SECTION – I

NOTICE INVITING E-TENDER

(SINGLE STAGE TWO ENVELOPE BIDDING)

NIeT No. DGM/TD/AGT/NieT/24-25/03 Date: 16.12.2024

1.0 Dy. General Manager, Transmission Division, 79 - Tilla, Agartala - 799006, on behalf of TPTL invites online two bid system tender from the resourceful experienced firms for the following work through electronic tendering (e-tendering)

Sl. No.	DNIeT No	Name of work	Estimated cost put to bid	Earnest Money	Period of completion
1	2	3	4	5	6
1.	DGM/TD/AGT/DNIeT/2024-25 /04 Dated 01.10.2024	**Re-conductoring of 132kV Intra-State Transmission lines by HTLS Conductor with allied accessories.** I. Surjamaninagar (TSECL) to LILO Point of Surjamaninagar (ISTS II. Bodhjungnagar (TSECL) to LILO Point of Surjamaninagar (ISTS) III. Surjamaninagar (TSECL) to Bodhjungnagar (TSECL) V. Ambassa (TSECL) to LILO Point of P.K. Bari (ISTS) via Manu (TSECL) V. P.K. Bari (TSECL) to LILO Point of P.K. Bari (ISTS) VI. P.K. Bari (TSECL) to Kumarghat (PG)	Rs.71,45,88,582.00	Rs. 1,42,91,772.00	365 (Three Hundred Sixty-Five) Days

- Bids shall be rejected if the offer is submitted without Earnest Money or with adequate Earnest money i.e. less than the prescribed fee mentioned in the NIT and Tender Fee / e-tender processing fee **Rs. 35,000 /-**.
- Earnest money deposit shall be 2% of the Estimated Value put to tender.
- If the offer is submitted with inadequate Earnest money i.e. less than 2% of the Estimated value put to tender the bid shall be rejected.

2.0 This NIT for the above work will appear in National Newspapers and in State Newspapers. This shall also be available on Tripura State Electricity Corporation Limited website at www.tsecl.in from 18.12.2024. The complete Bidding Documents shall be available at Government e-procurement portal http://tripuratenders.gov.in from 18.12.2024. Interested bidders can download the Bidding Documents and commence preparation of bids to gain time.

3.0 QUALIFYING REQUIREMENTS FOR BIDDERS: -

To be qualified to bid for the package, the bidder shall have to meet the following minimum criteria

3.1 TECHNICAL ELIGIBILITY: -

3.1.1 Manufacturing Experience

i) The Qualified Manufacturer should have manufactured, tested and supplied at least one thousand (1000) km of ACSR/ AAAC/ ACAR/ AACSR conductor and three hundred (300) km of

(HTLS) High Temperature Low Sag conductor of offered Technology having at least same or more number of strands as that of the conductor being offered in the package during last five (5) years and same should be in continuous satisfactory operation for the period of at least two (2) years in India as on originally scheduled date of publication of NIT.

ii) The Qualified Manufacturer should have established manufacturing facility in India and developed High temperature low sag conductor (HTLS) of same technology as that of the conductor being offered in this package and should have carried out following tests as on date of bid opening mentioned above: -

A) On complete Conductor
i) DC resistance test on stranded conductor
ii) UTS test on stranded conductor
B) * On Conductor Strand/core
i) Heat resistance test on Aluminium Alloy strands (not applicable for annealed Aluminium)
ii) Torsion and Elongation tests on core strands/composite core
iii) Breaking load test on core strands and Aluminium/Aluminium Alloy strands
iv) Conductivity test on thermal resistant Aluminium/Aluminium Alloy strands
v) Glass transition temperature test (For composite core only)
vi) Flexural Strength test (For composite core only)
vii) Galvanic Protection Barrier Layer Thickness test (For Composite core only)

* Note: The tests indicated at B) above should have been carried out by the qualified manufacturer on his own or by his supplier of Aluminium alloy strands, core/core strands.
"In case bidder is a holding company, the technical experience referred to in clause 3.1 above shall be of that holding company only (i.e. excluding its subsidiary/group companies). In case bidder is a subsidiary of a holding company, the technical experience referred to in clause 3.1 above shall be of that subsidiary company only (i.e. excluding its holding company)."

Authentic Documents in support of the above facts should be accompanied with the Bid. TSECL shall verify the same accordingly.

3.2 FINANCIAL ELIGIBILITY: -

i) Net worth for last 3 financial years should be positive.

ii) The minimum annual turnover of the bidder for the last three financial years should not be less than 30% of the estimated cost put to tender .i.e **Rs. 21,43,76,575.00**

3.3 Bids shall be submitted by an individual firm only and shall meet both the requirements of para 3.1 & 3.2 above.

3.4 Notwithstanding anything contained herein above, TSECL reserves the right to assess the capacity and capability of the bidder to execute the work.

4.0 The bidder shall bear all cost and expenses associated with purchase and submission of its bid document and TSECL will not be responsible or liable in any case for those cost, regardless of the conduct or outcome of the bidding process.

5.0 The bidder shall furnish documentary evidence in support of the qualifying requirements stipulated above along with their bid. Bid received without such documents shall be summarily rejected.

5.1 In addition to qualifying requirement mentioned above, the bidder's offer must include the following documents which to be submitted with technical bid :

i. Photo copy of PAN Card.

ii. Photo Copy of Goods & Service Tax (GST) registration certificate.

iii. Photo Copy Contractor license and supervisory certificate of competency for requisite parts.

iv. Photo Copy of balance sheet of the bidder (audited by Chartered Accountant) with auditor's certificate in support of annual turnover in/c. IT Return and annual turnover Certificate for the last 3 (Three) years.

v. Any bidder who has been debarred / black listed by any Central (GOI) / State Govt. Owned Power Utility, for works of similar type during last 3 years for whatever reasons and thereby shall stand disqualified automatically at the very pre-qualification stage. Therefore, the bidder submitting the tender documents is liable to enclose a "Declaration" to this effect with due certification by "NOTARY" depicting full name & designation. (As per Format, annexed in Bid document).

vi. Notwithstanding anything stated above, TSECL reserves the right to assess the capability and capacity of the bidder to execute the work satisfactorily.

vii. The above stated requirements are minimum and the TSECL reserves the right to request for any additional information and also reserves the right to reject the proposal of any bidder, if in the opinion of the owner, the qualification data is incomplete or the bidder if found not qualified to satisfactorily perform the works.

viii. Price bid of only those bidders shall be opened who qualify based on the specified qualifying requirements after Scrutiny of details / documents furnished by them and found to be techno- commercial responsive.

The bidder shall furnish documentary evidence in support of the qualifying requirements stipulated above along with their bid. Bid received without such documents shall be summarily rejected.

5.2 Eligible bidders shall participate in tender online through the government e-procurement portal at http://tripuratenders.gov.in. There is no provision to drop tenders physically (Hard copy). Tender shall be uploaded/submitted in a two-bid system:

(a) Bid Envelop-I (Technical bid)

(b) Bid Envelop-II (Financial bid)

6.0 Bidders willing to take part in the process of e-tendering are required to obtain a valid Class 2 /Class 3 **Digital Signature certificate (DSC)**, from any of the of the certifying authorities, enlisted by Controller of Certifying Authorities (CCA) at http://cca.gov.in. After obtaining the Class 2/3 Digital Signature Certificate (DSC) from the approved CA, Bidders shall Enroll themselves in the Tripura Government e-procurement web site at http: //tripuratenders.gov.in and obtain User ID and Password for the purpose of bidding.

7.0 CRITICAL DATES:

i	Completion period :	**365 (Three Hundred Sixty-Five) Days**
ii	Date of Publishing of tender :	18 / 12 / 2024
iii	Period of downloading of Bidding Documents at tripuratenders.gov.in:	From: - 18 / 12 / 2024 To:- 20/ 01 /2025
iv	Period of Seeking clarifications :	From: - 19 / 12 / 2024
		To: 31 /12 / 2024 12.00 P.M.
v	Time and date of Pre-Bid Meeting:	02/ 01 / 2025 at 3.00 P.M.
vi	Place of Pre-Bid Meeting:	O/o the Dy. General Manager, Transmission Division, TPTL, 79-Tilla, Agartala, West Tripura, Pin: 799006. Email: dgmtdagt@gmail.com
vii	**Bid submission Start Date**	From : 06/01 / 2025
viii	**Bid submission End Date:**	20 / 01/ 2025 **Up to 5.00 P.M.**
ix	Time and Date of Opening Technical Bid/Bids:	22 / 01/ 2025 **at 3.30 P.M.**
x	Time and Date of Opening Price/Financial Bid:	To be notified after Technical Evaluation
xi	Place of Opening Bids:	O/o the Dy. General Manager, Transmission Division, TPTL, 79-Tilla, Agartala, West Tripura, Pin: 799006. Email: dgmtdagt@gmail.com
xii	Bid Validity:	240 (Two Hundred Forty) days from the date of Opening of Technical Bid.
xii i	Officer inviting Bids (TPTL):	O/o the Dy. General Manager, Transmission Division, TPTL, 79-Tilla, Agartala, West Tripura, Pin: 799006. Email: dgmtdagt@gmail.com

8.0 SCOPE OF WORK:

Scope of work covered under this package includes design, engineering, manufacture, testing, supply, transportation to site, storage, insurance, handling, hoisting of insulators, stringing of conductor & earth wire, fitting & fixing of tower members if required and other related equipments / materials including associated works, de-stringing of existing conductor, insulator etc., testing and commissioning of the line complete in all respect.

The detailed scope has been described in the Bid Documents and as per schedule of items(s) / BOQ.

9.0 Earnest Money Deposit amounting to 2% (Two Percent) of the estimated cost put to tender i.e Rs. 1,42,91,772.00The Earnest Money Deposit shall be submitted by Demand Draft (D/D) /Banker's Cheque (BC) / Bank Guarantee on any Scheduled Bank guaranteed by Reserve Bank of India favouring TRIPURA STATE ELECTRICITY CORPORATION LIMITED payable at Agartala. on or before 5.00 PM on 22 / 01 /2024. For BG valid for a period of 10 (Ten) months with claim period of another 1 (one) year subject to further extension if required. Earnest Money Deposit in any other form or amount will not be accepted.

Tender fee is to be paid Offline in the shape of Demand Draft. favouring TRIPURA STATE ELECTRICITY CORPORATION LIMITED payable at Agartala.

Please note that in case of units registered with DIC having permanent registration, (valid up to validity of the offer) has to produce necessary competency certificate. ~~The Tender Fee and Earnest Money are to be paid electronically using the Online Payment Facility provided in the portal. For online payment for the Tender Fee & EMD, please follow the following process:-~~

i. ~~After initiating the bid submission process form "MY tender" option, an "online payment" page will appear which will display the total tender fee amount~~.
ii. ~~On submission of TF payment option, System will redirect to the SBI Bank MOPS window~~
iii. ~~SBI MOPS will have to options for net banking – "SBI" and "Other banks). Bidder can chose any of the options as desired and can complete the online payment process.~~

10.0 For BG / Tender fee , the details information is as follows:

The EMD amount shall be refunded to all the bidders including L_1 (Selected) bidder in their respective Bank Account, after the Letter of Award (LOA) event is completed in the Tripura e-Procurement Portal, on receipt of Performance Bank Guarantee from the selected bidder.

No interest will be paid to the bidders on EMD submitted.

EMD of the bidder may be forfeited if any case found to have made in false Declaration or Claims.

~~Bidders exempted under specific Govt. Order / rules from submitting EMD have to furnish Scan copy of the related Govt. Order / rules in English language, along with the tender in support of their claim exemption~~.

Earnest Money and-Tender Fee Deposit in any other form or amount will not be accepted.

For preparation of BG, the details Bank information is as follows:
Name of Bank: STATE BANK OF INDIA, TLA HOUSE BRANCH ,AGARTALA.
Account No : 10320312003
IFSC Code No : SBIN0005559
MICR Code No : 799002009

Tender submitted without any one of this EMD & Tender Fee shall render the tender for summarily rejected.

11.0 Power of Attorney, if given to authorized signatory for signing the Contract Agreement, shall be made in an **INDIA NON-JUDICIAL STAMP** OF **Rs.100.00 (Rupees One Hundred)** only.

12.0 On award of work the successful bidder shall have to deposit a **Contract Performance Guarantee** (CPG) equivalent to **10 %** of the LOA value (Excluding GST) in the shape of Demand Draft in favour of Tripura State Electricity Corporation Limited from any schedule Bank guaranteed by Reserve Bank of India, payable at Agartala or in the shape of Bank Guarantee from a Public sector / scheduled Indian Bank guaranteed by Reserve Bank of India. The **CPG** within the definition of **clause 34 of section – II** of the bid document shall remain valid for actual completion period plus guarantee period against the item as per provision of **clause 14.0 of section-III** of the bid document. Extension of bank guarantee for performance of the contract shall be extended as & when asked by the Engineer in charge to keep the currency of the contract alive. In the event of failure on the part of agency to extend the bank guarantee before expiry of the bank guarantee submitted, the same shall be encashed without showing the reason thereof.

13.0 The acceptance of Price bid / financial bid shall be subjected to acceptance of EMD and Tender fee.

14.0 The Bidding Documents are meant for the exclusive purpose of bidding against this specification and shall not be transferred to any other party or reproduced or used otherwise for any purpose other than for which they are specifically issued.

15.0 Downloaded NIT, Bid Document are to be uploaded back and digitally signed as a part of technical bid, and as a proof of acceptance of all terms and conditions in NIT and Bid Document.

16.0 Agency / Firm who does not fulfill the requirement of para 3.1 & 3.2 Section – I, is not allowed to participate in the Tender.

17.0 However the intending bidder has to quote all items as per BoQ, part quoting rate will not be entertained and will be rejected.

18.0 SUBMISSION OF BIDS:

Bids are to be submitted online through the website, All the documents uploaded by the TPTL, form an integral part of the contract. Bidders are required to upload all the bidding documents along with the other documents, as asked for in the Bid, through the above website and within the stipulated date and time mentioned in the Tender.

Tenders are to be submitted in two folders at a time for each work, one for Technical Proposal and the other for Financial Proposal. The Bidder shall carefully go through the requirements and prepare the required documents to be uploaded.

The bidder shall scan all the documents before uploading and all scanned documents shall be of 100 dpi resolution in Portable Document Format (PDF).The scanned documents shall be uploaded in the designated locations of Technical Bid and Financial Bid, as prompted by the e-Procurement website.

The Bidder needs to fill up their name and rates for all the items and in the designated Cells of the downloaded BOQ for the related work, and upload the same in the designated location of Financial Bid. The documents uploaded are virus scanned and digitally signed using the Digital Signature Certificate (DSC). Bidders shall specially take note of all the addendum/corrigendum related to the tender and upload the latest documents as part of the tender.

ENVELOP- I (TECHNICAL BID):

The Technical Bid/Bid Envelop-I should contain scanned copies and/or declarations in the following standardized formats.

A. My Document (Non-Statutory):-

All the below-mentioned documents/certificates are to be uploaded with digital signature in the '**My Document**' folder option available after login in the e-procurement portal **http://tripuratenders.gov.in**. Bidders are requested to scan the necessary documents in **100 dpi** resolution into PDF. 'My Document' shall be populated prior to real time biding and during real time bidding, uploaded documents/certificates in the 'My Document' are to be appropriately included (Checked) for incorporation in the Bid.

An indicative organization of 'My Document' folder and the related documents are indicated here under.

Sl	Folder Name	Documents to be uploaded
1.	Mfg lic	**Firm Details:** i. Registration certificate of bidder ii. Valid Labor license. iii. Valid Labor Insurance
2.	DNIT Documents	i. Corrigendum, if published
3.	Manpower / Machinery Details	i. Machinery & Manpower in possession of the firm.
4.	Tax related document of bidder	i. Professional Tax clearance Certificate (PTCC)/STCC. ii. GST registration certificate iii. IT return iv. PAN Card
5.	Financial details of bidder	i. Audited Balance Sheets of last three financial years with auditor's certificate regarding **annual turnover** from contracting business in each year.
6.	Misc. document	i. Litigation History ii. Notary Declaration regarding De-barred/ Black listed. iii. Declaration of the tenderer /Bidder iv. Performance certificate v. names of Manufacturer. vi. Technical Data: GTPs and Drawings specified in the bid

B. Statutory Documents: consortium

Bidders shall submit the following statutory documents during real time bidding

1. Scanned copy of EMD & Tender Fee certificate in single PDF.
2. NIT
3. Bid Document
4. All annexure with supporting documents/certificates specified in the Bid Document in single PDF.
5. Technical Data Sheet / GTPs and drawings specified in the Bid Document in PDF.

Note-1: Failure of submission of any one of the above mentioned documents shall render the tender to summarily rejection.

Note-2: If the company was set up less than five years ago, audited balance sheet for the no of years since inception is to be submitted.

