
4. Receiver Sensitivity	-30 dBm
5. Receiver Selectivity	As per IEC-60495
6. AGC Range (Automatic Gain Control)	40 dB dynamic range or better
7. Minimum Signal to Noise Ratio	20dB(QAM16/TCM32)/24dB(QAM64/TCM128)

C.GENERAL CHARACTERISTICS

1. Application	Universally applicable in analog, digital, or mixed operation.
2. Modulation	Single Side Band with Suppressed carrier SSB) Multi-Carrier (OFDM) modulation with Trellis Coding and forward error correction. Single step frequency conversion with Direct Digital Synthesis (DDS).
3. Gross Bit rate	32 kbps in 4 kHz, 128 kbps in 16 kHz up to 256 kbps in 32 kHz bandwidth
4. Test Facilities	Inbuilt accessible via HMI
5. Standards compliance	IEC 60495, IEC 60834-1, IEC 60950-1, IEC 61000-6-2, IEC 61000-6-4

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D. USER INTERFACES

1. Data Interfaces and bit rates supported	RS- 232 (up to 19.2 kbps)/V.24 Ethernet, V.11
2. Voice interfaces supported	2W/4W E&M, FXO and FXS, Hotline
3. Speech level adjustment	Transmit level (-20 to + 5 dBm) Receive level (-20 to + 8 dbm)

E. OTHER CHARACTERISTICS

1. Alarms	Supported on panel
2. Operating Temperature and humidity	0 to +45 deg C, 90% humidity
3. Power supply voltage	48 VDC +20/- 15%
4. Maximum power consumption	135 W or better for normal operation @ 75 Ohm

2.19.7 TECHNICAL SPECIFICATION OF TELE-PROTECTION COUPLER

The Digital protection signalling equipment is required to transfer the trip commands from one end of the line to the other end in the shortest possible time with adequate security and dependability. It shall also monitor the healthiness of the link from one end to the other and give alarms in case of any abnormality. The protection signalling equipment shall have a proven operating record in similar application over EHV systems and shall operate on 48V DC (+15%, -10%).

It shall provide suitable interfaces for protective relays, which operate at 220/110V DC. Power supply points shall be immune to electromagnetic interface.

2.19.7.1 Principle of Operation

During normal operation, protection signalling equipment shall transmit a guard signal/code. In case Protection signalling equipment is actuated by protective relays for transmission of commands, it shall interrupt the guard signal/code and shall transmit the command code to the remote end. The receiver shall recognize the command code and absence of the guard code and will generate the command to the protective relays.
All signal processing i.e. generation of tripping signal and the evaluation of the signals being received shall be performed completely digital using Digital Signal Processing techniques.

2.19.7.2 Loop Testing

An automatic loop testing routine shall check the tele protection channel.
It shall also be possible to initiate a loop test manually at any station by pressing a button on the front of the equipment.
Internal test routine shall continuously monitor the availability of the protection signalling equipment.
Proper tripping signal shall always take the priority over the test procedure.
The high-speed digital protection signalling equipment shall be designed and provided with following features.

- Shall work in Digital PLCC Terminal.
- Full Duplex operation
- Auto loop facility shall be provided
- Shall be able to transmit upto 4 commands with trip counter

Bidder shall quote for protection signalling equipment suitable for 4 commands with separate trip counters for transmit and receive. Laptop shall be provided for configuration of PLCC/DPC.
High security and dependability shall be ensured by the manufacturer. Probability of false tripping and failure to trip shall be minimum. Statistical curves/figures indicating above mentioned measures shall be submitted along with the bid.
The DPC shall be housed in offered PLCC panel and should be a standalone type.
Reports of the following tests shall be submitted for approval for protection signalling equipment and relays associated with the protection signalling equipment and interface unit with protective relay units, if any.

i) **General equipment interface tests :**

a. Insulated voltage withstand tests
b. Damped oscillatory waves disturbance test
c. Fast transient bursts disturbance test
d. Electrostatic discharge disturbance test
e. Radiated electromagnetic field test
f. RF disturbance emission test

ii) **Specific power supply tests**

a) Power supply variations
b) Interruptions
c) LF disturbance emission
d) Reverse polarity

iii) **Tele-protection system performance tests**

a) Security
b) Dependability
c) Jitter
d) Recovery time
e) Transmission time
f) Alarm functions
g) Temperature and Humidity tests (As per IEC 68-2)
   a. Dry heat test (50°C for 8 hours)
   b. Low temperature test (-5°C for 8 hours)
   c. Damp heat test (40°C/95%RH for 8 hours)

All the above tests at i, ii & iii (except temperature & humidity tests) shall be as per IEC 60834-1 and the **standards mentioned therein.**

iv) Relays

a) Impulse voltage withstand test as per IEC 60255.
b) High frequency disturbance test as per IEC 60255.

2.19.7.3 The bidder shall offer voice frequency transmission equipment, which shall work on frequency shift or coded signal principle for transmission/ reception of protection signals.

2.19.7.4 The teleprotection shall conform to IEC 60834-1, 1999.

2.19.7.5 Each teleprotection system shall support the transmission of up to four independent and simultaneous commands, programmable individually for blocking, permissive tripping or direct tripping (intertripping).

2.19.7.6 The transmission of the command signals shall be accomplished within the speech bandwidth or within the spectral bandwidth of the broadband modem, i.e. the teleprotection shall not require the allocation of extra / separate bandwidth.

2.19.7.7 During transmission of protection commands, other services like speech and data shall be temporarily interrupted in order to transmit the protection signal at increased power (commad signal boosting).

2.19.7.8 The nominal transmission time shall be < 11 ms, < 12 ms and < 13 ms for blocking, permissive tripping and direct tripping respectively.

2.19.7.9 The equipment for protection shall have high degree of reliability and speed. It shall be guaranteed to function reliably in the presence of noise impulse caused by isolator or breaker operation. The required SNR shall be less or equal than 6 dB for a dependability of < 1E-03 for blocking and permissive tripping, and for a dependability of < 1E-04 for direct tripping, i.e. the probability of missing a command in a maximum actual transmission time Ttr = 15 ms, 17 ms and 22 ms respectively.