Note-3: Bidders are requested to scan the necessary documents/certificates in **100 dpi** resolution into PDF.

Bid Envelop-II (Financial Bid):

Documents to be submitted in the Financial Bid are:

BOQ (Bill of quantity/Price schedule).

Note: Bill of Quantity (BOQ) i.e. Price schedule, which is the Rate quoting sheet in Ms-excel shall be downloaded, filled up properly and uploaded in the financial bid after digital signing. The Bidder shall always open the BOQ sheet with Macros Enabled. The Bidder shall quote rates in figures only, for all items in the Bill of Quantity (BOQ).

19.0 **BOQ (Price Schedule) TAMPERING**: The provided BOQ (Price schedule) in the Tender is meant for downloading in the Bidders client machine, for entering the relevant fields meant for rates & bidder's particulars and finally uploading in the Financial Bid. The BOQ Excel Sheet is Macro enabled and working with the Sheet requires the Macro to be allowed/ enabled to run. Bidders are hereby warned not to tamper the Excel Sheet, make copies and work in a copied Sheet or break through the default Work-Sheet Security. Such BOQs with stated violations will be treated as Tampered BOQs and Bids uploaded with Tampered BOQs will be summarily rejected.

20.0 Bidders are allowed to bid 24x7 till the time of Bid closing, with option for Re-Submission, wherein only their latest submitted Bid will be considered for evaluation. The e-Procurement website will not allow any Bidder to attempt bidding, after the scheduled date and time.

21.0 For any clarifications related to NIT/Bid Document/e-procurement, bidder(s) are requested to contact:

O/o the Dy. General Manager,
Transmission Division,
Tripura Power Transmission Limited,
79- Tilla, Agartala, West Tripura, Pin: 799006. E-mail: dgmtdagt@gmail.com

22.0 **Addendum/amendments/corrigendum:-** Before the last date for submission of Tenders, the TSECL may modify any of the Contents of the Tender Notice, Tender documents by issuing amendment / Addendum/corrigendum.

Any addendum/amendments/corrigendum issued by the TPTL shall be part of the tender Document and it shall be published in the e-procurement portal at **http://tripuratenders.gov.in**. Registered Bidders shall be notified of the related Corrigendum(s) by e-mail. However TPTL shall bear no responsibility or liability arising out of non-receipt of the same in time or otherwise. Bidders are requested to visit the site frequently to check whether there is any related Corrigendum(s) or not.

22.0 TPTL reserves the right to cancel/withdraw this invitation for bids without assigning any reason and shall bear no liability whatsoever consequent upon such a decision.

Dy. General Manager,
Transmission Division,
TPTL, 79-Tilla, Agartala, Tripura (W)

SECTION – II
INSTRUCTIONS TO BIDDER

A. INTRODUCTION

1.0 GENERAL INSTRUCTIONS

The bidders are to satisfy themselves by actual site visit to the site of work as regards the prevailing condition of approaches, transportation facilities, availability of labourrs and availability of materials etc. before submission of bid. No claim or excuse on this account will be entertained at any stage later on.

The location of the work is from **Re-conductoring of 132kV Intra-State Transmission line by High Temperature Low Sag (HTLS) Conductor with allied accessories.**

Sections:

I. **Surjamaninagar (TSECL) to LILO Point of Surjamaninagar (ISTS**
II. **Bodhjungnagar (TSECL) to LILO Point of Surjamaninagar (ISTS)**
III. **Surjamaninagar (TSECL) to Bodhjungnagar (TSECL)**
IV. **Ambassa (TSECL) to LILO Point of P.K. Bari (ISTS) via Manu (TSECL)**
V. **P.K. Bari (TSECL) to LILO Point of P.K. Bari (ISTS)**
VI. **P.K. Bari (TSECL) to Kumarghat (PG).**

The materials may be transported by road transport through National Highway – 8.

2.0 COST OF BIDDING

The bidder shall bear all the costs and expenses associated with preparation and submission of its Bid including post-bid discussions, technical and other presentation etc. and the TSECL shall in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

B. THE BIDDING DOCUMENTS

3.0 CONTENTS OF BIDDING DOCUMENTS

3.1 The goods and services required, bidding procedures and contract terms are as prescribed in the Bidding Documents.

In addition to the Invitation for Bids, the Bidding Documents is a compilation of the following sections:

Section – I:-	Notice Inviting e-Tender
Section – II:-	Instruction to Bidder
Section – III:-	General Terms & Conditions of Contract (GCC)
Section – IV:-	Erection Conditions of Contract
Section – V :-	Technical Specification
Section – VI:-	Price Bidding Schedule

4.0 UNDERSTANDING OF BIDDING DOCUMENTS

A prospective Bidder is expected to examine all instructions, forms, terms and specifications in the Bid Documents and fully inform himself as to all the conditions and matters which may in any way affect the scope of work or the cost thereof. Failure to furnish all information required by the Bid Documents or submission of a Bid not substantially responsive to the Bid Documents in every respect will be at the Bidder's risk and may result in the rejection of its Bid.

5.0 CLARIFICATIONS ON BIDDING DOCUMENTS

5.1. If prospective Bidder finds discrepancies or omissions in the specifications and documents or is in doubt as to the true meaning of any part or requires any clarification on Bid Documents should make the request / notify the Tender inviting Authority of TPTL in writing. The concerned authority of TSECL shall respond in writing to any request for such clarification of the Bidding Documents, which it receives not later than as mentioned in section - I prior to the deadline for submission of bids stipulated in tender notice.

5.2. Verbal clarification and information given from any offices of TPTL or its employee(s) or representative (s) shall not in any way be binding on TPTL.

6.0 CORRIGENDUM / AMENDMENT TO BIDDING DOCUMENTS

6.1 At any time prior to the deadline for submission of bids, TPTL 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 amendment (s).

6.2 The amendment(s) will be published in the e-Tender portal at http:// tripuratenders.gov.in. Registered Bidders shall be notified of the related Corrigendum(s) by e-mail. However, TPTL shall bear no responsibility or liability arising out of non-receipt of the same in time or otherwise. Bidders are requested to visit the site frequently to check whether there is any related Corrigendum or not.

6.3 In order to afford prospective bidders reasonable time to take the corrigendum/amendment into account in preparing their bids, TPTL may, at its discretion, extend the deadline for submission of bids.

6.4 Such corrigendum/amendment, clarifications, etc shall be binding on Bidders and shall be given due consideration by the Bidders while they submit their bids and invariably enclose such documents as a part of the Bid.

C. PREPARATION OF BIDS

7.0 LANGUAGE OF BID

7.1 The Bid prepared by the Bidders and all correspondence and documents relating to the bid, exchanged by the Bidder and TPTL, shall be written in English language, provided that any printed literature furnished by the Bidder may be written in another language so long as

accompanied by an English translation of its pertinent passages. Failure to comply with this may disqualify a bid. For purposes of interpretation of the bid, the English translation shall govern.

8.0 LOCAL CONDITIONS

8.1 It shall be imperative on each bidder to fully inform him of all local conditions and factors, which may have any effects on the execution of the contract covered under these documents and specifications. The Owner shall not entertain any request for clarification from the Bidders, regarding such local conditions.

8.2 It must be understood and agreed that such factors as above have properly been investigated and considered while submitting the proposals. No claim for financial adjustment to the Contract awarded under these specifications and documents shall be entertained by TPTL. Neither any change in the time schedule of the Contract nor any financial adjustments arising thereof shall be permitted by TPTL.

9.0 DOCUMENTS COMPRISING THE BID

The Bid shall be submitted in 2(two) parts, post registration in the http:// tripuratenders.gov.in, as under:

Part-I: Envelop-I (Technical Bid):

i. Containing Tender Fee & Earnest Money as per the stipulations described under the title "Notice Inviting e-Tender" of Section - I in this Bid Document. No financial aspect will be entertained in Technical bid.
ii. Containing Documentary Evidence of the Bidder in fulfilling the qualifying requirements as stipulated in the NIT /Bid Document along with other necessary documents. The documents to be submitted shall include copies of the corresponding completion and performance certificates issued by not below the rank of Executive Engineer / Dy. General Manager / Divisional Engineer or equivalent.
iii. Written power of attorney for the signatory of the bid, if any.
iv. Photo copy of **PAN Card** and **GST Registration Certificate/Tax Clearance Certificate**.
v. Copy of **balance sheet** of the bidder (audited by Chartered Accountant) in support of annual turnover for the last 3 (three) years.
vi. The credential of the participants with reference to quality of recent / past supplies to TSECL will be considered as a criterion among others.
vii. The bidders who have earlier failed to execute the similar nature of work to any power utility and or Debarred / Black listed by any Power Utility shall not be eligible to participate in this tender. In this context a declaration duly attested by notary shall be attached with the bid that the bidder is not blacklisted by any power utility for bad performance (As per format annexed in Bid Document). In absence of such self declared performance certificate, the bidder may not qualify the techno-commercial evaluation. Any litigation against the bidder but not cleared by court shall be produced along with tender document (As per format annexed in Bid Document).

viii. Containing Bidders Technical Proposal etc. along with his Commercial Terms, Payment Terms on conformity with the Bid Documents.

ix. Notwithstanding anything contained herein above, the TPTL reserves the right to assess the capacity and capability of bidder to execute the work.

x. Bids submitted without documents as indicated above shall be treated as disqualified. Bidders shall have to produce original document as and when asked by the TPTL authority, for verification and authentication of submitted documents.

Part-II: Envelop-II / PRICE BID / FINANCIAL BID :

Only the successfully qualified Technical bidders shall be considered for opening of Price bid/Financial Bid.

The Price Bid/ Financial Bid shall be consisting of the following documents:

Bill of Quantity (BOQ) i.e. the Price Bidding Schedule - to be downloaded.

Regarding **Bill of Quantity** mentioned as above (BoQ), the Bidder shall download the BOQ file in XLS format from the Tender document. All cells of the XLS document will be protected except the field (Bidder's Name and Rates only in figures), the Bidder is expected to fill in. The BoQ XLS document shall contain bundled Macros which shall have to be enabled for automatic calculations and "figure to word conversions".

NB: In addition to the composition of the **Technical Bid** regarding the documents to be supplied, the Bidder may also supply additional documents in either of this Bid, as Non-Sensitive documents, by scanning the related documents in PDF format (100 dps scan resolution) and saving them in Bidder's "My Document" before-hand. The Bidder may suitably use any additional document from his **"My Documents"** for proper justification of his **Technical Bid.**

10.0 SCOPE OF THE PROPOSAL

10.1 The scope of the proposal shall cover all the design, engineering drawing etc. specified under the accompanying Technical Specification. It shall include the following:

a. Detailed design of the equipment / material.

b. Complete manufacture including testing at works.

c. Providing engineering drawing, data, operation, manual, etc. for approval by TPTL.

d. Packing and transportation from the manufacturer's works and delivery on FOR site basis and providing supervision of unloading.

e. Associated civil works for foundation of structure.

f. Receipt, storage, preservation and conservation of materials at the site.

g. Pre-assembly, if any, handling at site erection, testing and commissioning.

h. TAKING OVER CERTIFICATE by TPTL's Engineer-in-charge.

10.2 Bids containing deviations from provisions relating to the following clauses shall be considered as non-responsive:

a. **Price Basis and Payments:** Clause 12.0, Section – II & 33.0, Section – III

b. **Bid Guarantee:** Clause 18.0, Section – II

c. **Contract Performance Guarantee:** Clause 34.0 of Section-II

d. **Liquidated Damages:** Clause 13.0, General Condition of Contract, Section – III

e. **Guarantee / Warrantee**: Clause 14.0 of Section – III

The determination of a Bid's responsiveness will be based on the contents of the Bid itself without recourse to extrinsic evidence.

10.3 Bids not covering the entire Scope of Work as above shall be treated as incomplete and hence rejected.

11.0 BID PRICE

11.1 The Bidder shall quote **firm** unit rates in the appropriate schedule of the Bid Document, for the entire period of schedule / extended schedule if any without any additional cost to TPTL.

~~11.2 The Bidder shall also furnish the price breakup in the appropriate schedule of Bid Form to indicate the following:~~

~~i) Ex-works price of the equipment / materials (including tools and tackles etc.)~~

~~ii) Charges for inland transportation and insurance for delivery of the equipments / materials up to their final destinations.~~

~~iii) Lump-sum charges towards unloading, storage & transit insurance, erection, testing and commissioning.~~

~~iv) GST, Octroi duty / entry tax, GST(Service tax) and any other levies legally payable on the transactions between the Owner and the Bidder as per prevailing rates.~~

12.0 PRICE BASIS AND PAYMENTS

12.1 The bidders shall quote **firm Price** in their price bidding schedule for the entire Scope of Work covered under the Technical Specification as required in the Bid, till taking over by TPTL.

12.2 Bidder shall indicate Bid prices in Indian Rupees only .

13.0 TAXES AND DUTIES

13.1 The quoted price shall be deemed to be inclusive but not limited to all taxes and duties, Municipal taxes, personnel and corporate tax as applicable, statutory levies, royalties, Custom duty and customs related duties, GST Compensation cess, IGST on built-in import content, irrespective of whether same is categorically specified or not but exclusive of "CGST and SGST". Admissible CGST and SGST payable by the CONTRACTOR under the

provisions of applicable law(s) / act(s) shall be payable by TSECL as per CONTRACTORS GST invoice raised to TSECL. Prices, taxes, duties including GST on any transaction between CONTRACTOR and their Sub-Contractor/supplier shall be included in the Unit Rates quoted by the CONTRACTOR.

13.2 Bidders are required to ascertain themselves the prevailing rates of Custom Duty, GST (SGST, CGST, IGST, UGST), any applicable Cess including income tax rates as Applicable on the scheduled date of submission of price bids / revised price bid (if any) and TSECL would not undertake any responsibility whatsoever in this regard. However, any Statutory variation in Taxes and Duties, would be governed as follows-

13.3 If any new taxes or duties (including any increase in rate of any existing taxes or duties) are levied in India after the date of submission of bids/revised price bids (whichever is later) on any payments due to the CONTRACTOR under the CONTRACT other than tax on income, or profits of the CONTRACTOR, TSECL shall reimburse the CONTRACTOR the amount of such taxes or duties lawfully paid and borne by the CONTRACTOR against proof of payment. However, this is applicable within the GUARANTEED COMPLETION DATE only and shall not be reimbursed by TSECL during the delayed contractual project completion attributable to CONTRACTOR'S account.

13.4 If any existing taxes or duties are withdrawn or the rate is decreased after the date of submission of the bids / revised bids (whichever is later) on any payments due to the CONTRACTOR under the CONTRACT other than tax on income, or profits of the CONTRACTOR, TSECL shall be entitled to discount in the amount payable to the CONTRACTOR of amount equivalent to the amount of such taxes or duties. This is applicable within the GUARANTEED COMPLETION DATE and also during the delayed contractual Project completion.

13.5 In case of delayed completion beyond the GUARANTEED COMPLETION DATE even though extension of completion time is allowed by TSECL, for reasons solely attributable to Contractor, all extra costs on account of changes of statutory regulations/ acts, or increase in price on any other account including price variation clause, if any, shall not apply to the Contract price and shall be borne by the CONTRACTOR.

13.6 However, any decrease in taxes and duties during the delayed period shall be passed on to TSECL.

13.7 **Income Tax:-** TOTAL CONTRACT PRICE shall be inclusive of Income Tax including withholding tax (if any) payable in India. TSECL shall deduct Indian Income Tax as per rates prescribed for such contracts from time to time, from the payments due to CONTRACTOR and issue tax deducted at source certificate to CONTRACTOR. It is the responsibility of the CONTRACTOR to file proper income tax return and pay taxes thereon if any, or claim refund thereof if any.

13.8 Personal income tax payable, if any, in respect of salary and perquisites of CONTRACTOR's personnel / SUB-CONTRACTOR's personnel shall be payable by the individual so deputed by CONTRACTOR or SUB-CONTRACTOR.

It is the responsibility of the individual or CONTRACTOR to file proper income tax return and pay taxes thereon if any, or claim refund thereof if any.

14.0 TIME SCHEDULE

14.1 The basic consideration and the essence of the Contract shall be strict adherence to the time schedule for performing the specified works.

14.2 The requirement of completion schedule for the works is mentioned in **Section – I** of this document.

14.3 The completion schedule as stated in **Section – I** shall be one of the major factors in consideration of the Bids.

14.4 TSECL reserves the right to request for a change in the work schedule during post-bid discussion with successful bidder.

14.5 The successful Bidder shall be required to submit detailed BAR CHART and finalize the same with TSECL, as per the requirement of completion schedule.

15.0 CONTRACT QUALITY ASSURANCE

15.1 The Bidder shall include in his proposal, the quality assurance programme containing the overall quality management and procedures which he proposed to follow in the performance of the works during various phases, as detailed in relevant clause of the General Technical Conditions.

15.2 At the time of award of Contract, the detailed quality assurance programme to be followed for the execution of the contract shall be mutually discussed and agreed to and such agreed programme shall form part of the contract.

16.0 INSURANCE

The bidder's insurance liability pertaining to the scope of Works is detailed out in clauses titled insurance in General Terms & Conditions of Contract and in Erection Conditions of Contract. Bidder's attention is specifically invited to these clauses. The bid price shall include all the cost in pursuance of fulfilling all the insurance liabilities including storage & erection under the Contract.

17.0 BRAND NAMES / MAKE LIST

All the equipments / materials shall be supplied out of the list of the makes as stipulated in **Annexure – VI** attached with this document. Any deviation in this regard shall not be entertained and bids having such deviation shall be rejected. In case brand names are not specified in the attached technical specification, standard equipments / materials shall be supplied.

18.0 BID GUARANTEE

18.1 The Bidder shall furnish, as part of its Bid, earnest money for an amount as specified in the Notice Inviting Tender (NIT) which is to be paid electronically using the Online Payment Facility provided in the portal.

18.2 The earnest money is required to protect TSECL against the risk of Bidder's conduct, which would warrant the earnest money forfeiture pursuant to **Para 18.6**.

18.3 The earnest money shall be deposited in Indian rupees only.

18.4 Any bid not secured in accordance with **Para 18.1** and **18.3** above shall be rejected by TSECL as non-responsive.

18.5 The earnest money of the unsuccessful Bidders shall be discharged / returned as promptly as possible as but not later than 60 days after the expiration of the period of bid validity prescribed by the Owner.

18.6 The earnest money shall be forfeited:

a) If a Bidder withdraws its bid during the period of bid validity specified by the Bidder on the bid form; or

b) In case of a successful Bidder fails:

i) to sign the contract; or

ii) to furnish the performance guarantee.

18.7 No interest shall be payable by TSECL on the above earnest money.

19.0 PERIOD OF VALIDITY OF BIDS

19.1 Bids shall remain valid for 180 days after the date of bid opening prescribed by TSECL, unless otherwise specified in this document. A Bid valid for a shorter period shall be rejected by TSECL as non-responsive.

19.2 In exceptional circumstances, TSECL may solicit the Bidder's consent to an extension of the period of Bid validity. The request and the response thereto shall be made in writing (including phone or fax or e_mail). The Earnest money provided in Section – I shall also be retained upto the extended period. No interest shall be payable by TSECL for retaining the earnest money upto the extended period. A Bidder may refuse the request without forfeiting the earnest money deposited by him. A Bidder granting the request shall not be required or permitted to modify his Bid.

D. SUBMISSION OF BIDS

20.0 FORMAT OF BID

20.1 Bids are to be submitted online through the website, and as, stated in Clause 9.0 of ITB of Section-II and as per NIT. All the documents uploaded by the Employer form an integral part of the contract. Bidders are required to upload all the bidding documents along with the other documents, as asked for in the Bid, through the above website and within the stipulated date and time mentioned in the Tender.

20.2 Tenders are to be submitted in two folders at a time for each supply/work, one for Technical Proposal and the other for Financial Proposal. The Bidder shall carefully go through the requirements and prepare the required documents to be uploaded

20.3 The bidder shall scan all the documents before uploading and all scanned documents shall be of 100 dpi resolution in Portable Document Format (PDF).The scanned documents shall be uploaded in the designated locations of Technical Bid and Financial Bid, as prompted by the e-Procurement website.

20.4 The Bidder needs to fill up their name and rates for all the items and in the designated Cells of the downloaded **BOQ** for the related supply/work, and upload the same in the designated location of Financial Bid. The documents uploaded are virus scanned and digitally signed using the Digital Signature Certificate (DSC). Bidders shall specially take note of all the addendum/corrigendum related to the tender and upload the latest documents as part of the tender.

20.5 **ENVELOP- I (TECHNICAL BID):**

The Technical Bid/Bid Envelop-I should contain scanned copies and/or declarations in the following standardized formats.

My Document (Non-Statutory):-

All the below-mentioned documents/certificates are to be uploaded with digital signature in the '**My Document**' folder option available after login in the e-procurement portal **http://tripuratenders.gov.in**. Bidders are requested to scan the necessary documents in **100 dpi** resolution into PDF. 'My Document' shall be populated prior to real time biding and during real time bidding, uploaded documents/certificates in the 'My Document' are to be appropriately included (Checked) for incorporation in the Bid.

An indicative organization of 'My Document' folder and the related documents are indicated here under.

Sl No	Folder Name	Documents to be uploaded
1	Mfg lic	**Firm Details:** i. Registration certificate of bidder ii. Valid Labor license. iii. Valid Labor Insurance
2	DNIT Documents	i. Corrigendum, if published
3	Manpower / Machinery Details	i. Machinery & Manpower in possession of the firm.
4	Tax related document of bidder	i. Professional Tax clearance Certificate (PTCC)/STCC. ii. GST registration certificate iii. IT return iv. PAN Card
5	Financial details of bidder	i. Audited Balance Sheets of last three financial years with **auditor's certificate regarding annual turnover** from contracting business in each year.
6	Misc. document	i. Litigation History ii. Notary Declaration regarding De-barred/ Black listed. iii. Declaration of the tenderer /Bidder iv. Performance certificate v. names of Manufacturer. vi. Technical Data: GTPs and Drawings specified in the bid

Statutory Documents:

After uploading the above mentioned non-statutory documents/certificates, Bidders shall submit the following, during real time bidding

1. Scanned copy of EMD & Tender Fee certificate in single PDF.
2. NIT
3. Bid Document
4. All annexure with supporting documents/certificates specified in the Bid Document in single PDF.
5. Technical Data Sheet / GTPs and drawings specified in the Bid Document in PDF.

Note-1: Failure of submission of any one of the above mentioned documents shall render the tender to summarily rejection.

Note-2: If the company was set up less than five years ago, audited balance sheet for the no of years since inception is to be submitted.

Note-3: Bidders are requested to scan the necessary documents/certificates in **100 dpi** resolution into PDF.

20.6 Bid Envelop-II (Financial Bid):

Documents to be submitted in the Financial Bid are:

BOQ (Bill of quantity/Price schedule).

Note: Bill of Quantity (BOQ) i.e. Price schedule, which is the Rate quoting sheet in Ms-excel shall be downloaded, filled up properly and uploaded in the financial bid after digital signing. The Bidder shall always open the BOQ sheet with Macros Enabled. The Bidder shall quote rates in figures only, for all items in the Bill of Quantity (BOQ).

20.7 **BOQ (Price Schedule) TAMPERING**: The provided BOQ (Price schedule) in the Tender is meant for downloading in the Bidders client machine, for entering the relevant fields meant for rates & bidder's particulars and finally uploading in the Financial Bid. The BOQ Excel Sheet is Macro enabled and working with the Sheet requires the Macro to be allowed/ enabled to run.

20.8 Bidders are hereby warned not to tamper the Excel Sheet, make copies and work in a copied Sheet or break through the default Work-Sheet Security. Such BOQs with stated violations will be treated as Tampered BOQs and Bids uploaded with Tampered BOQs will be summarily rejected.

20.9 Bidders are allowed to bid 24x7 till the time of Bid closing, with option for Re-Submission, wherein only their latest submitted Bid will be considered for evaluation. The e-Procurement website will not allow any Bidder to attempt bidding, after the scheduled date and time.

20.10 For any clarifications related to NIT/Bid Document/e-procurement, bidder(s) are requested to contact:

O/o the Dy. General Manager,
Transmission Division,
Tripura Power Transmission Limited,
79- Tilla, Agartala, West Tripura, Pin: 799006. E-mail: dgmtdagt@gmail.com

21.0 SIGNATURE OF BIDS

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

21.2 Bid by a partnership must be furnished with full names of all partners and be signed with the partnership name, followed by the signature(s) and designation(s) of the authorized partner(s) or other authorized representative(s).

21.3 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.

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

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

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

21.7 Bids not conforming to all the above requirements of **Para 21.0** above may be disqualified.

21.8 The original tender document shall be digitally signed by the bidder and will be uploaded during the eBid as part of the financial bid.

21.9 The Bidder shall have to give a DECLARATION that he /they have gone through the details of the bidding document as per format appended herewith.

22.0 DEADLINE FOR SUBMISSION OF BIDS

22.1 TSECL may, at its discretion, extend this deadline for the submission of Bids, in which case all rights and obligations of TSECL and Bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.

23.0 MODIFICATION AND WITHDRAWAL OF BIDS

23.1 Withdrawal of the Bid is permitted.

23.2 The Bidder may Revise (modify) his Bid as many number of times he wants, till the time of Tender Closing. In such case, only last modified Bid would be considered for evaluation.

24.0 INFORMATION REQUIRED WITH THE PROPOSAL

24.1 The Bids must clearly indicate the name of the manufacturer, the type of model of each principal item of equipment proposed to be furnished and erected. The Bid shall also contain drawings and descriptive materials indicating general dimensions, principles of operation, the extent of pre-assembly involved, major construction equipment proposed to be deployed, method of erection and the proposed erection organizational structure.

24.2 The above information shall be provided by the Bidder in the form of separate sheets, drawings, catalogues, etc. in five copies.

24.3 Any bid not containing sufficient descriptive material to describe accurately the equipment proposed, shall be treated as incomplete and hence rejected. Such descriptive materials and drawings submitted by the Bidder shall be retained by TPTL. Any major departure from these drawings and descriptive material submitted shall not be permitted during the execution of the Contract without specific written permission of TPTL.

24.4 Oral statements made by the Bidder at any time regarding quality, quantity or arrangement of the equipment or any other matter shall not be considered.

24.5 Standard catalogue pages and other documents of the Bidder may be used in the Bid to provide additional information and data as deemed necessary by the Bidder.

24.6 In case the 'Proposal' information contradicts specification requirements; the specification requirements shall govern, unless otherwise brought out clearly in the technical / commercial deviation schedule.

E. BID OPENING AND EVALUATION

25.0 OPENING OF BIDS BY TSECL

25.1 The Employer will designate Tender Opening Authority for each and every Bid separately, and the Technical bids will be opened online by them at the time and date, as specified in the NIT/ Standard Bid Documents.

25.2 All the Statements, Documents, Certificates, Demand Draft / Bank Guarantee etc. uploaded by the Bidders will be verified for technical evaluation. The clarifications and particulars, if any, required from the bidders, will be obtained by addressing the bidders directly. The technical bids will be evaluated against the specified parameters/ criteria mentioned in the BID, and in the same process as done in the case of conventional tenders. The technically qualified bidders will be identified and considered for their Financial Bid opening. The result of Technical Bids evaluation shall be displayed in the e-procurement portal and all the Bidders who have participated in the Tender will be able to access the same.

25.3 The Bidders or their authorized representatives may remain present at the time of opening of the tenders. Either the Bidder himself or one of his representative with proper authorization only will be allowed at the time of tender opening. If any of the Bidders is not present at the time of opening of tenders, the tender opening authority will, on opening the tender of the absentee Bidder, read out and record the deficiencies if any, and this will be binding on the Bidder.

25.4 The Minutes of the Technical bid opening shall be recorded and signed by the Tender Opening Authority as well as Bidders or their Authorized Representatives present and the same shall be uploaded and can be accessed in the e-procurement portal

25.4 The Price bids/Financial bids of all the technically qualified bidders will be opened by the concerned Tender Opening Authority at the specified date and time. The same can be tracked through the e-procurement portal by all the technically qualified bidders who

participated in the tender. However, Qualified Bidders or their authorized representatives may remain present at the Price Bid (Financial bid) opening.

25.6 The Financial Bid's Item-wise Rates and total amount shall be read out, Minutes of the Bid opening shall be recorded and the Bidder's signatures will be taken in the minutes. The result of financial bids (Price bids) evaluation shall be displayed in the e-procurement portal and Bidders can access the same.

25.7 The 'BOQ comparative chart' generated & displayed from the e-procurement portal, after the opening of financial Bid (which will be displayed as 'BOQ comparative chart' at financial bid opening summary page), will not be final.

25.8 Employer will prepare comparative Statement as per the decision of the Financial Bid Evaluation Committee in the Employer, which will be appropriately displayed in the e-procurement portal (this will be displayed at financial bid opening summary page).

25.9 The Price Bid /Financial Bid of the Unqualified Bidders will not be opened.

26.0 CLARIFICATION OF BIDS

26.1 To assist in the examination, evaluation and comparison of Bids, TSECL may, at its discretion, ask the Bidder for a clarification of its Bid. The request for clarification and the response shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted.

27.0 PRELIMINARY EXAMINATION

27.1 TSECL shall examine the Bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed and whether the Bids are generally in order.

27.2 The Bidder shall ensure that the prices furnished by him are complete. In the case of not quoting of rates of any item (supply) in the downloaded BOQ XLS file, TSECL shall be entitled to consider the highest price of the tender for the purpose of evaluation and for the purpose of award of the Contact, use the lowest prices of the tender.

27.3 Prior to the detailed evaluation, TPTL shall determine the substantial responsiveness of each Bid w.r.t. Bidding Documents. For purpose of these Clauses, a substantially responsive Bid is one which conforms to all the terms and conditions of the Bidding Documents without material deviations. A material deviation is one which affects in any way the prices, quality, quantity or delivery period of the equipment or which limits in any way the responsibilities or liabilities of the Bidder or any right of TPTL as required in these specifications and documents. TSECL determination of a Bid's responsiveness shall be based on the contents of the Bid itself without recourse to extrinsic evidence.

27.4 A Bid determined as not substantially responsive shall be rejected by TPTL and may not subsequently be made responsive by the Bidder by correction of the non-conformity.

27.5 TSECL may waive any minor non-conformity or irregularity in a Bid which does not constitute a material deviation, provided such waiver does not prejudice or affect the relative ranking of any Bidder

28.0 COMPARISON OF BIDS

28.1 Evaluated bid prices of all the bidders shall be compared among themselves to determine the lowest evaluated Bid and, as a result of this comparison, the lowest Bid shall be selected for consideration of award of the Contract

29.0 CONTACTING THE OWNER

Bids shall be deemed to be under consideration immediately after they are opened and until such time official intimation of award / rejection is made by TSECL to the Bidders. While the bids are under consideration, Bidders and / or their representatives or other interested parties are advised to refrain from contacting by any means, the Owner and / or his employees / representatives on matters relating to the bids under consideration. TSECL, if necessary, shall obtain clarifications on the bids by requesting for such information from any or all the Bidders, either in writing or through personal contacts as may be necessary. Bidders shall not be permitted to change the substance of the bids after the bids have been opened.

F. AWARD OF CONTRACT

30.0 AWARD CRITERIA

30.1 TSECL shall award the Contract to the successful Bidder whose bid has been determined to be substantially responsive and has been determined as technically acceptable and lowest evaluated Bid, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily. TSECL shall be the sole judge in this regard.

30.2 Further, TSECL reserves the right to award separate Contracts to two or more parties in line with the terms and conditions specified in the accompanying Technical Specifications.

30.3 On being Awarded with LOA (Letter of Award), the successful bidder should confirm the unconditional acceptance of LOA duly signed with stamp.

31.0 OWNER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS

31.1 TSECL 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 such action.

32.0 NOTIFICATION OF AWARD

32.1 Prior to the expiration of the period of bid validity and extended validity period, if any, TSECL shall notify the successful Bidder in writing by registered letter or by telex or FAX, to be confirmed in writing by registered letter, that his Bid has been accepted.

32.2 The Notification of Award / Letter of Award shall constitute the formation of the Contract.

32.3 Upon the successful Bidder's furnishing of Contract Performance Guarantee pursuant to **Clause 12.0 of Section – I**. TSECL shall promptly notify each unsuccessful Bidder and will discharge its bid guarantee, pursuant to **Clause 18.0 (Section – II**).

33.0 SIGNING OF CONTRACT

33.1 At the same time as TSECL notifies the successful Bidder that its bid has been accepted, TSECL shall send the Bidder the detailed Letter of Award.

33.2 Within 15 (fifteen) days of receipt of the detailed Letter of Award, the successful Bidder shall convey in writing unconditional acceptance of the Letter of Award and shall attend the respective office of TSECL for signing the contract agreement.

34.0 CONTRACT PERFORMANCE GUARANTEE:

34.1 As a Contract Performance Security, the successful Bidder, to whom the work is awarded, shall be required to furnish a contract Performance Guarantee in the shape of Demand Draft / Banker Cheque / Bank Guarantee in favour of Tripura State Electricity Corporation Limited payable at Agartala, West Tripura or in the shape of Bank Guarantee from a Public Sector / Scheduled Indian Bank having paid up capital (net of any accumulated losses) of Rs.100 Crores or above (the latest annual report of the Bank should support compliance of capital adequacy ratio requirement) in the form attached as annexure – II in favour of TRIPURA STATE ELECTRICITY CORPORATION LIMITED. 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 contract performance guarantee submitted in the shape of Bank Guarantee shall be valid upto guarantee period as per clause – 14 of section – III.