2.19.7.10 The probability of an unwanted command (security) shall for any SNR condition (worst case) be not higher than 1E-03, 1E-06 and 1E-09 for blocking, permissive tripping and direct tripping respectively.

2.19.7.11 Electrically isolated opto-coupler inputs, solid-state outputs shall be available as I/O interfaces to the protection devices. Voltage range shall be selectable from 24 VDC to 250 VDC nominal.

2.19.7.12 Commands shall be freely allocatable to the inputs and the outputs, alarms shall be freely allocatable to the outputs (programmable via HMI).

2.19.7.13 It shall be possible to individually delay and prolongate the input command signals or to prolongate the output command signals and to monitor their duration (all parameters configurable via HMI).

2.19.7.14 All transmitted and received commands shall be logged with time stamps of 1 ms resolution by the internal event-recorder.

2.19.7.15 The teleprotection shall provide an integrated cyclic loop test.

2.19.7.16 The teleprotection shall be software-programmable via PC HMI with GUI.

2.19.7.17 For single-purpose teleprotection applications, the nominal transmission bandwidth of the PLC terminal shall be configurable for 2 kHz or 2.5 kHz in each direction. A service phone channel shall optionally be available in this operating mode.

2.19.7.18 The DPC should have E1 interface so that two channels can be created for transmission of commands, out of which one channel will be through PLCC and the other channel through FOTE. The channel arrangement should be such that if the main channel fails, the DPC should automatically switch to the other channel.

2.19.7.19 The offered DPC shall be equipped with redundant Power Supply Card and redundant 4 command Relay Interfacing card.

2.19.7.20 The DPC shall be IEC 61850 compliant Digital Tele- Protection Coupler, have 16 commands with redundant power supply card and CPU along with Analog PLCC Interface Card, E1 interface card and optical interface card to support 150 km for 132kV and 220kV and 240km for 400kV

2.19.7.21 PRINCIPAL TECHNICAL REQUIREMENTS OF TELE PROTECTION COUPLER

TABLE-III

Application	Transmission of protection commands for line and objects protection via DPLC equipment.
Number of units	Two No. 8 commands (atleast) module to be fitted in offered DPC (Standalone)
Number of commands	16 simultaneous commands per system, simultaneously transmitted. Individually configurable for blocking, permissive or direct tripping.

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	Single purpose teleprotection in the 2 kHz APLC chalnnel: 3 independent commands (as above) and 1 prioritised command (for direct tripping).		
Secure against	Noise (continuous or impulsive), speech and sweep tones, DTMF (CCITT 48430 or ITU-T Q.23) in-band signalling		
Bandwidth requirement	Nil; command signal transmission in-band (alternate purpose with signal boosting)		
Processing of received signal	Adaptive (to prevailing channel condition, always ensuring shortest transmission time)		
Guard signal	Pilot signal or own guard signal in speech band		
Number and type of inputs Method of tripping Voltage ranges	16 optocoupler per tele protection interface Contact and battery, or dry contact 24 to 250 V DC, selectable in 4 ranges.		
Number and type of outputs Tripping voltage Tripping current	16 solid state relays contacts per tele protection interface. 5 to 250 V DC ≤ 1 A carry / 2 A peak solid state 5 A carry / 20 A peak mechanical relay		
HMI configurable	Command and alarm assignment to I/O ports, Command pick-up times, hold times, duration monitoring State of command outputs during link alarm Alarm and unblocking level thresholds		
Test facilities	Manual or periodic loop test every 1,3,6,12,24 hours.		
Event recording	Time-stamped command events, command counters, stored in non-volatile memory. GPS Clock synchronizing input should be available		
Teleprotection performance	Blocking	Permissive tripping	Direct tripping
Overall time for PLC, VFT and transmission path	<20 ms	<20 ms	< 30 ms
Operating time lower than the specified maybe preferred provided they fulfil the requirements of security and reliability as mentioned: False Trip Probability (Noise burst of any amplitude) : 10^{-5} or better Fail to trip probability for S/N 6 dB in 3.1kHz Band (white Noise Measurement) : 10^{-2} or better			

2.19.8 TECHNICAL SPECIFICATION 48V PLCC BATTERY BANK

2.19.8.1 TYPE AND RATING

i) Stationary type, sealed, valve regulated lead acid battery tank suitable for operation on 48 Volts D.C. system to meet loads like emergency lightning, control and signaling circuits, relays, breaker operations, indicating circuits, etc. shall be required. The stationary battery shall comply with the provisions of IEC 896, Part 2 / ANSI T1.330.

ii) The Ampere-hour capacity of the battery bank at 27°C at 10 hours discharge rate shall be 200 AH.

iii) The nominal voltage of the battery bank shall be 48 Volts D.C.

iv) The number of cells in a complete battery bank set shall be 24 plus 2 spares.

2.19.8.2 PLATES

Positive plates shall be made of flat pasted type using lead-cadmium antimony alloy for durability, high corrosion resistant, maintenance free, long life both in cyclic as well as in ,float applications. Negative plates shall be heavy duty, durable flat plate using lead calcium alloy pasted box grid. Negative plates shall be designed to match the life of positive plates and combination of negative and positive plates shall ensure long life, durability and trouble-free operation of battery. PLC operated equipment should be deployed for preparation of paste to ensure consistency in paste quality. Conventional / manual type of paste preparation is not allowed.

2.19.8.3 CONTAINER AND LID

The containers and lids shall be made of a special grade polypropylene copolymer plastic material. They shall be sufficiently robust and not liable lo deformation under internal operating pressures and within the temperature range naturally encountered, leak proof, non-absorbent and resistant to the acid with low water vapour permeability.

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2.19.8.4 VENT PLUGS

Each cell shall be equipped with one-way safety valve with opening pressure of 5±1 psi and closing pressure 4±1 psi. The vent plug shall be made with suitable grade of fire retardant plastic material. Each valve opening shall be covered with flame barrier capable in preventing the ingress of flame into the cell interior when the valve opens and hydrogen / oxygen gas mixture is released.

2.19.8.5. SEPARATORS

Separator shall be made of spun glass, micro porous matrix and shall be resistant to Sulphuric Acid. It shall be capable of keeping the entire electrolyte and shall be electrically insulated. Sufficient separator overlap and PVC shield protection to top and bottom edges of the plates is to be provided to prevent short circuit formation between the edges of adjacent plates.

2.19.8.6 CONNECTORS

The connectors shall be lead coated copper of suitable size to join the cells. The connectors shall be suitably designed and coated to withstand corrosion due to sulphuric acid. The coating should be adequate and tenacious. All the copper inter cell connectors shall be provided with heal shrinkable sleeves except at the connecting points.

2.19.8.7 ELECTROLYTE

The electrolyte shall be prepared from the battery grade Sulphuric Acid confirming to ISS: 266. The batteries shall be supplied in factory filled and charged condition.

2.19.8.8 WATER

Water required for preparation of electrolyte shall conform to IS: I069.

2.19.8.9 PLATE CONNECTION

Lugs of plates of like polarity shall be connected by lead burning to a horizontal strap having an upstanding terminal post adopted for connection to external circuit. Strap and post shall be caste with lead alloy. The positive and negative terminal posts shall be clearly marked for unmistakable identification.

2.19.8.10 BOLTS AND NUTS

Nuts and Bolts for connecting the cells shall be of superior grade passivated Stainless steel.

2.19.8.11 TERMINALS

Terminals shall be of integral lead terminal with solid copper core with M6 threading for fastening. The junction between terminal posts and cover and between the cover and container shall be hermetically sealed.

2.19.8.12 BATTERY RACKS

Batteries shall be installed on MS racks to be supplied by the Contractor to fit in the battery room. Racks/Trays shall be powder coated with anti-corrosive paint. Rack shall accommodate 55 cells plus 2 spares. Racks/Tray shall be suitably treated before painting for protection against fungus growth and other harmful effects due to tropical environment. The colour of the supporting racks shall conform to RAL 7032 shade.

2.19.8.13 CAPACITY REQUIREMENTS:

When the battery is discharged at 10 hour rate, it shall deliver 80% of Rated Capacity (corrected at 27°C) before any of the cells in the battery bank reaches 1.85 V/cell. The battery shall be capable of being recharged from the fully exhausted condition (1.75 V/cell) within 10hrs upto 90% state of charge. All the cells in a battery shall be designed for continuous float operation at the specified float voltage throughout the life.

The capacity (corrected at 27°C) shall also not be less that Rated capacity & not more that 120% of Rated capacity before any cell in the battery bank reaches 1.75 V/cell. The battery voltage shall not be less than the following values, when a fully charged battery is put to discharge at a rate of 1/10th of the Rated Capacity:

(a) After SIX hours of discharge: 1.92V/cell

(b) After EIGHT hours of discharge: 1.85V/cell

(c) After TEN hours of discharge: 1.75V/cell

Loss in capacity during storage at an average ambient temperature of 35°C for a period of 6 months shall not be more than 60% and the cell/battery shall achieve 85% of its rated capacity within 3 charge/discharge cycles and full rated capacity within 5 cycles, after the storage period of 6 months. Voltage of each cell in the battery set shall be within 0.05V of the average voltage throughout the storage period. Ampere hour efficiency shall be better than 90% and watt-hour efficiency shall be better than 80%. However, the battery to be manufactured and to be delivered at site in such a way that load can be connected with the battery within 15 days from the date of installation. Date of initial charging is to be mentioned on the battery.

2.19.8.14 ASSOCIATED EQUIPMENTS & ACCESSORIES (For each set of battery) :

a) Best quality metallic stand/frame as per Clause 9.12.

b) Stand insulators +5% extra

c) Inter row connectors :Appropriate quantity

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d) Inter tier connectors
e) Centre-zero (3-0-3) volts DC Voltmeter : 1 No
f) Torque wrench/ Spanners : 1 No
g) Connection hardwares, such as strips, bolts, nuts(with 5% extra)
h) Cable clamps with hardware
i) Cell numbering tags with fixing arrangement
j) Two sets of special tools and tackles for connecting terminals of the battery
k) Any other accessories not specified but required for satisfactory operation.

2.19.8.15 TYPE TEST OF BATTERY:

The Bidder/ Supplier shall supply type tested battery as per IS 15549:2004/ IEC 60896-21 & 22 over the range of at least one capacity per design. The Bidder/ Supplier shall submit necessary evidences enclosed along with tender documents.

Sl No	DESCRIPTION
1	Gas Emission
2	High Current Tolerance
3	Short Circuit Current & DC Internal resistance
4	Protection against Internal Ignition from External Spark source
5	Protection against Ground Short Propensity
6	Content & Durability of required marking
7	Material Identification
8	Valve Operation
9	Flammability Rating of Material
10	Intercell Connector Performance
11	Discharge Capacity
12	Charge Retention during Storage
13	Float Service with Daily Discharge for reliable mains power
14	Recharge behavior
15	Service Life at an operating temperature of 40°C for brief duration exposure time
16	Impact of Stress Temperature of 60°C for brief duration exposure time with 3hrs discharge test
17	Abusive Over Discharge
18	Thermal Runaway Sensitivity
19	Low Temperature Sensitivity
20	Dimensional Sensitivity at Elevated Internal Pressure & Temperature
21	Stability against Mechanical abuse of units during installati

2.19.8.16 Routine Test:

(i) Physical Examination Test
(ii) Visual Inspection
(iii) Dimensions, Mass & Layout
(iv) Marking & Packing

2.19.8.17 ACCEPTANCE TEST OF BATTERY

(i) Polarity Marking
(ii) Verification of Dimensions
(iii) Open Circuit Voltage of each Cell & Total Open Circuit voltage of the battery bank
(iv) Test of AH Capacity

2.19.8.18 LIST OF FACTORY & SITE TESTS FOR BATTERY

Sr. No.	TEST	FACTORY TESTS	SITE TESTS
1	Physical Verification	YES	YES
2	Capacity Test on the cell at 1/10th of Rated Capacity, corrected at 27°C	YES	
3	8hrs Charge & 15mins Discharge Test at Full Rated Load	YES	

2.19.9.0 48V BATTERY CHARGER

2.19.9.1 **General:**

This section covers the general requirement of 48 V DC SMPS Based Power Plants, based on High Frequency Switch Mode Techniques using switching frequencies of 20KHz and above for use in AEGCL.