34.2 The Performance Guarantee shall cover additionally the following guarantees to TSECL:

a. The successful Bidder guarantees the successful and satisfactory operation of the equipment supplied and erected under the Contract, as per the specifications and documents.

b. The successful Bidder further guarantees that the equipment provided and installed by him shall be free from all defects in design, material and workmanship and shall upon written notice from TSECL fully remedy free of expenses to TSECL such defects as developed under the normal use of the said equipment within the period of guarantee specified in the relevant clause of the General Terms and conditions.

34.3 The Contract Performance Guarantee is intended to secure the performance of the entire contract. However, it is not to be construed as limiting the damages under clause entitled "Equipment Performance Guarantee" in Technical Specifications and damages stipulated in other clauses in the Bidding Documents.

34.4 The Contract performance Guarantee submitted in the shape of demand draft shall be returned to the Contractor without any interest at the end of successful completion and commissioning of the work against a Bank Guarantee of equivalent amount from any Public

Sector / scheduled Indian Bank valid up to the Guarantee period. The Bank Guarantee such deposited shall be discharged after expiry of Guarantee period.

34.5 The contract performance Guarantee shall be forfeited: -

a) If the contractor fails to start the work as per approved BAR CHART for reasons solely rest on him.

b) If the contractor left / suspends the work without prior written intimation to the owner's Engineer in charge of the work stating the reasons for such suspension of work.

c) If the contractor left / suspends the work for reasons which are not acceptable to TSECL.

35.0 CORRUPT OR FRAUDULENT PRACTICES

35.1 TSECL expects the bidders / suppliers / contractors to observe the highest standards of ethics during the procurement and execution of such contracts. In pursuance of this policy, TSECL

a. Defines, for the purpose of this provision, the terms set forth below as follows:

i) "Corrupt practice" means offering, giving, receiving or soliciting of anything of value to influence the action of a 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 owner, 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 owner from the benefits of free and open competition.

b. Will reject a proposal for award if it determines the bidder recommended for award has engaged a corrupt or fraudulent practice in competing for the contract in question.

c. Will declare a firm ineligible, either indefinitely or for a stated period of time, if TSECL at any time determines that the firm has engaged in corrupt / fraudulent practices in competing for, or in executing the contract.

36.0 CONSIGNEE:

The Sr. Manager, Transmission Sub-Division, 79 tilla, Agartala.

SECTION – III
GENERAL TERMS & CONDITIONS OF CONTRACT

A. INTRODUCTION

1.0 DEFINITION OF TERMS

1.1 'The Contract' means the agreement entered into between Tripura State Electricity Corporation Limited and Contractor as per the Contract Agreement signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

1.2 'Owner' shall mean **TRIPURA POWER TRANSMISSION LIMITED (TPTL)** and shall include their legal representatives, successors and assigns.

1.3 'Contractor' or 'Manufacturer' shall mean the Bidder whose bid shall be accepted by TPTL for award of the Works and shall include such successful Bidder's legal representatives, successors and permitted assigns.

1.4 'Sub-contractor' shall mean the person named in the Contract for any part of the Works or any person to whom any part of the Contract has been sublet by the Contractor with the consent in writing of the owner's Engineer in charge of the work and shall include the legal representatives, successors and permitted assigns of such person.

1.5 'Engineer in Charge' shall mean TPTL's nominated representative who will sign the agreement on behalf of TPTL for the purpose of carrying out the work.

1.6 The terms 'Equipment', 'Stores' and 'Materials' shall mean and include equipment, stores and materials to be provided by the Contractor under the Contract.

1.7 'Works' shall mean and include the furnishing of equipment, labour and services, as per the Specifications and complete erection, testing and putting into satisfactory operation including all transportation, handling, unloading and storage at the Site as defined in the Contract.

1.8 'Specifications' shall mean the Specifications and Bidding Documents forming a part of the Contract and such other schedules and drawings as may be mutually agreed upon.

1.9 'Site' shall mean and include the land and other places on, into or through which the works and the related facilities are to be erected or installed and any adjacent land, paths, street or reservoir which may be allocated or used by TPTL or Contractor in the performance of the Contract.

1.10 The term 'Contract Price' shall mean the item wise price / lump-sum price quoted by the Contractor in his bid with additions and / or deletions as may be agreed and incorporated in the Letter of Award, for the entire scope of the works.

1.11 The term 'Equipment Portion' of the Contract price shall mean the ex-works value of the equipment.

1.12 The term 'Erection Portion' of the Contract price shall mean the value of field activities of the works including erection, testing and putting into satisfactory operation including successful

completion of performance and guarantee tests to be performed at Site by the Contractor including cost of insurances.

1.13 'Manufacturer's Works' or 'Contractor's Works', shall mean the place of work used by the manufacturer, the Contractor, their collaborators / associate or sub-contractors for the performance of the Contract.

1.14 'Inspector' shall mean TPTL or any person nominated by TPTL from time to time, to inspect the equipment; stores or Works under the Contract and / or the duly authorized representative of TPTL.

1.15 'Notification of Award of Contract' / Letter of Award' / Telex of Award' shall mean the official notice issued by TPTL notifying the Contractor that his bid has been accepted.

1.16 'Date of Contract' shall mean the date on which Notification of Award of Contract / Letter of Award / Telex of Award has been issued.

1.17 'Month' shall mean the calendar month. 'Day or 'Days', unless herein otherwise expressly defined, shall mean calendar day or days of 24 hours each.

A 'Week' shall mean continuous period of seven (7) days.

1.18 "Writing" shall include any manuscript, type written or printed statement, under or over signature and / or seal as the case may be.

1.19 When the words 'Approved' subject to Approval', 'Satisfactory', 'Equal to', 'Proper', 'Requested', 'As Directed', 'Where Directed', 'When Directed', 'Determined by', 'Accepted', 'Permitted', or words and phrases of like importance are used the approval, judgment, direction etc. is understood to be a function of TPTL.

1.20 "Test on Completion" shall mean such tests as prescribed in the Contract to be performed by the Contractor before the work is taken over by TPTL.

1.21 'Start Up' shall mean the time period required to bring the equipment covered under the Contract from an inactive condition, when construction is essentially complete, to the state ready for trial operation. The Start-up period shall include preliminary inspection and checkout of equipment and supporting sub-system, initial operation of the complete equipment covered under the Contract to obtain necessary pre-trial operation data, perform calibration and corrective action, shut down, inspection and adjustment prior to the trial operation period.

1.22 "Initial Operation" shall mean the first integral operation of the complete equipment covered under the Contract with the sub-system and supporting equipment in service or available for service.

1.23 'Trial Operation', Reliability Test', 'Trial Run', 'Completion Test' shall mean the extended period of time after the start up period. During this trial operation period, the unit shall be operated over the full load range. The length of Trial Operation shall be as determined by the Engineer of TSECL unless otherwise specified elsewhere in the Contract.

1.24 'Performance and Guarantee Test' shall mean all operational checks and tests required to determine and demonstrate capacity, efficiency and operating characteristics as specified in the Contract Documents.

1.25 The term 'Final Acceptance / Taking Over' shall mean written acceptance of the Works performed under the Contract by TSECL, after successful commissioning / completion of Performance and Guarantee Tests, as specified in the accompanying Technical Specification or otherwise agreed in the Contract.

1.26 "Commercial Operation" shall mean the Conditions of Operation in which the complete equipment covered under the Contract is officially declared by TSECL to be available for continuous operation at different loads upto and including rated capacity. Such declaration by TSECL, however, shall not relieve or prejudice the Contractor of any of his obligations under the Contract.

1.27 'Guarantee period' / 'Maintenance Period' shall mean the period during which the Contractor shall remain liable for repair or replacement of any defective part of the works performed under the contract.

1.28 'Latent Defects' shall mean such defects caused by faulty designs, material or work man ship which cannot be detected during inspection, testing etc, based on the technology available for carrying out such tests.

1.29 'Drawings', 'Plans' shall mean all:

a. Drawing furnished by TPTL as a basis for Bid Proposals.

b. Supplementary drawings furnished by TPTL to clarify and to define in greater detail the intent of the Contract.

c. Drawings submitted by the Contractor with his Bid provided such drawings are acceptable to TPTL.

d. Drawings furnished by TPTL to the Contractor during the progress of the Work; and

e. Engineering data and drawings submitted by the Contractor during the progress of the Work provided such drawings are acceptable to the owner's Engineer in charge of the work.

1.30 "Codes" shall mean the following including the latest amendments and / or replacement, if any:

a. A.S.M.E. Test Codes.

b. A.I.E.E. Test Codes.

c. American Society of Testing Materials Codes.

d. Standards of the Indian Standards Institutions.

e. I.E.E. standards.

f. I.E.C. standards.

g. Other Internationally approved standards and / or rules and regulations touching the subject matter of the Contract.

1.31 Words imparting 'Person' shall include firms, companies, corporation and association or bodies of individuals.

1.32 Terms and expressions not herein defined shall have the same meaning as are assigned to them in the Indian Sale of Goods Act (1930), failing that in the Indian Contract Act (1872) and failing that in the General Clauses Act (1897) including amendments thereof if any.

1.33 In addition to the above the following definitions shall also apply.

a. 'All equipment and materials' to be supplied shall also mean 'Goods'.

b. 'Constructed' shall also mean 'erected and installed'.

c. 'Contract Performance Guarantee shall also mean 'Contact Performance Security'.

2.0 APPLICATION

These General Conditions shall apply to the extent that they are not superseded by provisions in other parts of the Contract.

3.0 STANDARDS

The Goods supplied under this Contract shall conform to the standards mentioned in the Technical Specifications and when no applicable standard is mentioned; to the authoritative standard appropriate to the Goods and such standards shall be the latest issued by the concerned institution.

4.0 LANGUAGE AND MEASURES

All documents pertaining to the Contract including specification, Schedules, notices, correspondence, operating and maintenance instructions, drawings or any other writing shall be written in English language. The Metric System of measurement shall be used exclusively in the Contract.

5.0 CONTRACT DOCUMENTS

5.1 The term "Contract Documents" shall mean and include the following which shall be deemed to form an integral part of the Contract:

a. Invitation of Bid including letter forwarding the Bidding Documents, Instructions to Bidders, General Terms and Conditions of Contract, Erection Conditions of Contract and all other documents included under various other sections.

b. Specifications of the equipment to be furnished and erected under the Contract as brought out in the accompanying Technical Specification.

c. Contractor's Bid proposal and the documents attached thereto including the letter of clarifications thereto between the Contractor and TSECL prior to the Award of Contract.

d. All the materials, literature, data and information of any sort given by the Contractor along with his bid, subject to the approval of TSECL.

e. Letter of Award and any agreed variations of the conditions of the documents and special terms and conditions of contract if any.

6.0 USE OF THE CONTRACT DOCUMENTS AND INFORMATION

The Contractor shall not communicate or use in advertising, publicity, sales releases or in any other medium, photographs or other reproduction of the Works under this contract, or descriptions of the site, dimensions, quantity, quality, or other information, concerning the Works unless prior written permission has been obtained from TSECL.

7.0 JURISDICTION OF CONTRACT

The laws applicable to the Contact shall be the laws in force in India. The Courts of **Agartala** shall have exclusive jurisdiction in all matters arising under this Contract. No case can be transferred to any place than Agartala.

8.0 MANNER OF EXECUTION OF CONTRACT

8.1 The contractor should attend the concerned office of TSECL within 15 (fifteen) days from the date of issue of the Letter of Award to the Contractor for signing the contract agreement.

8.2 The Contractor shall provide for signing of the Contract, Performance Guarantee, appropriate power of attorney and other requisite materials.

8.3 The Agreement shall be signed in two originals and the Contractor shall be provided with one signed original and the rest shall be retained by TSECL.

8.4 The Contractor shall provide free of cost to TSECL all the Engineering data, drawings, and descriptive materials submitted with the Bid, in at least six (6) copies to form a part of the contract immediately after issue of Letter of Award.

8.5 Subsequent to signing of the Contract, the Contractor, at his own cost, shall provide TSECL with at least ten (10) true copies of Agreement and one soft copy including 6 (six) hard copies of the approved drawings within fifteen (15) days after the signing of the Contract.

9.0 ENFORCEMENT OF TERMS

9.1 The failure of either party to enforce at any time any of the provisions of this Contract or any rights in respect thereto or to exercise any option therein provided, shall in no way be construed to be a waiver of such provisions, rights or options or in anyway to affect the validity of the Contract. The exercise by either party of any of its rights herein shall not preclude or prejudice either party from exercising the same or any other right it may have under the Contract.

10.0 COMPLETION OF CONTRACT

10.1 Unless otherwise terminated under the provisions of any other relevant clause, this Contract shall be deemed to have been completed on the date stipulated in the NIT.

B. GUARANTEE & LIABILITIES

11.0 TIME – THE ESSENCE OF CONTRACT

11.1 The time of completion of the Contract as stipulated in the bidding document by TPTL without or with modifications, if any, and so incorporated in the Letter of Award, shall be deemed to be the essence of the Contract. The Contractor shall so organize his resources and perform his Work as to complete it not later than the date agreed to.

11.2 The Contractor shall submit a detailed **BAR CHART / PERT NETWORK** consisting of adequate number of activities covering various key phases of the Work such as design, procurement, manufacturing, shipment and field erection activities within fifteen (15) days of the date of Notice of Award of Contract. This Bar Chart shall also indicate the interface facilities to be provided by TSECL and the dates by which such facilities are needed. The Contractor shall discuss with the owner's Engineer in charge of the work for finalization and approval of the Bar Chart by TSECL. The agreed Bar Chart shall form part of the contract documents. During the performance of the Contract, if in the opinion of the owner's Engineer in charge of the work, proper progress is not maintained, suitable changes shall be made in the Contractor's operations to ensure proper progress without any cost implication to TSECL. The interface facilities to be provided by TSECL in accordance with the agreed Bar Chart shall also be reviewed while reviewing the progress of the Contractor.

11.3 Based on the agreed Bar Chart fortnightly reports shall be submitted by the Contractor as directed by the owner's Engineer in charge of the work.

11.4 Subsequent to the finalization of the Bar Chart, the Contractor shall make available to the owner's Engineer in charge of the work a detailed manufacturing programme in line with the agreed Contract Bar Chart. Such manufacturing programme shall be reviewed, updated and submitted to the owner's Engineer in charge of the work once in every month.

11.5 The above Bar Charts / manufacturing programme shall be compatible with TSECL computer environment and furnished to TSECL on such media as may be desired by TSECL.

12.0 EFFECTIVENESS OF CONTRACT

The Contract shall be considered as having come into force from the date of the Notification of Award, unless otherwise provided in the Notification of Award.

13.0 LIQUIDATED DAMAGES

13.1 For Equipment Portion (Excluding Spares) & Erection portion

13.1.1 If the Contractor fails to successfully complete the commissioning within the time fixed under the Contract, the Contractor shall pay to TSECL as liquidated damages and not as penalty a sum specified for each specified period of delays as below.

13.1.2 Equipment and materials will be deemed to have been delivered only when all its components, parts are also delivered. If certain components are not delivered in time, the equipment and materials will be considered as delayed until such time the missing parts are also delivered.

13.1.3 **The total amount of Liquidated Damages (LD) for delay under the Contract will be subject to a maximum of 5% of the Contract price for maximum 120 days delay exceeding stipulated completion period, beyond that imposition of percentage of LD lies at the discretion of TSECL. Fixing of LD shall be the sole responsibility of TSECL**.

13.2 **For Spares**

13.2.1 The liquidated damages for delay in supply of spares, beyond the dates stipulated under **clause 35.0 Section – III** shall be ½% (Half per cent) of the price of undelivered spares, per week or part thereof.

13.2.2 The total amount of liquidated damages for delay under the Contract shall be subject to a maximum of ten per cent (10%) of the value of spares ordered unless otherwise specifically mentioned.

14.0 **GUARANTEE:**

14.1 The Contractor shall warrant that the equipment shall be new, unused and in accordance with the contract documents and free from defects in material and workmanship for a period of twelve (12) calendar months commencing immediately upon the satisfactory commissioning. The Contractor's liability shall be limited to the replacement of any defective parts in the equipment of his own manufacture or those of his sub-contractors under normal use and arising solely from faulty design, materials and/or workmanship provided always that such defective parts are repairable at the site and are not in the meantime essential in the commercial use of the equipment. Such replaced/defective parts shall be returned to the Contractor unless otherwise arranged. No repairs or replacement shall normally be carried out by owner's Engineer in charge of the work when the equipment is under the supervision of the Contractor's supervisory engineer. **The successful bidder shall submit BG (Bank Guarantee) valid up to the above guarantee period.**

14.2 In the event of any emergency, where in the judgment of the owner's Engineer in Charge of work, delay would cause serious loss or damages, repairs or adjustment may be made by him or a third party chosen by him 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 Dy. General Manager in Charge of work, the Contractor shall 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.