2.19.9.2 SMPS Based Power Plants is intended to be used in **Auto Dual Float Rectifier cum Boost Charger (FR-BC)** mode as a regulated DC Power Source.

2.19.9.3 Power System Configuration: The configuration of 48 V DC Power Plants with FR-FC & FRBC Modules shall be as under:

Sl No	Basic SMR Module	Configuration	Permissible Ultimate Capacity
1	25 A FR-FC	(n+1)	75 Amp
2	50 A FR-FC	(n+1)	150 Amp
3	25 A FR-BC	(n+2)	75 Amp
4	50 A FR-BC	(n+2)	150 Amp

The FR-FC or FR-BC modules shall be housed in (n+1) or (n+2) parallel configuration in a single rack where 'n' is the actual required number of FR-FC, FR-BC modules for meeting the particular load requirement.

AEGCL shall indicate the Type, Number and Configuration of SMR Modules, depending upon the load requirement.

19.7.3.1. The Battery Charger of 48V/25A (Ultimate capacity 150A) or 48/50A (Ultimate capacity 150A) N+1 configuration shall be of SMPS type and shall be chosen as per load demand of communication equipments of the substations. The system shall consist of DSA and Float Rectifier –cum-Charger (FR/FC) in a steel rack in a modular type. It should have menu driven microprocessor control technique for DSA as well as module for control, monitoring and alarm to achieve better reliability of the system.

2.19.9.4 The Battery Charger shall have Dual Source AC Input (AC Input 1 and AC Input 2) with individual MCCB and shall be provided with Auto Changeover arrangement.

2.19.9.5 The Battery Charger shall have an IP Rating of IP42 or better. The Charger shall be type tested for IP42 or better rating.

2.19.10 Rack Configuration :

Rack is composed of following units accommodated in sub racks

a) Dual Float Rectifier cum Boost Charger (FR-BC) Modules
b) Distribution-Switching-Control-Alarm Arrangement (DSCA)
c) The number and rating of FR-FC, FR-BC Modules shall be provided as per purchaser's requirement. The Distribution-Switching-Control-Alarm Arrangement (DSCA) shall be provided for the Ultimate Expandable Capacity. All factory wirings for the rack shall be for the Ultimate Expandable Capacity so that only plugging-in of FR-FC or FR-BC module shall enhance the DC Power output.

2.19.11 Parts & Components

2.19.11.1 The Parts & Components including Fuses and Circuit Breakers for manufacturing of the SMPS Based Power Plants shall be of Industrial Grade. These Parts & Components shall be procured from reputed manufacturers to ensure prompt and continuous service and delivery of spare parts.

2.19.11.2 Power Transformers and Chokes shall use Class B or Higher Grade of insulation. The Transformers and Chokes shall be wound with copper wire provided with adequate insulation.

2.19.11.3 Component mounting and fixing methods shall be secured.

2.19.12 Wiring:

2.19.12 1 All insulated conductors except those within the confines of a printed circuit board assembly shall be of the rating enough to withstand the maximum current voltage during fault and overload.

2.19.12 2 All wiring shall be neatly secured in position and adequately supported. Where wires pass through any part of Metal Panel or Cover, the hole through which they pass shall be suitably bushed with rubber grommet.

2.19.13 Bus Bars:

2.19.13.1 Bus bars shall be of high conductivity electrolytic copper strips capable to with-stand 1.5 times the maximum load current. The Bus bar shall be capable to carry current density of 2 Amps/mm2 but shall not be less than 25mmx5mm in any case. The size of bus bars chosen for battery and load path shall be capable to take care of the current of maximum power plant capacity for which it is designed.

2.19.12.2 Bus-bar Riser height wherever applicable shall be 250mm for both load and battery.

2.19.12.3 Earthing: All non-current carrying metal parts shall be bonded together and earthed. An earth terminal suitable for taking minimum 4 mm dia wire and with suitable marking shall be provided.

2.19.12.4 The SMPS Based Power Plants shall be designed & manufactured for continuous operation at rated load in the ambient temperature range of 0ºC to 55ºC.

2.19.12.5 Insulation Resistance and Voltage Proof

2.19.12.6 The insulation resistance of a fully wired FR-FC and FR-BC Modules when tested with a 500V DC Megger shall be as given below:

a) AC input and Earth - Greater than 2 Mega Ohm
b) DC Output and Earth - Greater than 1 Mega Ohm
c) AC input and DC output - Greater than 5 Mega Ohm.

2.19.14 Lightning Protection :

The SMPS Based Power Plants shall have modular type Type I/Class B and Type II/Class C type surge protection in TT configuration of wiring. Both the Type I/Class B and Type II/Class C arrestors should be from the same manufacture and shall be mounted as per the specific installation recommendations of the manufacturer to achieve perfect coordination.

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2.19.14.1 Radio Frequency Interference Suppression: The module shall be designed to minimize the level of electromagnetic interference (EMI), both conducted and radiated, detected in its vicinity and generated by Switch Mode Power Conversion Equipment operating within the rack.

2.19.15 Name plate :

A name plate etched/engraved/anodized or any other better arrangement ensuring better life expectancy shall be suitably fixed on each rack/module and contain following information.

1. Specification Number
2. Type of Unit
3. Manufacturer's name and identification
4. Model No.
5. Unit Serial No.
6. Input Voltage and phase
7. Output Voltage and current
8. Year of manufacture
9. Suitable for battery capacity

2.19.16 AC input supply: The Power Plant using FR-FC or FR-BC modules of 25 Amps shall operate from single phase AC input and FR-FC or FR-BC modules of 50A capacity may operate from single phase or 3 phase 4 wire AC input. The nominal input frequency is 50Hz which may vary from 48-52Hz. The input voltage range shall be as given below:

a) Single Phase (nominal 230V) :

For Power Plant to be used at stations having reasonable power supply regulation, incoming power supply range shall be from 165 V AC to 260 V AC.

b) Three Phase/4 Wire 400V+10%/ - 15% (Nominal 400V)

2.19.17 There shall be an automatic arrangement for shutting off the FR-FC or FR-BC Modules wherever the input voltage is beyond the specified operating limits with suitable alarm indication. It shall resume normal working automatically when the input is restored within the working limits. Hysteresis within specified working limits shall not cause shutting down of the FR-FC or FR-BC Modules. A tolerance of ±5V may be acceptable for protection & alarm operation. All the FR-FC or FR-BC Modules shall switch OFF simultaneously.