14.3 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 twelve (12) months from the date of such replacement or renewal. If any defects are not remedied within a reasonable time, the owner's Engineer in Charge of work may proceed to do the work at the Contractor's risk and cost, but without prejudice to any other rights which TSECL may have against the Contractor in respect of such defects.

14.4 The repaired or new parts shall 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.

14.5 The cost of any special or general overhaul rendered necessary during the maintenance period due to defects in the equipment or defective work carried out by the Contractor shall be borne by the Contractor.

14.6 The acceptance of the equipment by the owner's Engineer in Charge of work shall in no way relieve the Contractor of his obligation under this clause.

14.7 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 Owner's Engineer in Charge of work shall mutually agree to a programme of replacement or renewal, which shall minimize interruption to the maximum extent in the operation of the equipment.

14.8 At the end of the guarantee period, the Contractor's liability ceases except for latent defects. For latent defects, the Contractor's liability as mentioned in **clause nos. 14.1 through 14.7 above** shall remain till the end of 5 years from the date of commissioning.

In respect of goods supplied by sub-contractors to the Contractor, where a longer guarantee (more than 12 months) is provided by such sub-contractor, TPTL shall be entitled to the benefits of such longer guarantee.

14.9 The provisions contained in this clause shall not be applicable:

a. If TPTL has not used the equipment according to the generally approved industrial practice and in accordance with the conditions of operations specified and in accordance with operating manuals, if any.

b. In cases of normal wear and tear of the parts to be specifically mentioned by the Contractor in the offer.

15.0 TAXES, PERMITS & LICENCES

The Contractor shall be liable and pay all non-Indian taxes, duties, levies lawfully assessed against TSECL or the Contractor in pursuance of the Contract. In addition, the Contractor shall be responsible for payment of all Indian duties, levies and taxes lawfully assessed against this contract.

16.0 REPLACEMENT OF DEFECTIVE PARTS AND MATERIALS

16.1 If during the performance of the Contract, owner's Engineer in charge of the work shall decide and inform in writing to the Contractor that the Contractor has manufactured any equipment, material or part of equipment unsound and imperfect or has furnished any equipment inferior to the quality specified, the Contractor on receiving details of such defects or deficiencies shall at his own expense within seven (7) days of his receiving the notice, or otherwise, within such time as may be reasonably necessary for making it good, proceed to alter, reconstruct or remove such works and furnish fresh equipment/materials up to the standards of the specifications. In case, the Contractor fails to do so, the Owner's Engineer in charge of the work may on giving the Contractor seven (7) days notice in writing of his intentions to do so, proceed to remove the portion of the works so complained of and at the cost of the Contractor perform all such work or furnish all such equipment / materials.

16.2 The Contractor's full and extreme liability under this clause shall be satisfied by the payment to TSECL of the extra cost, of such replacement procured including erection as provided for in the Contract, such extra cost being the ascertained difference between the price paid by TSECL for such replacements and the Contract Price by portion for such defective equipment / materials / works and repayments of any sum paid by TPTL to the Contractor in respect of such defective equipment / material. Should TPTL not so replace the defective equipment / materials, the Contractor's extreme liability under this clause shall be limited to repayment of all sums paid by TPTL under the Contract for such defective equipment / materials.

17.0 PATENT RIGHTS AND ROYALTIES

Royalties and fees for patents covering materials, articles, apparatus, devices, equipment or processes used in the works shall be deemed to have been included in the Contract Price. The Contractor shall satisfy all demands that may be made at any time for such royalties or fees and he alone shall be liable for any damages or claims for patent infringements and shall keep TSECL indemnified in that regard. The Contractor shall, at his own cost and expense, defend all suits or proceedings that may be instituted for alleged infringement of any patents involved in the Works, and, in case of an award of damages, the Contractor shall pay for such award. In the event of any suit or other proceedings instituted against TPTL, the same shall be defended at the cost and expense of the Contractor who shall also satisfy/comply with any decree, order or award made against TPTL. But it shall be understood that no such machine, plant, work, material or thing has been used by TPTL for any purpose or any manner other than that for which they have been furnished and installed by the Contractor and specified under these specifications. Final payment to the Contractor by TSECL shall not be made while any such suit or claim remains unsettled. In the event any apparatus or equipment, or any part thereof furnished by the Contractor, is in such suit or proceedings held to constitute infringement, and its use is enjoined, the Contractor shall at his option and at his own expense, either procure for TPTL, the right to continue the use of said apparatus, equipment or part thereof, replace it with non-infringing apparatus or equipment or modify it, so it becomes non-infringing.

18.0 DEFENCE OF SUITS

If any action in court is brought against TPTL for the failure, omission or neglect on the part of the Contractor to perform any acts, matters, or things under the Contract, or for damage or injury caused by the alleged omission or negligence on the part of the Contractor, his agents, representatives or his Sub-Contractors, or in connection with any claim based on lawful demands of Sub-Contractors, workmen, suppliers or employees, the Contractor shall in all such cases indemnify and keep TPTL, from all losses, damages, expenses or decrees arising of such action.

19.0 LIMITATION OF LIABILITIES

The final payment by TPTL in pursuance of the contract shall mean the release of the Contractor form all his liabilities under the Contract. Such final payment shall be made only at the end of the Guarantee period, and still such time as the contractual liabilities and

responsibilities of the Contractor, shall prevail. All other payments made under the Contract shall be treated as on-account payments.

20.0 POWER TO VARY OR OMIT WORK

20.1 No alterations, amendments, omissions, suspensions or variations of the Works (hereinafter referred to as 'variation') under the Contract as detailed in the Contract Documents, shall be made by the Contractor except as directed in writing by owner's Engineer in charge of the work, but he shall have full powers subject to the provisions hereinafter contained, from time to time during the execution of the Contract, by notice in writing to instruct the Contractor to make such variation without prejudice to the Contract. The Contractor shall carry out such variation and be bound by the same conditions as far as applicable as though the said variations occurred in the Contract Documents. If any suggested variations would, in the opinion of the Contractor, if carried out, prevent him from fulfilling any of his obligations or guarantees under the Contract, he shall notify the owner's Engineer in charge of the work thereof in writing and the owner's Engineer in charge of the work shall decide forthwith whether or not, the same shall be carried out and if the owner confirm his instructions, the Contractor's obligations and guarantees shall be modified to such an extent as may be mutually agreed. Any agreed difference in cost occasioned by any such variation shall be added to or deduced from the Contract Price as the case may be.

20.2 In the event of the owner requiring any variation, a reasonable and proper notice shall be given to the Contractor to enable him to work his arrangement accordingly, and in cases where goods or materials are already prepared or any design, drawings or pattern made or work done requires to be altered, a reasonable and agreed sum in respect thereof shall be paid to the Contractor.

20.3 In any case in which the Contractor has received instructions from the owner's Engineer in charge of the work as to the requirement of carrying out the alterations or additional or substituted work which either then or later on, shall in the opinion of the Contractor, involve a claim for additional payment, the Contractor shall immediately and in no case later than thirty (30) days, after receipt of the instructions aforesaid and before carrying out the instructions, advise the Owner's Engineer in charge of the work to that effect. But the Owner's Engineer in charge of the work shall not become liable for the payment of any charges in respect of any such variations, unless the instructions for the performance of the same shall be confirmed in writing by the owner's Engineer in charge of the work.

20.4 If any variation in the Works results in reduction of Contract Price, the parties shall agree, in writing, to the extent of any change in the price, before the Contractor proceeds with the change.

20.5 In all the above cases, in the event of a disagreement as to the reasonableness of the said sum, the decision of owner's Engineer in charge of the work shall prevail.

20.6 Notwithstanding anything stated above in this clause, owner's Engineer in charge of the work shall have the full power to instruct the Contractor, in writing, during the execution of the Contract to vary the quantities of the items or groups of items in accordance with the provisions of clause entitled 'Change of Quantity in Section – III'. The Contractor shall carry

out such variations and be bound by the same conditions as though the said variations occurred in the Contract Documents.

21.0 ASSIGNMENT AND SUB-LETTING OF CONTRACT

21.1 The Contractor may, after informing owner's Engineer in charge of the work and getting his written approval, assign or sub-let the Contract or any part thereof other than supply of main equipments and any part of the plant for which makes are identified in the Contract. Suppliers of the equipment not identified in the Contract or any change in the identified suppliers shall be subjected to approval by the owner's Engineer in charge of the work. The experience list of equipment vendors under consideration by the Contractor for this Contract shall be furnished to the owner's Engineer in charge of the work for approval, prior to procurement of all such items / equipment. Such assignment / sub-letting shall not relieve the Contractor of any obligation, duty or responsibility under the Contract. Any assignment as above, without prior written approval of the owner's Engineer in charge of the work, shall be void.

21.2 For components / equipment procured by the Contractor for the purposes of the Contract, after obtaining the written approval of TSECL, the Contractor's purchase specifications and enquiries shall call for quality plan to be submitted by the suppliers along with their proposals. The quality plans called for from the Vendors shall set out, during the various stages of manufacture and installation, the quality practices and procedures followed by the Vendors quality control organization, the relevant reference document / standard used, acceptance level, inspection documentation raised, etc. Such quality plans of the successful vendors shall be discussed and finalized in consultation with the owner's Engineer in charge of the work and shall form part of the purchase order/contract between the Contractor and the Vendor. Within three weeks of the release of the purchase orders / contracts for such bought out items / components, a copy of the same without price details but together with detailed purchase specifications, quality plans and delivery conditions shall be furnished to the owner's Engineer in charge of the work by the Contractor.

22.0 CHANGE OF QUANTITY

22.1 During the execution of the Contract, TSECL reserves the right to increase or decrease the quantities of items under the Contract but without any change in unit price or other terms & conditions. Such variations shall not be subjected to any limitation for the individual items but the total variations in all such items including items not covered under the Contract shall be limited to **±25%**.

22.2 The base unit rates, as identified in the Contract shall however remain constant during the currency of the contract. In case, the unit rates are not available in the contract, the same shall be worked out as below: -

i) If the rates for the additional, altered or substituted work are specified in the contract, the contractor is bound to carry the additional, altered or substituted work at the same rates as are specified in the contract.

ii) If the rates for the additional, altered or substituted work are not specifically provided in the contract, the rates will be derived from a similar class of work as are specified in the contract.

iii) If the rates for the additional, altered or substituted work includes any work for which no rate is specified in the contract / can not be derived from the similar class of work in the contract, then such work shall be carried out at the rates which will be determined on the basis of current schedule of rate of TPTL above minus / plus the percentage which the total contract amount bears to the estimated cost put to tender. Provided always if the rate for particular part or parts of the item is not available in the schedule of rates the rate of such part or parts will be determined by TPTL of the work on the basis of the prevailing market rate when the work was done.

iv) If the rates for the additional, altered or substituted work can not be determined in the manner specified in sub-clause i, ii & iii above, then the contractor shall within 7 (seven) days of receipt of order to carry out the order, inform the owner's Engineer in charge of the work of rate which it is his intention to charge for such class of work, supported by analysis of rate or rates claimed, and TPTL shall determine the rate or rates claimed with mutual settlement with the contractor.

v) The deviation limit referred to above is the net effect (algebraically sum) of all additions and deductions ordered.

vi) Time for the completion of the work shall be extended in the proportion that the altered, additional or substituted work bears to the original contract of the work and the certificate of the owner's Engineer in charge of the work shall be conclusive for approval of the time extension by TPTL.

vii) The contractor shall submit to owner's Engineer-in-charge of the work the time extension application as per proforma attached at **Annexure – III**.

23.0 PACKING, FORWARDING AND SHIPMENT

23.1 The Contractor, wherever applicable, shall after proper painting, pack and crate all equipment in such a manner as to protect them from deterioration and damage during rail and road transportation to the site and storage at the site till the time of erection. The Contractor shall be held responsible for all damages due to improper package.

23.2 The Contractor shall notify the owner's Engineer in charge of the work of the date of each shipment from his works, and the expected date of arrival at the site.

23.3 The Contractor shall also give all shipping information concerning the weight, size and content of each packing including any other information the owner's Engineer in charge of the work may require.

23.4 The Contractor shall prepare detailed packing list of all packages and containers, bundles and loose materials forming each and every consignment dispatch to Site.

The Contractor shall further be responsible for making all necessary arrangements for loading, unloading and other handling, right from his works up to the Site and also till the

equipment is erected, tested and commissioned. He shall be solely responsible for proper storage and safe custody of all equipment.

24.0 CO-OPERATION WITH OTHER CONTRACTORS AND CONSULTING ENGINEERS

The Contractor shall agree to cooperate with the TPTL's Consulting Engineers and freely exchange with them such technical information, as is necessary to obtain the most efficient and economical design and to avoid unnecessary duplication of efforts. The owner's Engineer in charge of the work shall be provided with three copies of all correspondence addressed by the Contractor to the consulting Engineers of TPTL in respect of such exchange of technical information.

25.0 NO WAIVER OF RIGHTS

Neither the inspection by TPTL nor any order by TPTL for payment of money or any payment for or acceptance of, the whole or any part of the Works by the owner's Engineer in charge of the work, nor any extension of time, nor any possession taken by the owner's Engineer in charge of the work shall operate as a waiver of any provision of the Contract, or of any power herein reserved to TSECL or any right to damages herein provided nor shall any waiver of any breach in the Contract be held to be a waiver of any other or subsequent breach.

26.0 CERTIFICATE NOT TO AFFECT RIGHT OF TPTL AND LIABILITY OF CONTRACTOR

No interim payment certificate of the owner's Engineer in charge of the work, nor any sum paid on account by TSECL, nor any extension of time for execution of the Works granted by TSECL shall affect or prejudice the rights of TSECL against the Contractor or relieve the Contractor of his obligation for the due performance of the Contractor, or be interpreted as approval of the Works done or of the equipment furnished and no certificate shall create liability for TSECL to pay for alterations, amendments, variations or additional works not ordered, in writing, by the owner's Engineer in charge of the work or discharge the liability of the Contractor for the payment of damages whether due, ascertained or certified or not or any sum against the payment of which he is bound to indemnify TSECL, nor shall any such certificate nor the acceptance by him of any sum paid on account or otherwise affect or prejudice the rights of TSECL against the Contractor.

27.0 INSPECTION AND TESTING OF EQUIPMENTS & MATERIALS

27.1 All equipments / materials shall be inspected by the inspecting officer / team of TPTL / TPIA (Third Party Inspecting Agency) as nominated by TPTL unless otherwise waived by TPTL during execution of the contract in special circumstances.

27.2 After manufacturing or at the stage of dispatch of equipments / materials the contractor shall give intimation to the owner's Engineer in charge of the work for conducting inspection of equipments / materials at manufacture's works or at recognized testing laboratories to be arranged by the contractor. **The intimation shall be made at least 15 (fifteen) days before the equipments / materials become ready for dispatch.**

27.3 Pre – dispatch inspection and testing of equipments / materials as specified above shall be conducted at the risk and cost of the Contractor. The Contractor shall also bear the to and fro travelling, food and lodging charges of the inspecting Officer / team of TSECL.

27.4 **All equipments / materials shall be dispatched by the contractor only after issuance of Materials Dispatch Clearance Certificate (MDCC) by the TPTL authority.**

28.0 TRAINING OF OWNER'S PERSONNEL

28.1 The Contractor shall undertake to train free of cost, two engineering personnel selected and sent by TPTL at the works of the manufacturer. The period and nature of training for the personnel shall be agreed upon mutually between the Contractor and TPTL. These engineering personnel shall be given special training in the shops, where the equipment shall be manufactured and / or in their Collaborator's works and where possible, in any other plant where equipment manufactured by the Contractor or his Collaborator is under installation, operation, or testing to enable those personnel to become familiar with the equipment being supplied by the Contractor.

28.2 All traveling and living expenses for the engineering personnel to be trained during the total period of training shall be borne by the Contractor. These engineering personnel, while undergoing training, shall be responsible to the Contractor for discipline.

28.3 TPTL shall not be entitled for any rebate, whatsoever on any account in the event of his failing to avail of the training facilities, for any reason.

29.0 PROGRESS REPORTS AND PHOTOGRAPHS

During the various stages of the Work in the pursuance of the Contract, the Contractor shall at his own cost submit periodic progress reports as may be reasonably required by the owner's Engineer in charge of the work with such materials as, charts, Bar Charts, photographs, test certificates, etc. Such progress reports shall be in the form and size as may be required by the owner's Engineer in charge of the work and shall be submitted in at least three (3) copies.

30.0 TAKING OVER

Upon successful completion of all the tests to be performed at Site on equipment furnished and erected by the Contractor, the owner's Engineer in charge of the work shall issue to the Contractor a **Taking over Certificate** as a proof of the final acceptance of the equipment. Such certificate shall not unreasonably be withheld.

C. CONTRACT SECURITY AND PAYMENTS

31.0 CONTRACT PERFORMANCE GUARANTEE

The Contractor shall furnish contract performance guarantee as specified in **clause 12.0 of Section – I** for the proper fulfillment of the Contract within fifteen (15) days of "Notice of Award of Contract."

32.0 PAYMENT

32.1 The payment to the Contractor for the performance of the Works under the Contract will be made by TPTL as per the guidelines and conditions specified herein. All payment made during the Contract shall be on account payments only. The final payment will be made on completion of all Works and on completion of warranty / guaranty period including fulfillment by the Contractor of all his liabilities under the Contract.

32.2 Currency of Payment

All payments under the Contract shall be in Indian Rupees only.

32.3 Due Dates for Payments

TPTL will make progressive payment as and when the payment is due as per the terms of payment set forth as herein after.

33.0 MODE OF PAYMENT

Payment due on supply / erection of Equipment & materials / services shall be made by the owner's Engineer in charge of the work through account payee Banker cheque.

33.1 TERMS OF PAYMENT

The terms of payments for various activities under the contract are as follows:

33.1.1 Minimum bill value in a single R/A bill shall not be less than 5% of the contract value.

33.1.2 Price of Supply and Erection:

The terms of payments for price of all equipment / materials and erection are detailed herein after.

A) **For supply of Equipment / materials**:

i) 80% of the cost of equipment / materials after fulfillment of the following requirements:

a. Acknowledgement of Letter of Award.

b. Submission of contract performance guarantee as per **clause 12.0 (Section – I)**.

c. Submission of a detailed Bar Chart based on the work schedule stipulated in the Bid document and its approval by TPTL.

d. Signing of contract agreement.

e. On production of dispatch documents including the material inspection clearance certificate (MICC) issued by the inspecting officer / team of TPTL/ TPIA.

f. On receipt of materials at site.

ii) 10% of the cost of equipment / materials after successful erection at site.

iii) Balance 10% of the cost of equipment / materials after successful commissioning.

33.1.3 All further payments under the Contract shall be made as stipulated in the Contract document after signing the Contract Agreement.

33.1.4 Inland Transportation & Insurance

Inland transportation (including port handling) and inland insurance charges shall be borne by the contractor and TPTL in no way shall be liable for the inland transportation and insurance charges.

33.1.5 Spares

The Ex-works price components including packing and forwarding charges of spares shall be paid as indicated below: -

a. On receipt and storage at Site and on physical verification by the owner's Engineer in charge of the work.

33.1.6 DEDUCTION FROM CONTRACT PRICE

All costs, damages or expenses which TPTL may have paid, for which under the Contract, the Contractor is liable, will be deducted from the progressive bill of the contractor.

D. SPARES

34.0 SPARES

34.1 All the spares for the equipment under the Contract will, strictly, conform to the specification and documents and will be identical to the corresponding main equipment / components supplied under the Contract and shall be fully interchangeable.

34.2 All the mandatory spares covered under the Contract shall be produced along with the main equipment as a continuous operation and the delivery of the spares will be affected along with the main equipment in a phased manner and the delivery would be completed by the respective dates for the various categories of equipment as per the agreed Bar chart. In case of recommended spares, the above will be applicable provided the order for the recommended spares has been placed with the Contractor prior to commencement of manufacture of the main equipment.

34.3 The quality plan and the inspection requirement finalized for the main equipment will also be applicable for the corresponding spares.

34.4 The Contractor will provide TPTL with the manufacturing drawings, catalogues, assembly drawings and any other documents required by TPTL so as to enable the Owner to identity the recommended spares. Such details will be furnished to TPTL as soon as they are prepared but in any case not later than six months prior to commencement of manufacture of the corresponding main equipment.

34.5 The Contractor will provide TPTL with all the addresses and particulars of his sub-suppliers while placing the order on vendors for items / components / equipment covered under the Contract and will further ensure with his vendors that TPTL, if so desires, will have the right

to place order(s) for spares directly on them on mutually agreed terms based on offers of such vendors.

35.0 WARRANTEE FOR SPARES

The Contractor shall warrant that all spares supplied will be new and in accordance with Contract Documents and will be free from defects in design, materials and workmanship and shall further guarantee as under:

35.1 For 3 years operational spares (both mandatory and recommended)

a. For any item of spares ordered or to be ordered by TPTL for 3 years operational requirement of the plant which is manufactured as a continuous operation together with the corresponding main equipment/component, the warranty will be 12 months from the scheduled date of commercial operation of the last unit of main equipment under the Contract. In case of any failure in the original component/equipment due to faulty designs, materials and workmanship, the corresponding spare parts, if any, supplied will be replaced without any extra cost to TPTL unless a joint examination and analysis by TPTL and the Contractor of such spare parts prove that the defect found in the original part that failed, can safely be assumed not to be present in spare parts. Such replaced spare parts will have the same warranty as applicable to the replacement made for the defective original part/ component provided that such replacement for the original equipment and the spare replaced are again manufactured together. The discarded spare parts will become the property of the Contractor as soon as they have been replaced by the Contractor.

b. For the item of spares ordered / to be ordered by TPTL for 3 years operational requirement of the equipment, which with the written approval of the Owner, are not manufactured as a continuous operation together with the manufacture of the corresponding main equipment / component, will be warranted for 6000 hrs of trouble free operation, if used within a period of 18 months (reckoned from the date of delivery at Site). However, if such spare parts are put to use after 18 months of the delivery at site then the guarantee of such spares will stand valid till the expiry of 36 months from the scheduled date of the completion of commissioning of the last unit of equipment or 6000 hrs of trouble free operation after such spares are put in service, whichever is earlier.

c. For long Term Requirement.

For items of spares that may be ordered by TPTL to cover requirements beyond 3 years of initial operation of the plant, the warranty will be till the expiry of 6000 hrs. of trouble free operation if used within a period of 18 months from the date of delivery at Site. For items of spares that may be used after 18 months from the date of delivery at Site, the warranty period will be 12 months from the date they are put to use or 6000 hrs of trouble free operation, whichever is earlier.

35.2 The warranty of spares that are not used within 18 months from the respective dates of the delivery at Site covered in Para (b) & (c) above will, however, be subject to the condition that

all such spares have been stored / maintained / preserved in accordance with Contractor's standard recommended practice, if any, and the same have been furnished to TPTL.

35.3 To enable TPTL to finalize the requirement of recommended spares which are ordered subsequent to placement of order for main equipment in addition to necessary technical details, catalogue and such other information brought-out here-in-above, the Contractor will also provide a justification in support of reasonableness of the quoted prices of spares which will, inter-alia, include documentary evidence that the prices quoted by the Contractor are not higher than those charged by them from other customers in the same period.

35.4 In addition to the spares recommended by the Contractor, if TPTL further identifies certain particular items of spares, the Contractor will submit the prices and delivery quotations for such spares within 30 days of receipt of such request with validity period for 6 months for consideration of placement of order for additional spares, if TPTL so desires.

35.5 The Contractor shall guarantee the long-term availability of spares to TPTL for the full life of the equipment covered under the Contract. The Contractor shall guarantee that before going out of production of spare parts of the equipment, he shall give at least twelve (12) months advance notice so that the latter may order his bulk requirement of spares, if he so desires. The same provision will also be applicable to Sub-Contractor of any spares by the Contractor or his Sub-Contractors. Further, in case of discontinuance of manufacture of any spares by the Contractor or his Sub-Contractors, the Contractor will provide TPTL, two years in advance, full manufacturing drawings, material specifications and technical information required by TPTL for the purpose of manufacture of such items.

35.6 Further in case of discontinuance of supply of spares by the Contractor or his Sub-contractors, the Contractor will provide TPTL with full information for replacement of such spares with other equivalent makes, if so required by TPTL.

35.7 The prices of all future requirements of items of spares beyond 3 years operational requirement will be derived from the corresponding ex-works price at which the order for such spares have been placed by TPTL as part of mandatory spares or recommended spares. Ex-works order price of future spares shall be computed in accordance with the price adjustment provisions covered under the main Contract excepting that 'the base indices will be counted from he scheduled date of successful completion of trial operation of the last equipment under the main project and there will be no ceiling on the amount of narration in the prices. The above option for procuring future long term requirement of spares by TPTL shall remain valid for a period of 5 years from successful completion of commissioning of the last unit of equipment.

35.8 The Contractor will indicate in advance the delivery period of the items of spares, which TPTL may procure in accordance with above Sub-clause. In case of emergency requirements of spares, the Contractor would make every effort to expedite the manufacture and delivery of such spares on the basis of mutually agreed time schedule.

35.9 In case the Contractor fails to supply the mandatory, recommended or long term spares in accordance with the terms stipulated above, TPTL shall be entitled to purchase the same from alternate sources at the risk and the cost of the Contractor and recover from the

Contractor, the excess amount paid by TPTL over the rates worked out on the above basis. In the event of such risk purchase by TPTL, the purchases will be as per the works and procurement policy of TPTL prevalent at the time of such purchases and at his option, may include a representative of the Contractor in finalizing the purchases.

35.10 It is expressly understood that the final settlement between the parties in terms of the relevant clauses of the Bidding Documents shall not relieve the Contractor of any his obligations under the provision of long term availability of spares unless otherwise discharged in writing by TPTL.

E. RISK DISTRIBUTION

36.0 TRANSFER OF TITLE

36.1 This Transfer of Title of equipments / materials shall not be constructed to mean the acceptance and the consequent "Taking Over" of equipment and materials. The Contractor shall continue to be responsible for the quality and performance of such equipment and materials and for their compliance with the specifications until "Taking Over" and the fulfillment of guarantee provisions of this Contract.

36.2 This Transfer of Title shall not relieve the Contractor from the responsibility for all risks of loss or damage to the equipment and materials as specified under the clause entitled "Insurance" of this Section.

37.0 INSURANCE

37.1 The Contractor at his cost shall arrange, secure and maintain all insurance as may be pertinent to the Works and obligatory in terms of law to protect his interest and interests of TPTL against all perils detailed herein. The form and the limit of such insurance as defined herein together with the under-writer in each case shall be acceptable to TPTL. However, irrespective of such acceptance, the responsibility to maintain adequate insurance coverage at all times during the period of Contract shall be of the Contractor alone. The Contractor's failure in this regard shall not relieve him of any of his contractual responsibilities and obligations. The insurance covers to be taken by the Contractor shall be in a joint name of TPTL and the Contractor. The Contractor shall, however, be authorized to deal directly with Insurance Company or Companies and shall be responsible in regard to maintenance of all insurance covers. Further the insurance should be in freely convertible currency.

37.2 Any loss or damage to the equipment during handling, transportation, storage, erection, putting into satisfactory operation and all activities to be performed till the successful completion of commissioning of the equipment shall be to the account of the Contractor. The Contractor shall be responsible for preference of all claims and make good the damages or loss by way of repairs and/or replacement of the equipment, damaged or lost. The transfer of title shall not in any way relieve the Contractor of the above responsibilities during the period of Contract. The Contractor shall provide TPTL with copy of all insurance policies and documents taken out by him in pursuance of the Contract. Such copies of documents shall be submitted to TPTL immediately after such insurance coverage. The Contractor shall also inform TPTL in writing at least sixty (60) Days in advance regarding the expiry / cancellation

and / or change in any of such documents and ensure revalidation, renewal etc., as may be necessary well in time.

37.3 The perils required to be covered under the insurance shall include, but not be limited to fire and allied risks, miscellaneous accidents (erection risks) workman compensation risks, loss or damage in transit, theft, pilferage, riot, strikes, social unrest and malicious damages, civil commotion, weather conditions, accidents of all kinds, etc. The scope of such insurance shall be adequate to cover the replacement / reinstatement cost of the equipment for all risks up to and including delivery of goods and other costs till the equipment is delivered at Site. The insurance policies to be taken should be on replacement value basis and / or incorporating escalation clause. Notwithstanding the extent of insurance cover and the amount of claim available from the underwriters, the Contractor shall be liable to make good the full replacement / rectification value of all equipment / materials and to ensure their availability as per project requirements.

37.4 All costs on account of insurance liabilities covered under the Contract will be to Contractor's account and will be included in Contract Price, However, TPTL may from time to time, during the pendency of the Contract, ask the Contractor in writing to limit the insurance coverage, risks and in such a case, the parties to the Contract will agree for a mutual settlement, for reduction in Contract price to the extent of reduced premium amount. The Contractor, while arranging the insurance shall ensure to obtain all discounts on premium, which may be available for higher volume or for reason of financing arrangement of the project.

37.5 The clause entitled 'Insurance' under the Section – IV, covers the additional insurance requirements for the portion of the works to be performed at the Site.

38.0 LIABILITY FOR ACCIDENTS AND DAMAGES

Under the Contract, the Contractor shall be responsible for loss or damage to the equipment until the successful completion of commissioning as defined else-where in the Bidding Documents.

38.1 DELAYS BY TPTL OR HIS AUTHORISED AGENTS

In case the Contractor's performance is delayed due to any act on the part of TPTL or his authorized agents, then the Contractor shall be given due extension of time for the completion of the Works, to the extent of such act on the part of TPTL has caused delay in the Contractor's performance of the Contract.

Regarding reasonableness or otherwise of the extension of time, the decision of the TPTL shall be final.

39.0 DEMURRAGE, WHARFAGE, ETC.

All demurrage, wharf-age and other expenses incurred due to delayed clearance of the material or any other reason shall be to the account of the Contractor.

40.0 FORCE MAJEURE

40.1 Force majeure is herein defined as any cause which is beyond the control of the Contractor or TPTL as the case may be, which they could not foresee or with a reasonable amount of

diligence could not have foreseen and which substantially affects the performance of the Contract, such as:

a. Natural phenomena, including but not limited to floods, droughts, earthquakes and epidemics;

b. Acts of any Government including but not limited to war, declared or undeclared, quarantines, and embargoes.

Provided the contractor shall within fifteen (15) days from the occurrence of such a cause notify TPTL in writing of such causes, acceptance of which will be given by TPTL after verification.

40.2 The Contractor or TPTL shall not be liable for delays in performing his obligations resulting from any force-majeure cause as referred to and /or defined above.

The date of completion will, subject to hereinafter provided, be extended by a reasonable time. In such case the contractor shall submit to owner's Engineer-in-charge of the work the time extension application as per proforma attached at **Annexure – III.**

41.0 SUSPENSION OF WORK

41.1 TPTL reserves the right to suspend and reinstate execution of the whole or any part of the Works without invalidating the provisions of the Contract. Orders for Suspension or reinstatement of the Works will be issued by TPTL to the Contractor in writing. The time for completion of the works will be extended for a period equal duration of the suspension.

42.0 CONTRACTOR'S DEFAULT

42.1 If the Contractor shall neglect to execute the Works with due diligence and expertise or shall refuse or neglect to comply with any reasonable order given to him, in the Contract by the owner's Engineer in charge of the work in connection with the works or shall contravene the provisions of the Contract, TPTL may give notice in writing to the Contractor to make good the failure, neglect or contravention complained of. Should the Contractor fail to comply with the notice within thirty (30) days from the date of serving the notice, then and in such case TPTL shall be at liberty to employ other workmen and forthwith execute such part of the Works as the Contractor, may have neglected to do or if TPTL shall think fit, without prejudice to any other right he may have under the Contract to take the work wholly or in part out of the Contractor's hands and re-contract with any other person or persons to complete the works or any part thereof and in that event TPTL shall have free use of all Contractor's equipment that may have been at the time on the Site in connection with the works without being responsible to the Contractor for fair wear and tear thereof and to the exclusion of any right of the Contractor over the same, and TPTL shall be entitled to retain and apply any balance which may otherwise be due on the Contract by him to the Contractor, or such part there of as may be necessary, to the payment of the cost of executing the said part of the Work or of completing the Works as the case may be. If the cost of completing of Works or executing a part there of as a foresaid shall exceed the balance due to the Contractor, the Contractor shall pay such excess. Such payment of excess amount shall be independent of

the liquidated damages for delay, which the Contractor shall have to pay if the completion of Works is delayed.

42.2 In addition, such action by TPTL as aforesaid shall not relieve the Contractor of his liability to pay liquidated damages for delay in completion of Works as defined in **clause 13.0 of this Section**.

42.3 Such action by TPTL as aforesaid, the termination of the Contract under this clause shall neither entitle the Contractor to reduce the value of the Contract Performance Guarantee nor the time thereof. The Contract Performance Guarantee shall be valid for the full value and for the full period of the Contract including guarantee period.