2.19.18 FR-FC or FR-BC Modules working from 3 phase/4 wire input shall work satisfactorily for unbalance of ±10% of nominal input. The module shall be isolated (if required for the protection of the unit) in the event of unbalance beyond 10% and shall restore when the input is within limits.

2.19.19 The SMPS battery charger shall be capable of continuous operation with float voltage 2.23 to 2.25 Volt per cell and 2.3 Volt per cell for charge voltage while supplying the constant DC load.

2.19.20 The SMPS battery charger shall have constant voltage characteristics throughout the range (from zero to full load) at floating value of the voltage so as to keep the VRLA batteries fully charged but without harmful overcharge.

2.19.21 The float cum boost charger works on 415 V AC, 50 Hz supply (or 230 V AC, 50 Hz supply). The battery charger should be capable of delivering the full rated load at the specified voltage at the output terminals. The set output voltage is maintained for AC input variation of + 10% and load variation from 0-100% of rated full load.

2.19.22 The charger voltage in float mode of operation is normally be set at 54 V DC and the same shall be adjustable between 48 and 54 V DC through variable potentiometer. When the charger is selected to boost mode, it should supply charging at the rated current maximum. This shall be adjusted from 20% to 100% of rated current through potentiometer.

2.19.23 All these circuits are housed in freestanding cabinet of folded sheet steel (thickness of sheet steel should not be less than 2.5mm) construction finished in stove enamel light gray colour conforming to shade of 631 of IS: 5. The cabinet is provided with front and back doors for easy accessibility. All meters, meter selector switches, control switches and LCD display (Microprocessor unit) etc are to be provided on the front panel. The AC input and DC output MCCB'S and control switches are provided on middle inside of the breaker panel. The cable terminations are provided on front side of the cubicles.

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2.19.24 PARTICULARS FOR 48 VDC

Type FLOAT CUM BOOST CHARGER

Hot swappable rectifier modules 25A/48V, N+1 configuration.

TABLE-IV (a)

SL NO	DESCRIPTION	PARAMETERS
1	RATING	48 V (Capacity shall be as per Battery Sizing Calculation) Dual float cum boost charger (suitable for MF-VRLA battery).
	AC INPUTS	
2	VOLTAGE	415 V AC+ 10% (230V AC +10%)
3	PHASE	3 phase, 3 wire (single phase)
4	FREQUENCY	50 Hz+5% (50Hz+2Hz)
5	POWER FACTOR	(Better than 0.7 lagging)
	DC OUTPUT	
6	FLOAT VOLTAGE	48 V- 54 V DC
7	BOOST VOLTAGE	48 V-55.2 V DC
8	OUTPUT CURRENT	35A
9	VOLTAGE REGULATION	Better than + 1% of set value
10	RIPPLE	Less than 1% r m s
11	EFFICIENCY	(Better than 90%)
12	SYSTEM OUTPUT VOLTAGE	55.2V DC+1%(at load terminal)

METERS: The microprocessor-based controller should have metering facilities namely (a) Load Voltage (b) Load Current, (c) Battery Voltage (d) Battery Current (e) Battery Temperature, (f) Voltage and current of individual module.

TABLE-IV (b)

PROTECTION			
Over voltage trip at the output	:	Over voltage cutback	56.5+ 0.5 V DC
DC under voltage at battery input	:		42+ 0.5 V(1.75 V X 24)
Fuse at AC input	:	Fast acting semiconductor fuse	Fast acting semiconductor fuse
Fuse at DC out put to load	:	MCCB	Fast acting semiconductor fuse
Reverse polarity at battery input	:	Protected	Protected
Out put current limiting	:		Battery charging current limit
AC input MCCB	:	Required	Required
Blocking diode	:	Required	Required
Charger over load	:	Required	Required
INDICATION			
AC input ON	:	Required	
DC output ON	:	Required	
Float ON	:	Required	
Boost ON	:	Required	

AC under voltage	:	Required
AC over voltage	:	Required
DC over load	:	Required

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DC over voltage	:	Required
Short circuit	:	Required
Reverse polarity	:	Required
Mains fail		Required
Charger fuse fail		Required
Battery over voltage		Required

TABLE-IV (c)

CONTROLS AND SWITCHES	
AC input MCCB	ON/OFF switch at input
DC output MCCB	Three-way switch to select auto / manual float / manual boost operation
Auto/manual float/boost mode selector switch	Two-way switch to read charger output current or battery charge / discharge current
Auto /manual voltage regulator selector switch	Single tern potentiometer for float voltage adjust
Float and boost voltage variable potentiometer	Single tern potentiometer for boost voltage adjust
Manual voltage adjust variable potentiometer	Single tern potentiometer for charger total current adjust
Battery current adjust potentiometer	Single tern potentiometer for battery current adjust
Heaters power supply switch	
Socket power supply switch	
ADDTIONAL FEATURES	
Soft start on DC side	Auto float / boost operation

2.19.25 TECHNICAL SPECIFICATION OF PAX SYSTEM

2.19.25.1 The offered exchange shall be the latest state of-art digital 32-bit microprocessor based suitable for direct connection to PLCC terminals, Optic Fibre, Digital Microwave, VSAT, etc, without the need for any four wire interconnection device. The design shall employ stored program technique and utilizes the principles of Time Division Multiplexing / PCM technology.

2.19.25.2 The offered EPAX directly interface with the Power Line Carrier Communication terminals with E & M signalling. The EPAX shall also support the CO trunk. The software of the EPAX should support both the E & M and CO trunks and should have the facility to be interconnected to P & T trunks for CO Access.

2.19.25.3 The EPAX should support single, two- or three-digit numbering scheme. The exchange should support a minimum of 16 out pulsing digits and a maximum of 20 out pulsing digits at time from a normal telephone. The exchange should be fully Non-blocking.

2.19.25.4 The duplication of both CPU and PSU is to be provided as in-built features in the offered exchange.

2.19.25.5 The EPAX should support a maximum configuration of 250 Ports. The EPAX shall have universal ports wherein any type of line card or trunk card of the EPAX can be inserted into any slots. Also, the number of trunks can be either E & M or CO or a combination of both. The offered exchange shall work purely as a PLCC switch or a combination of PLCC & CO or a network switch or a combination of PLCC, CO, Fibre and digital microwave.

2.19.25.6 The offered switch shall have an integrated E1 type card wherein a direct 2 MB stream can be connected to the switch.

2.19.25.7 The switch shall have ISDN compatibility for interfacing with PSTN and other public ISDN exchanges. A valid TEC certification for ISDN compatibility to be enclosed without the same the bid is liable for rejection.

2.19.25.8 The switch shall be equipped with voice guidance feature to navigate the subscriber in using the major features of the exchange. Data transmission through MODEM pooling shall be available in the exchange. The EPAX shall support exclusive Load Despatch Express type communication network with all to one and one to All type of trunk access. This feature shall be in addition to the normal All to All type. The exchange offered needs to be type tested for EMC specifications in line with IEC recommendations 495 for PLCC equipment. A valid certification for EMC compliance from any government laboratory within three years as on date of bid opening needs to be enclosed with the bid. The EPAX must have been EMI / EMC tested for the following as per IEC 495 to suit the stringent conditions in the Sub-station environment.

a. Impulse Voltage withstand test (IEC 255-4).
b. High Frequency disturbance susceptibility test (IEC 255-22-1).
c. Electrical Fast Transient Susceptibility Test (IEC 801-4).
d. Electrostatic discharge susceptibility test (IEC 801-2). Radiated susceptibility (IEC 801-3).

2.19.25.9. The Bidders shall offer suitable telephone equipment for automatic dialling which must work in full cordination with the already provided telephone equipment in the existing PLC system.

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2.19.25.10 The bidder shall offer the latest state-of-art digital based Microprocessor EPAX suitable for direct connection to the PLCC terminals without the need of any four wire-interconnecting device (EFGS/EMFGS). The EPAX shall employ stored programme technique and utilize Time Division Multiplexing.

2.19.25.11 The EPAX shall be suitable for internal communication between the local subscribers as well as for selective communication over tie lines.

The special features of the offered EPAX shall be as follows:

i) EPAX is of latest microprocessor-based design, which employs Pulse Code Modulation/Time Division Multiplexing principle.

The following are the advantages over space division/reed relay switching:

a) Fully solid-state circuitry and hence high reliability in operation.
b) Fast response
c) Low operation and maintenance cost
d) High traffic handling capacity - Fully Non-blocking type
e) Compact size
f) Noise free operation

ii) Self checking diagnostics facility as a built-in feature of the EPAX. In view of this, the maintenance of the EPAX is extremely simple.

iii) The design of the software structure should be very flexible. Using any standard telephone instrument, the following programming shall be done at site:

- Modification of local subscriber number
- Modification of subscriber priority
- Modification of subscriber facilities like Access to Tie lines and Follow Me
- Modification of Tie line number
- Modification of Tie line groups
- Modification of Exchange number
- Allocation of Alternate route
- Transit call barring

The above programming facility at site should not require any additional test equipment.

iv) Built-in main distribution frame with Protective Devices such as surge arresters and fuses for all limbs of subscriber lines and tie lines to protect the sophisticated electronic circuitry of the exchange from damage due to external surges/spikes.

v) The EPAX is suitable for easy expansion if required at a later date.

As per your requirement, supply of EPAXs equipped with 16,32,64 subscriber lines and 8,16,32 tie lines (PLCC directions). The ultimate capacity of the EPAX shall be 250 ports for flexible usage of either the subscriber lines or trunk lines.

2.19.25.13. The line interface circuit module shall serve as an interface between the subscriber line and the exchange whereas the trunk interface circuit module shall serve as an interface between the tie line and the exchange. However, the EPAX shall be possible to expand either the number of subscriber lines or tie lines if required, at a later date, in view of the modular construction adopted. The EPAX shall have a 32-bit microprocessor and programmable at site. The software shall support both E&M signalling and CO trunks. The EPAX shall be provided with universal ports wherein the Subscriber line card and CO trunk card can be inserted into any slots. . If the ultimate capacity of the trunks has been used and on a later date the board intends to increase the trunk capacity the same can be done by decreasing the subscriber lines and thereby increasing the trunks. Vice versa for subscriber lines if the ultimate capacity is reached by reducing the trunks the subscriber lines can be increased.

2.19.25.14 The duplication of both the CPU and PSU is to be provided as an in-built feature in the offered EPAX. The EPAX shall support the digital telephone with display on a single pair of cable. The offered EPAX shall be provided with a voice guidance card, which helps the subscriber in using, the all the features of the exchange viz. call back etc. The EPAX shall be fully automatic and should function without the help of an operator. The details of site programming facility shall be provided in detail.

2.19.25.15. The EPAX shall have the following facilities:

a) Follow me
b) Priority interrupt/Conference
c) Automatic alternate route selection
d) Ring when free
e) Line Lock out
f) Either party release
g) Real time clock
h) Audible and visual alarm on all fault conditions.

2.19.25.16. The EPAX shall be self-contained and provide its own ringing current and tones.

2.19.25.17. Visual display with LED's shall be available on each line and trunk card to display call status. Visual and audible alarms shall be provided on all fault conditions based on the self-diagnostic routines.

2.19.25.18. The EPAX is to be housed in dust proof steel cabinet.

2.19.25.19. The EPAX works on 48V DC +15% -10% supply. The loop resistance for subscriber lines is 1000 ohm maximum and for Tie lines 1500 ohm maximum.

2.19.25.20. The offered EPAX shall support the system software to work as an exclusive PLCC exchange or a combination of PLCC and CO trunks or as a network exchange on E&M. It is very important to note that these three combinations shall be

available on the system software so that the purchaser can switch to the exact application at the time of commissioning. The offered EPAX shall work in conjunction with the existing EPAXs of other makes in the grid.