43.0 TERMINATION OF CONTRACT ON OWNER'S INITIATIVE

43.1 TPTL reserves the right to terminate the Contract either in part or in full due to reasons stipulated in the clause entitled "Contractor's Default." TPTL shall in such an event give fifteen (15) days notice in writing to the Contractor of his decision to do so.

43.2 The contractor upon receipt of such notice shall discontinue the work on the date and to the extent specified in the notice.

43.3 If the contractor is an individual or a proprietary concern and the individual or the proprietor dies and if the Contractor is a partnership concern and one of the partners dies then unless TPTL is satisfied that the legal representatives of the individual contractor or of the proprietor of propriety concern and in the case of partnership, the surviving partners, are capable of carrying out and completing the Contract, TPTL shall be entitled to cancel the Contract as to its uncompleted part without being in any way liable to payment of any compensation to the estate of deceased Contractor and/or to the surviving partners of the Contractor's firm on account of the cancellation of the Contract. The decision of TPTL that the legal representatives of the deceased Contractor or surviving partners of the Contractor's firm cannot carry out and complete the Contract shall be final and binding on the parties.

F. RESOLUTION OF DISPUTES

44.0 SETTLEMENT OF DISPUTES

44.1 Any dispute(s) or difference (s) arising out of or in connection with the Contract shall, to the extent possible, be settled amicably between the parties.

44.2 If any dispute or difference of any kind, whatsoever, shall arise between the owner's Engineer in charge of the work and the Contractor, arising out of the Contract for the performance of the Works whether during the progress of the Works or after its completion or whether before or after the termination, abandonment or breach of the Contract, it shall, in the first place, be referred to and settled by the Additional General Manager of the concerned circle / General Manager as the case may be, who, within a period of thirty (30) days after being requested by either party to do so, shall give written notice of his decision to both the parties.

44.3 In the event the Contractor being dissatisfied with any such decision, the matters in dispute shall be referred to arbitration as hereinafter provided.

45.0 ARBITRATION

45.1 All disputes or differences in respect of which the decision, if any, of the Engineer has not become final or binding as aforesaid shall be settled by arbitration in the manner hereinafter provided.

45.1.1 The demand for arbitration shall be made within a reasonable time after the claim, dispute or other matter in question has arisen, and in no event shall it be made after 90 (ninety) days from when the aggrieved party knew or should have known of the controversy, claim, dispute or breach.

45.1.2 The arbitration shall be conducted by an arbitrator, to be nominated by TPTL and he will be the sole arbitrator to conduct the arbitration.

45.1.3 The arbitration shall be conducted in accordance with the provisions of the Indian Arbitration & Reconciliation Act, 1996 or any statutory modification thereof. The venue of arbitration shall be at Agartala**.**

45.2 The arbitrators may, from time to time with the consent of all the parties enlarge the time for making the award.

45.3 The arbitrator shall have full powers to review and/or revise any, decision, opinion, direction, certification or valuation of the Engineer in accordance with the Contract, and neither party shall be limited in the proceedings before such arbitrators to the condense or arguments out before the Engineer for the purpose of obtaining the said decision.

45.4 During settlement of disputes and arbitration proceedings, both parties shall be obliged to carry out their respective obligations under the Contract.

46.0 RECONCILIATION OF ACCOUNTS

The Contractor shall prepare and submit every six months, a statement covering payments claimed and the payments received vis-à-vis the works executed, for reconciliation of accounts with the owner's Engineer in charge of the work. The Contractor shall also prepare and submit a detailed account of Materials received from TPTL and utilized by him for reconciliation purpose.

SECTION – IV

ERECTION CONDITIONS OF CONTRACT

1.0 GENERAL

1.1 The following shall supplement the conditions already contained in the other parts of these specifications and document and shall govern the portion of the work of this Contract to be performed at Site.

1.2 The Contractor upon signing of the Contract shall, in addition to a Project Coordinator, nominate another responsible officer as his representative at Site suitably designated for the purpose of overall responsibility and co-ordination of the works to be performed at Site. Such person shall function from the Site Office of the Contractor.

2.0 REGULATION OF LOCAL AUTHORITIES

2.1 The Contractor shall comply with all the rules and regulations of local authorities during the performance of his field activities. He shall also comply with the Minimum Wages Act, 1948 and the Payment of Wages Act (both of the Government of India) and the rules made there-under in respect of any employee or workman employed or engaged by him or his Sub-Contractor.

2.2 All registration and statutory inspection fees, if any, in respect of his work pursuant to this Contract shall be to the account of the Contractor. However, any registration, statutory inspection fees lawfully payable under any statutory laws and its amendments from time to time during erection in respect of the equipment ultimately to be owned by the Owner, shall be to the account of TPTL. Should any such inspection or registration need to be re-arranged due to the fault of the Contractor or his Sub-Contractor, the additional fees to such inspection and / or registration shall be borne by the Contractor.

3.0 OWNER'S LIEN ON EQUIPMENT

TPTL shall have a lien on all equipment including those of the Contractor brought to the Site for the purpose of erection, testing and commissioning of the equipment to be supplied & erected under the Contract. TPTL shall continue to hold the lien on all such equipment throughout the period of Contract. No material brought to the Site shall be removed from the Site by the Contractor and / or his Sub-Contractors without the prior written approval of the Engineer.

4.0 INSPECTION, TESTING AND INSPECTION CERTIFICATES

The provisions of the clause entitled Inspection, Testing and Inspection Certificates under Technical Specification, Section General Terms & Conditions (GTC) shall also be applicable to the erection portion of the Works. The Dy. General Manager in charge of the work shall have the right to re-inspect any equipment though previously inspected at the Contractor's works, before and after the same are erected at Site. If by the above inspection, the Dy. General Manager in charge of the work rejects any equipment, the Contractor shall make good for such rejections either by replacement or modification / repairs as may be necessary to the satisfaction of TPTL. Such replacements shall also include the replacements or re-

execution of such of those works of other Contractors and / or agencies, which might have got damaged or affected by the replacements or re-work done to the Contractor's work.

5.0 ACCESS TO SITE AND WORKS ON SITE

5.1 Suitable access to the Site shall be afforded to the Contractor by TPTL in reasonable time.

5.2 In the execution of the works, no person other than the Contractor or his duly appointed representative, Sub-Contractor and workmen, shall be allowed to do work on the Site, except by the special permission, in writing of the site Engineer of TPTL or his representative.

6.0 CONTRACTOR'S SITE OFFICE ESTABLISHMENT

The Contractor shall establish a Site Office at the Site and keep posted an authorized representative for the purpose of the Contract. Any written order or instruction of the Dy. General Manager in charge of the work or his duly authorized representative shall be communicated to the said authorized resident representative of the Contractor and the same shall be deemed to have been communicated to the Contractor at his legal address.

7.0 CO-OPERATION WITH OTHER CONTRACTORS

7.1 The Contractor shall co-operate with all other Contractors or tradesmen of TPTL, who may be performing other works on behalf of TPTL and the workmen who may be employed by TPTL and doing work in the vicinity of the Works under the Contract. The Contractor shall also so arrange to perform his work as to minimize, to the maximum extent possible, interference with the work of other Contractors and their workmen. Any injury or damage that may be sustained by the employees of the other Contractors and TPTL, due to the Contractor's work shall promptly be made good at the Contractor's own expense. The site Engineer of TPTL shall determine the resolution of any difference or conflict that may arise between the Contractor and other Contractors or between the Contractor and the workmen of TPTL in regard to their work. If the work of the Contractor is delayed because of any acts of omission of another Contractor, the Contractor shall have no claim against TPTL on that account other than an extension of time for completing his Works.

7.2 The site Engineer of TPTL shall be notified promptly by the Contractor of any defects in the other Contractor's works that could affect the Contractor's Works. The Engineer shall determine the corrective measures if any required rectifying this situation after inspection of the works and such decisions by the Engineer shall be binding on the Contractor.

8.0 DISCIPLINE OF WORKMEN

The Contractor shall adhere to the disciplinary procedure set by the site Engineer of TPTL in respect of his employees and workmen at Site. The Engineer shall be at liberty to object to the presence of any representative or employee of the Contractor at the Site, if in the opinion of the Engineer such employee has misconduct himself or is incompetent or negligent or otherwise undesirable and then the Contractor shall remove such a person objected to and provide in his place a competent replacement.

9.0 CONTRACTOR'S FIELD OPERATION

9.1 The Contractor shall keep the site Engineer of TPTL informed in advance regarding his field activity plans and schedules for carrying-out each part of the works. Any review of such plan or schedule or method of work by the site Engineer of TPTL shall not relieve the Contractor of any of his responsibilities towards the field activities. Such reviews shall also not be considered as an assumption of any risk or liability by TPTL or any of his representatives and no claim of the Contractor shall be entertained because of the failure or inefficiency of any such plan or schedule or method of work reviewed. The Contractor shall be solely responsible for the safety, adequacy and efficiency of plant and equipment and his erection methods.

9.2 The Contractor shall have the complete responsibility for the conditions of the Work-Site including the safety of all persons employed by him or his Sub-Contractor and all the properties under his custody during the performance of the work. This requirement shall apply continuously till the completion of the Contract and shall not be limited to normal working hours. The construction review by the site Engineer of TPTL is not intended to include review of Contractor's safety measures in, on or near the work Site, and their adequacy or otherwise.

10.0 PHOTOGRAPHS AND PROGRESS REPORT

10.1 The Contractor shall furnish three (3) prints each to the site Engineer of progress photographs of the work done at Site. Photographs shall be taken as and when indicated by the site Engineer of TPTL or his representative. Photographs shall be adequate in size and number to indicate various stages of erection. Each photograph shall contain the date, the name of the Contractor and the title of the photograph.

10.2 The above photographs shall accompany the monthly progress report detailing-out the progress achieved on all erection activities as compared to the schedules. The report shall also indicate the reasons for the variance between the scheduled and actual progress and the action proposed for corrective measures, wherever necessary.

11.0 MAN-POWER REPORT

11.1 The Contractor shall submit to the site Engineer of TPTL, on the first day of every month, a man-hour schedule for the month, detailing the man hours scheduled for the month, skill-wise and area-wise including the list of engineers / workers.

11.2 The Contractor shall also submit to the site Engineer of TPTL, on the first day of every month, a man power report of the previous month detailing the number of persons scheduled to have been employed and actually employed, skill-wise and the areas of employment of such labour.

12.0 PROTECTION OF WORK

The Contractor shall have total responsibility for protecting his works till it is finally taken over by TPTL. No claim shall be entertained by TPTL for any damage or loss to the Contractor's works and the Contractor shall be responsible for complete restoration of the damaged works to original conditions to comply with the specification and drawings, should any such damage to the Contractor's works occur because of any other party not being under his supervision or

control. The Contractor shall make his claim directly with the party concerned. If disagreement or conflict or dispute develops between the Contractor and the other party or parties concerned regarding the responsibility for damage to the contractor's works, the same shall be resolved as per the provisions of the **Clause 7.0 above** entitled "Cooperation with other Contractors". The Contractor shall not cause any delay in the repair of such damaged works because of any delay in the resolution of such dispute. The Contractor shall proceed to repair the Work immediately and no cause thereof will be assigned pending resolution of such disputes.

13.0 EMPLOYMENT OF LABOUR

13.1 The Contractor shall be expected to employ on the work only his regular skilled employees with experience of this particular work. No female labour shall be employed after darkness. No person below the age of eighteen years shall be employed.

13.2 All traveling expenses including provisions of all necessary transport to and from Site, lodging allowances and other payments to the Contractor's employees shall be the sole responsibility of the Contractor.

13.3 The hours of work on the Site shall be decided by the site Engineer of TPTL and the Contractor shall adhere to it. Working hours shall normally be eight (8) hours per day – Monday through Saturday and may have to be extended in the interest of work.

13.4 The Contractor's employees shall wear identification badges while on work at Site.

13.5 In case TPTL becomes liable to pay any wages or dues to the labour or any Government agency under any of the provisions of the Minimum Wages Act, Workmen Compensation Act, Contract Labour Regulation Abolition Act or any other law due to act of omission of the Contractor, TPTL may make such payments and shall recover the same from the Contractor's bills.

14.0 FACILITIES TO BE PROVIDED

By the Contractor

14.1 Tools, tackles and scaffoldings

The Contractor shall provide all the construction equipment, tools, tackles and scaffoldings required for pre-assembly, erection, testing and commissioning of the equipment covered under the Contract. He shall submit a list of all such materials to the site Engineer of TPTL before the commencement of pre-assembly at Site. These tools and tackles shall not be removed from the Site without the written permission of the site Engineer.

14.2 First – aid

The Contractor shall provide necessary first-aid facilities for all his employees, representatives and workmen working at the Site. Enough number of Contractor's personnel shall be trained in administering first – aid.

14.3 Cleanliness

The Contractor shall be responsible for keeping the entire area allotted to him clean and free from rubbish, debris etc. during the period of Contract. The Contractor shall employ enough number of special personnel to thoroughly clean his work-area at least once in a day. All such rubbish and scrap material shall be stacked or disposed in a place to be identified by the site Engineer of TPTL. Materials and stores shall be so arranged to permit easy cleaning of the area. In areas where equipment might drip oil and cause damage to the floor surface, a suitable protective cover of a flame resistant, oil proof sheet shall be provided to protect the floor from such damage.

14.4 **Communication**

The contractor shall extend the telephone & telex facilities, if available at Site, for the purposes of interaction with the site office by him and TPTL.

By the Owner

14.5 **Space**

a) Land for Contractor's Office, Store, and Workshop etc if available shall be provided by TPTL. Otherwise contractor has to arrange at his own cost and responsibilities the accommodation for his site office, store and workshop etc.

b) The site Engineer of TPTL shall at his discretion and for the duration of execution of the Contract make available at site, land for construction of Contractor's field office, workshop, stores, magazines for explosives in isolated locations, assembling yard, etc. required for execution of the Contract. Any construction of temporary roads, offices, workshop, etc. as approved by the site Engineer of TPTL shall be done by the Contractor at his cost.

c) On completion of work, the Contractor shall hand over the land duly cleaned to the site Engineer of TPTL. Until and unless the Contractor has handed over the vacant possession of land allotted to him for the above purpose, the payment of his final bill shall not be made. The Contractor shall be made liable to pay for the use and occupation at the rates to be determined by the Engineer if the Contractor over stays in the land after the Contract is completed.

14.6 **Electricity – Power Supply**

Where power supply is available with TPTL for construction purpose, the same shall be provided at the job at one point of the distribution system as may be decided by site Engineer of TPTL. The charge for extension of service line and energy consumption charges shall be borne by the contractor. In case the contractor fails to pay the related charge of extension of service line and energy consumption within due date of the bill raised for the purpose, the amount will be deducted from the progressive bill of the contractor.

14.7 **Water**

Free supply of water shall be made available for the construction purpose whenever water is available and the same shall be given at an agreed single point at the Site. Any further distribution shall be the responsibility of the Contractor. Free drinking water if available shall

also be provided at one agreed point in the Site. Further distribution either to his labour colony or his work Site or to his office shall be the responsibility of the Contractor.

15.0 LINES AND GRADES

All the works shall be performed on the lines, grades and elevations indicated on the drawings. The Contractor shall be responsible to locate and lay-out the works. Basic horizontal and vertical control points shall be established and marked by the Engineer at Site at suitable points. These points shall be used as datum for the works under the Contract. The Contractor shall inform the site Engineer of TPTL well in advance of the times and places at which he wishes to do work in the area allotted to him so that suitable datum points may be established and checked by the site Engineer to enable the Contractor to proceed with his works. Any work done without being properly located may be removed and / or dismantled at contractor expense.

16.0 FIRE PROTECTION

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

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

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

16.4 The Contractor shall provide enough fire protection equipment of the types and number for the ware-houses, office, temporary structures, labour colony area etc. Access to such fire protection equipment shall be easy and kept open at all time.

17.0 SECURITY

The Contractor shall have total responsibility for all equipment and materials in his custody / stores, loose, semi-assembled and / or erected by him at Site. The contractor shall make suitable security arrangements including employment of security personnel to ensure the protection of all materials, equipment and works from theft, fire, pilferage and any other damages and loss. All materials of the Contractor shall enter and leave the project Site only with the written permission of site Engineer of TPTL in the prescribed manner.

18.0 CONTRACTOR'S AREA LIMITS

The site Engineer of TPTL shall mark-out the boundary limits of access roads, parking spaces, storage and construction areas for the Contractor and the Contractor shall not trespass the areas not so marked out for him. The Contractor shall be responsible to ensure that none of his personnel move out of the areas marked out for his operations. In case of such a need for the Contractor's personnel to work out of the areas marked out for him, the same shall be done only with the written permission of the site Engineer of TPTL.