2.19.25.21. The offered EPAX shall have ISDN compatibility for the CO trunks. The system software shall be posted on flash memory as per the latest International standards for fast and reliable operations. The EPAX shall also support a minimum dialling of 16 digits at a time and a maximum of 20 digits. The EPAX shall have compatibility with E1 trunks for expansion in later stage. It should have the software in-built for through connectivity from E1 trunk to PLCC trunks.

2.19.25.22. The EPAX should be provided with universal ports for peripheral cards so that any combination of subscribers and trunks can be selected by the user by inserting suitable interface cards.

2.19.25.23. The EPAX must have been EMI/ EMC tested for the following as per IEC 495 to suit the stringent conditions in the Sub-station environment.

1.Impulse Voltage withstand test. (IEC 255-4)
2. High Frequency disturbance susceptibility test (IEC 255-22-1)
3.Electrical Fast Transient Susceptibility Test (IEC 801-4)
4.Electrostatic discharge susceptibility test (IEC 801-2)
5.Radiated susceptibility. (IEC 801-3).

2.19.26.0 TECHNICAL SPECIFICATION OF HIGH FREQUENCY COAXIAL CABLE

2.19.26.1 The high frequency coaxial cable shall be required to connect the line matching unit / line matching distribution unit installed in the switchyard of the substation to the carrier equipment installed in the carrier rooms.

2.19.26.2. The high frequency cable to be offered by the bidders shall be suitable for being laid directly to the ground or in trench or ducts.

2.19.26.3. The cable shall be PVC sheathed and steel armoured. The capacitance of the cable shall be low so as to minimise attenuation of the signal within carrier frequency range. The impedance of the cable shall be so as to match the output impedance of the PLC terminals and secondary impedance of the coupling units. The cable shall be installed to withstand a test voltage of 4 KV.

2.19.26.4 Bidders shall specify attenuation per Km. of high frequency coaxial cable at various frequencies in the range of 80 to 450 KHz.

2.19.26.5 High frequency cable shall be supplied on drums containing lengths of minimum 500 metres.

TABLE-V

Sl No	Description	Particulars
1	COAXIAL CABLE	1/1.22mm HF Coaxial Cable having annealed plain tinned copper wire centre conductor, Semi-Air spaced dielectric of composite helical thread of polythene in a polythene tube and annealed plain tinned copper wire braided, Melinex tapped, extruded, special PVC sheathed, black steel wire Braid armoured and characteristic impedance of 75 ohms.
2	Centre Conductor	Tinned copper wire of 1.22 mm dia.
3	Cable Core and Air	Centre Conductor wrapped with Spaced Centre Conductor wrapped with Spaced Radial thickness:1.00 mm. Diameter over Pe tube: 5.20 mm.
4	Outer conductor	Braid of tinned copper (Electrolytic grade/wire of 0.20mm dia with 90% coverage.
5	Barrier	PVC/MYLAR Tape.
6	Inner Jacket	Special cable grade PVC Radial thickness 0.70 mm.
7	Bedding	PVC Tape.
8	Armouring	0.4mm GI wire, 70% coverage.
9	Overall jacket	PVC.
10	Electrical data:	
11	Max Conductor resistance @ 20%	15.7 Ohms/KM
12	Dielectric strength(Core to shield)	4KV RMS for 1 minute
13	Nominal impedance	75 ohm
14	Nominal capacitance at 1Khz	53 pf/meter
15	Mx. Attenuator frequency (KHZ)	(KHZ) db/km 10 0.80 60 1.40 300 3.30 500 4.70
16	Min.Bending radius	15 Cm

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2.20.0 TECHNICAL SPECIFICATION FOR CLAMPS:

2.20.1 T Clamps, UPG clamps :

1. Standard Specification and tests shall be as per IS:5561.
2. For connecting ACSR conductor alluminium alloy extruded conforming as per latest relevant IS.
3. Bolts, nuts and washers shall be made of mild steel and hot dip galvanized as per IS 2629. Small fittings like spring washers, nuts etc. may be electrogalvanised.
4. The quality of HDG ferrous components shall be determined by the test given in IS:2633 and shall satisfy the requirement of that standard.
5. The rated short time current shall be one of the standard values laid down in Indian Standards for the associated circuit breakers, Switches etc.
6. Current carrying capacity same as conductor full current rating. For two different conductors, conductor with smaller rating shall be considered.
7. No part of a clamp shall be less than 12 mm thick for fittings suitable upto size of ACSR conductor.
8. All sharp edges and corners shall be blurred and rounded off.
9. For bimetallic connectors, copper alloy liner of minimum thickness of 2 mm shall be cast integral with aluminium body.
10. From outermost hole edge to nearest edge of any clamps and connectors the distance shall not be less than 10 mm.

Bidder's Signature & Seal

SECTION-3

BIDDING FORMS

(This Section contains the forms which are to be completed by the Bidder and submitted as part of his Bid)

Form – 1
Document checklist

Sl. No.	Document to be submitted	Submitted (Yes/No)	Name of uploaded PDF
1.	Letter of technical bid (Form-2)		
2.	Notarised Power of attorney for the person signing the tender		
3.	EMD		
4.	Bid document fee		
5.	Bidders company / firm registration certificate/certificate of incorporation		
6.	GST registration		
7.	GST return acknowledgement		
8.	PAN		
9.	Trade License as mentioned above		
10.	Filled up Form 2		
11.	Filled up Form 4 ELI		
12.	Filled up Form 5 LIT		
13.	Filled up Form 6 FIN		
14.	Filled up Form 7 EXP		
15.	Filled up Form 8 MA		
16.	Filled up Form 9		
17.	Income Tax Return Acknowledgement for last three years		
18.	Audited Balance sheet for last three years		
19.	Bank solvency certificate/certificate/another supporting document		
20.	Order/Contract copies establishing past experience		
21.	Completion certificate of work executed		
22.	Documents relating to Personnel Capability of the Bidder*		
23.	Documents relating to Equipment Capabilities of the bidder**		
24.	Additional documents if any		

Note: Bidders are requested to submit all required documents in e-tender portal and along with **physical copies.**

Bidder's Signature & Seal

Form-2

Bid Submission Sheet

(To be submitted in Bidder's Letterhead)

Name of contract:

To,

The Deputy General Manager,
Lower Assam, T&T Circle, AEGCL,
Narengi.Guwahati-26

Sir:

We have examined the General Conditions of Contract, Technical Specification, Schedules, and Addenda Nos _____(if any). We have understood and checked these documents and have not found any errors in them. We accordingly offer to execute and complete the said Works and remedy any defects fit for purpose in conformity with these documents and the enclosed Proposal (Price Offer)

We accept your suggestions for the appointment of the Dispute Adjudication Board, as set out in the Bidding Document.

We agree to abide by this Bid until _____ and it shall remain binding upon us and may be accepted at any time before that date.

If our bid is accepted, we will provide the specified performance security, commence the Works as soon as reasonably possible after receiving the notice to commence, and complete the Works in accordance with the above-named documents within the time stated in the Bidding Document.

Unless and until a formal Agreement is prepared and executed this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.

We understand that you are not bound to accept the lowest or any bid you may receive.

Commissions or gratuities, if any, paid or to be paid by us to agents relating to this Bid, and to contract execution if we are awarded the contract, are listed below:

Yours faithfully

Signature _____ in the capacity of _____ duly authorized to sign bids for and on behalf of _____

Address

_____

_____

Bidder's Signature & Seal

Form-3 (BG)

Form of Performance Security (Bank Guarantee)

WHEREAS, _____ *[Name of Bidder]* (hereinafter called "the Bidder") has submitted his bid dated _____ *[Date]* for the construction of _____ *[Name of Contract]* (hereinafter called "the Bid").

KNOW ALL MEN by these presents that We _____ *[Name of Bank]* of _____ *[Name of Country]* having our registered office at _____ (hereinafter called "the Bank) are bound unto _____ *[Name of Employer]* (hereinafter called "the Employer") in the sum of _____for which payment will and truly to be made to the said Employer the Bank binds himself, his successors and assigns by these presents.
SEALED with the Common Seal of the said Bank this ___ day of_____ 20___.

THE CONDITIONS of this obligation are:

(1) If the bidder withdraws his Bid during the period of bid validity specified in the Form of Bid:
Or

(2) If the Bidder refuses to accept the correction of errors in his Bid;

Or

(3) if the Bidder, having been notified of the acceptance of his Bid by the Employer during the period of Bid validity;

(a) fails or refuses to execute the Form of Contract Agreement in accordance with the Instructions to Bidders, if required; or

(b) fails or refuses to furnish the Performance Security, in accordance with the Instructions to Bidders;

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 one or all of the three conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date 180 days after the deadline for submission of bids as such deadline is stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

DATE _____ SIGNATURE OF THE BANK _____

WITNESS _____ SEAL _____

(Signature, Name, and Address)

Form- 4 (ELI)
Bidder's information Sheet

Sl. No.	Particulars	Bidders' response
1	Bidders name and registered address	
2	Bidders authorised representative, designation and contacts	
3	GST registration no.	
4	Bid validity	180 (One Hundred Eighty) Days

(Signature and common seal)
Name:
Designation:
Date:

Form – 5 (LIT)
Pending Litigation

Year	Matter in Dispute	Value of Pending Claim in Rupees	Value of Pending Claim as a Percentage of Net Worth

(Signature and common seal)
Name:
Designation:
Date:

Bidder's Signature & Seal

Form – 6 (FIN)
Average Annual Turnover

Annual Turnover Data for the Last 3 Years	
Year	**Amount (Rupees)**
Average Annual Turnover	

The information supplied should be the Annual Turnover of the Bidder in terms of the amounts billed to clients for each year for contracts in progress or completed.

(Signature and common seal)
Name:
Designation:
Date:

Form – 7 (EXP)

EXPERIENCE

Each Bidder must fill in this form

Sl. No.	Customer name	Contract No. and date	Work order value	Brief description of work	Completion date

Note: Order/contract copies are to be submitted as supporting document. Performance/per certificate to be submitted wherever applicable.

(Signature and common seal)
Name:
Designation:
Date:

Bidder's Signature & Seal

Form- 8 (MA)

Form of Manufacturer's Authorization
(To be submitted in Manufacturer's Letterhead)

Bid No.:
To,
The Deputy General Manager,
Lower Assam, T&T Circle, AEGCL,
Narengi.Guwahati-26

WE [insert: name of Manufacturer] who are established and reputable manufacturers of [insert: name and/or description of the Goods] having production facilities at [insert: address of factory] do hereby authorize [insert: name & address of Bidder] (hereinafter, the "Bidder") to submit a bid the purpose of which is to provide the following goods, manufactured by us, and to subsequently negotiate and sign the Contract:

1. ----------
2. ----------

We hereby extend our full guarantee and warranty in accordance with Clause 1.35.0 of the Special Conditions of Contract, for the above specified Goods supporting the Supply of specified Goods and fulfilling the Related Services by the Bidder against this Bidding Documents, and duly authorize said Bidder to act on our behalf in fulfilling these guarantee and warranty obligations. We also hereby declare that, we will furnish the Performance Guarantee in accordance with SCC Clause 1.36.0.
Further, we also hereby declare that we and, [insert: name of the Bidder] have entered into a formal relationship in which, during the duration of the Contract (including related services and warranty / defects liability) we, the Manufacturer or Producer, will make our technical and engineering staff fully available to the technical and engineering staff of the successful Bidder to assist that Bidder, on a reasonable and best effort basis, in the performance of all its obligations to the Purchaser under the Contract.

For and on behalf of the Manufacturer

Common Seal and Signature of the authorised person: Name:
Designation:

NOTE:
This MA should be signed by a person having either of the following-
1) Valid Power of attorney
2) Authorised by Managing Director

Bidder's Signature & Seal

Form- 9

Guarantee Declaration

We declare that the ratings, specifications and performance figures of the various plants and equipments /material furnished by us in the Bid are guaranteed. We further declare that in the event of any deficiencies in meeting the guarantees in respect of the characteristics mentioned in Guaranteed Technical Particulars, of Technical Bid as established after conducting the factory test, you may at your discretion, reject or accept the equipment/material after assessing the liquidated damages as specified in relevant clause of Bid Document.

Date: (Signature).....
Place: (Printed Name).....
(Designation).....
(Common Seal).....
Member of Board of Directors

Bidder's Signature & Seal