19.0 CONTRACTOR'S CO-OPERATION

In case where the performance of the erection work by the Contractor affects the operation of the system facilities of TPTL, such erection work of the Contractor shall be scheduled to be performed only in the manner stipulated by the site Engineer and the same shall be acceptable at all times to the Contractor. The site Engineer may impose such restrictions on the facilities provided to the Contractor such as electricity, water etc. as he may think fit in the interest of TPTL and the Contractor shall strictly adhere to such restrictions and co-operate with the site Engineer of TPTL. It will be the responsibility of the Contractor to provide all necessary temporary instrumentation and other measuring devices required during start-up and operation of the equipment systems which are erected by him. The Contractor shall also be responsible for flushing and initial filling of all the oil and lubricants required for the equipment furnished and erected by him, so as to make such equipment ready for operation. The Contractor shall be responsible for supplying such flushing oil and other lubricants unless otherwise specified elsewhere in the document and specification.

20.0 MATERIALS HANDLING AND STORAGE

20.1 All the equipment furnished under the Contract and arriving at Site shall be promptly received, unloaded, transported and stored in the storage arrange by the contractor at his risk and cost.

20.2 The Contractor shall be responsible for examining all the shipment and notify the site Engineer of TPTL immediately of any damage, shortage, discrepancy etc. for the purpose of information only. The Contractor shall submit to the site Engineer of TPTL every week a report detailing all the receipts during the week. However, the Contractor shall be solely responsible for any shortages or damage in transit, handling and/or in storage and erection of the equipment at Site. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor.

20.3 The Contractor shall maintain an accurate and exhaustive record detailing out the list of all equipment received by him for the purpose of erection and keep such record open for the inspection by the site Engineers / higher officials of TPTL.

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

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

20.6 All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in a month from the date of receipt till the date of commissioning and a record of such measured insulation values maintained by the Contractor. Such records shall be made available for inspection by the site Engineers / higher officials of TPTL.

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

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

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

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

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

21.0 CONSTRUCTION MANAGEMENT

21.1 The field activities of the Contractors working at Site shall be coordinated by the site Engineer of TPTL and his decision shall be final in resolving any disputes or conflicts between the Contractor and other Contractors and tradesmen regarding scheduling and co-ordination of work. Such decision by site Engineer of TPTL shall not be a cause for extra compensation or extension of time for the Contractor.

21.2 The site Engineer of TPTL shall hold weekly meeting with the site Engineer / supervisor of the contractor. The site Engineer / supervisor of the contractor shall attend such meetings and take notes of the discussions during the meeting and the decision of the site Engineer of TPTL and shall strictly adhere to those decisions in performing his works. In addition to the above weekly meeting, the site Engineer / higher officials of TPTL may call for other meeting with the site Engineer / supervisor / any other authorized representative of the contractor and in such a case the personnel of the contractor shall attend such meetings.

21.3 Time is the essence of the Contract and the Contractor shall be responsible for performance of his works in accordance with the specified construction schedule. If at any time, the

Contractor is falling behind the schedule, he shall take necessary action to make good for such delays by increasing his work force or by working overtime or otherwise accelerate the progress of the work to comply with the schedule and shall communicate such actions in writing to the site Engineer of TPTL, satisfying that his action shall compensate for the delay. The Contractor shall not be allowed any extra compensation for such action.

21.4 TPTL shall, however, not be responsible for provision of additional labour and / or materials or supply or any other services to the Contractor.

22.0 FIELD OFFICE RECORDS

The Contractor shall maintain at his Site office up-to-date copies of all drawings, specifications and other Contract Documents and any other supplementary data complete with all the latest revisions thereto. The Contractor shall also maintain in addition the continuous record of all changes to the above Contract Documents, drawings, specifications, supplementary data, etc. effected at the field and on completion of his total assignment under the Contract, shall incorporate all such changes on the drawings and other engineering data to indicate as installed conditions of the equipment furnished and erected under the Contract. Such drawings and engineering data shall be submitted to the Dy. General Manager in charge of the work in required number of copies.

23.0 CONTRACTOR'S MATERIALS BROUGHT ON TO SITE

23.1 The Contractor shall bring to Site all equipment, components, parts, materials, including construction equipment, tools and tackles for the purpose of the works under intimation to the site Engineer. All such goods shall, from the time of their being brought vest in TPTL, but may be used for the purpose of the Works only and shall not on any account be removed or taken away by the Contractor without the written permission of the site Engineer of TPTL. The Contractor shall nevertheless be solely liable and responsible for any loss or destruction thereof and damage thereto.

23.2 After the completion of the Works, the Contractor shall remove from the Site under the direction of the site Engineer of TPTL the materials such as construction equipment, erection tools and tackles, scaffolding etc. with the written permission from him.

24.0 PROTECTION OF PROPERTY AND CONTRACTOR'S LIABILITY

24.1 The Contractor shall be responsible for any damage resulting from his operations. He shall also be responsible for protection of all persons including members of public and employees of TPTL and the employees of other contractors and Sub-contractors and all public and private property including structures, building, other plants and equipment and utilities either above or below the ground.

24.2 The Contractor shall ensure provision of necessary safety equipment such as barriers, signboards, warning lights and alarms, etc. to provide adequate protection and safety to persons and property.

25.0 INSURANCE

25.1 In addition to the conditions covered under the Clause entitled "Insurance" in General Terms and conditions of Contract, the following provisions shall also apply to the portion of works to be done beyond the Contractor's own or his Sub-contractor's manufacturing Works.

25.2 **Workmen's Compensation Insurance**

This insurance shall protect the Contractor against all claims applicable under the Workmen's Compensation Act, 1948. This policy shall also cover the Contractor against claims for injury, disability, disease or death of his or his Sub-Contractor's employee, which for any reason are not covered under the Workmen's Compensation Act, 1948. The liabilities shall not be less than:

Workmen's Compensation: As per statutory Provisions

Employee's liability: As per statutory Provisions

25.3 **Comprehensive Automobile Insurance**

This insurance shall be in such a form to protect the Contractor against all claims for injuries, disability, disease and death to members of public including the employees of TPTL and damage to the property of other arising from the use of motor vehicles during on or off the Site operations, irrespective of the ownership of such vehicles.

25.4 **Comprehensive General Liability Insurance**

25.4.1 This insurance shall protect the Contractor against all claims arising from injuries, disabilities, disease or death of members of public or damage to property of others, due to any act or omission on the part of the Contractor, his agents his employees, his representatives and Sub-contractors or from riots, strikes and civil commotion. This insurance shall also cover all the liabilities of the Contractor arising out of the Clause stipulated in the General Terms and Conditions of Contract.

25.4.2 The hazards to be covered will pertain to all the works and areas where the Contractor, his Sub-contractors, his agents and his employees have to perform work pursuant to the Contract.

25.5 The above are only illustrative list of insurance covers normally required and it shall be the responsibility of the Contractors to maintain all necessary insurance coverage to the extent both in time and amount to take care of all his liabilities either direct or indirect, in pursuance of the Contract.

26.0 UNFAVOURABLE WORKING CONDITIONS

The Contractor shall confine all his field operations to those works which can be performed without subjecting the equipment and materials to adverse effects during inclement weather conditions, like monsoon, storms, etc. and during other unfavorable construction conditions. No field activities shall be performed by the Contractor under conditions which might adversely affect the quality and efficiency thereof, unless special precautions or measures are taken by the Contractor in a proper and satisfactory manner in the performance of such Works and with the concurrence of the site Engineer of TPTL. Such unfavorable construction

conditions shall in no way relieve the Contractor of his responsibility to perform the Works as per the Schedule.

27.0 WORK & SAFETY REGULATIONS

27.1 The Contractor shall ensure proper safety of all the workmen, materials plant and equipment belonging to him or to owner or to others, working at the Site as per CEA (Measures relating to Safety and Electric Supply) Regulation, 2010. The Contractor shall also be responsible for provision of all safety notices and safety equipment required both by the relevant legislations and also by the site Engineer as he may deem necessary.

27.2 The Contractor shall notify well in advance to the site Engineer of his intention to bring to the Site any container filled with liquid or gaseous fuel or explosive or petroleum substance or such chemicals, which may involve hazards. The site Engineer shall have the right to prescribe the conditions, under which such container is to be stored, handled and used during the performance of the works and the Contractor shall strictly adhere to and comply with such instructions. The site Engineer shall have the right at his sole discretion to inspect any such container or such construction plant/equipment for which material in the container is required to be used and if in his opinion, its use is not safe, he may forbid its use. No claim due to such prohibition shall be entertained by TPTL.

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

27.3 Where it is necessary to provide and / or store petroleum products or petroleum mixtures and explosives, the Contractor shall be responsible for carrying-out such provision and / or storage in accordance with the rules and regulations laid down in the Petroleum Act 1934, Explosives Act, 1948, and Petroleum and Carbide of Calcium Manual published by the Chief Inspector of Explosives of India. All such storage shall have prior approval of the site Engineer of TPTL. In case, any approvals are necessary from the Chief Inspector (Explosives) or any statutory authorities, the Contractor shall be responsible for obtaining the same.

27.4 All equipment used in construction and erection by Contractor shall meet Indian / International Standards and where such standards do not exist, the Contractor shall ensure these to be absolutely safe. All equipments shall be strictly operated and maintained by the Contractor in accordance with manufacturer's operation Manual and safety instructions and as per Guidelines / Rules of TPTL in this regard.

27.5 Periodical Examinations and all tests for all lifting / hoisting equipment & tackles shall be carried-out in accordance with the relevant provisions of Factories Act 1948, Indian Electricity Act 1910 and associated Laws / Rules in force from time to time. A register of such examinations and tests shall be properly maintained by the Contractor and shall be promptly produced as and when desired by the site Engineer of TPTL or by the person authorized by TPTL.

27.6 The Contractor shall be fully responsible for the safe storage of his and his sub-contractor's radio-active sources in accordance with BARC / DAE Rules and other applicable provisions. All precautionary measures stipulated by BARC / DAE in connection with use, storage and handling of such material shall be taken by Contractor.

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

27.8 Where explosives are to be used, the same shall be used under the direct control and supervision of an expert, experienced, qualified and competent person strictly in accordance with the Code of Practices / Rules framed under the Indian Explosives Act pertaining to handling, storage and use of explosives.

27.9 The Contractor shall provide safe working conditions to all workmen and employees at the Site including safe means of access, railings, stairs, ladders, scaffoldings, etc. The scaffoldings shall be erected under the control and supervision of an experienced and competent person. For erection, good and standard quality material only shall be used by the Contractor.

27.10 The Contractor shall not interfere or disturb electric fuses, wiring and other electrical equipment belonging to TPTL or other contractors under any circumstances, whatsoever, unless expressly permitted in writing by site Engineer of TPTL to handle such fuses, wiring or electrical equipment.

27.11 Before the Contractor connects any electrical appliances to any plug or socket belonging to TPTL, he shall:

a) Satisfy the Site Engineer of TPTL that the appliance is in good working condition :

b) Inform the site Engineer of the maximum current rating, voltage and phases of the appliances;

c) Obtain permission of the site Engineer detailing the sockets to which the appliances may be connected.

27.12 The site Engineer shall not grant permission to connect until he is satisfied that;

a) The appliance is in good condition and is fitted with suitable plug;

b) The appliance is fitted with a suitable cable having two earth conductors, one of which shall be an earthed metal sheath surrounding the cores.

27.13 No electric cable in use by the Contractor / TPTL shall be disturbed without prior permission. No weight of any description shall be imposed on any cable and no ladder or similar equipment shall rest against or attached to it.

27.14 No repair work shall be carried out on any live equipment. The equipment must be declared safe by the site Engineer before any repair work is carried out by the Contractor. While working on electric lines / equipment whether live or dead, suitable type and sufficient quantity of tools shall have to be provided by Contractor to electricians / workmen / officers.

27.15 The Contractors shall employ necessary number of qualified, full time electricians / Electrical Supervisors to maintain his temporary electrical installations.

27.16 In case any accident occurs during the construction/erection or other associated activities undertaken by the Contractor thereby causing any minor or major or fatal injury to his employees due to any reason, whatsoever, it shall be the responsibility of the Contractor to promptly inform the same to the site Engineer of TPTL and also to all the authorities envisaged under the applicable laws.

27.17 The site Engineer of TPTL shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and / or property, and / or equipment. In such cases, the Contractor shall be informed in writing about the nature of hazards and possible injury / accident and he shall comply to remove short-comings promptly. The Contractor after stopping the specific work can, if felt necessary, appeal against the order of stoppage of work to the Executive Engineer in charge of the work within 3 days of such stoppage of work and the decision of the Dy. General Manager in charge of the work in this respect shall be conclusive and binding on the Contractor.

27.18 The Contractor shall not be entitled for any damages / compensation for stoppage of work due to safety reasons as provided in **para 27.18 above** and the period of such stoppage of work shall not be taken as an extension of time for completion of work and shall not be the ground for waiver of levy of liquidated damages.

27.19 It is mandatory for the Contractor to observe during the execution of the works, the requirements of safety rules which would generally include but not limited to the following:

Safety Rules:

a) Each employee shall be provided with initial indoctrination regarding safety by the Contractor, so as to enable him to conduct his work in a safe manner.

b) No employee shall be given a new assignment of work unfamiliar to him without proper introduction as to the hazards incident thereto, both to himself and his fellow employees.

c) Under no circumstances shall an employee hurry or take unnecessary chance when working under hazardous conditions.

d) Employees must not leave naked fires unattended. Smoking shall not be permitted around fire prone areas and adequate fire fighting equipment shall be provided at crucial locations.

e) Employees under the influence of any intoxicating beverage, even to the slightest degree shall not be permitted to remain at work.

f) There shall be a suitable arrangement at every work site for rendering prompt and sufficient first aid to the injured.

g) The staircases and passageways shall be adequately lighted.

h) The employees when working around moving machinery must not be permitted to wear loose garments. Safety shoes are recommended when working in shops or places where materials or tools are likely to fall. Only experienced workers shall be permitted to go behind guard rails or to clean around energized or moving equipment.

i) The employees must use the standard protection equipment intended for each job. Each piece of equipment shall be inspected before and after it is used.

j) Requirements of ventilation in underwater working to licensed and experienced divers, use of gum boots for working in slushy or in inundated conditions are essential requirements to be fulfilled.

k) In cases or rock excavation blasting shall invariably be done through licensed blasters and other precautions during blasting and storage / transport of charge material shall be observed strictly.

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

27.21 If the Contractor does not take all safety precautions and/or fails to comply with the Safety Rules as prescribed by Consortium or under the applicable law for the safety of the equipment and plant and for the safety of personnel and the Contractor does not prevent hazardous conditions which cause injury to his own employees or employees of other contractors, or Employees of TPTL or any other person who are at Site or adjacent thereto, the Contractors shall be responsible for payment of compensation to Consortium members as per the compensation order issued by the appropriate authority of Government of Tripura / verdict issued by court.

The compensation mentioned above shall be in addition to the compensation payable to the workmen / employees under the relevant provisions of the Workmen's Compensation Act and rules framed there under or any other applicable laws as applicable from time to time. In case TPTL is made to pay such compensation then the amount of such compensation shall be deducted from the progressive bills / contract performance guaranty of the contractor.

28.0 CODE REQUIREMENTS

The erection requirements and procedures to be followed during the installation of the equipment shall be in accordance with the relevant Codes and accepted good engineering practice, the Engineering Drawings and other applicable Indian recognized codes and laws and regulations of the Government of India.

29.0 FOUNDATION DRESSING & GROUTING

29.1 The surfaces of foundations shall be dressed to bring the top surface of the foundations to the required level, prior to placement of equipment / equipment bases on the foundations.

29.2 All structural steel base shall be grouted and finished as per these specifications unless otherwise recommended by the equipment manufacturer.

29.3 The concrete foundation surfaces shall be properly prepared by chipping, grinding as required to bring the type of such foundation to the required level, to provide the necessary roughness for bondage and to assure enough bearing strength. All laitance and surface film shall be removed and cleaned.

29.4 **Grouting Mix**

The Grouting mixture shall be composed of Portland cement, sand and water. The Portland cement to be used shall conform to ISI No. 269 or equivalent. Sand shall conform to ISI No. 383 / 2386 or equivalent. All grouts shall be thoroughly, mixed for not less than five minutes in an approved mechanical mixer and shall be used immediately after mixing.

29.5 **Placing of Grout**

29.5.1 After the base has been prepared, its alignment and level has been checked and approved and before actually placing the grout a low dam shall be set around the base at a distance that shall permit pouring and manipulation of the grout. The height of such dam shall be at least 25 mm above the bottom of the base. Suitable size and number of chains shall be introduced under the base before placing the grout, so that such chains can be moved back and forth to push the grout into every part of the space under the base.

29.5.2 The grout shall be poured either through grout holes provided or shall be poured at one side or at two adjacent sides giving it a pressure head to make the grout move in a solid mass under the base and out in the opposite side. Pouring shall be continued until the entire space below the base is thoroughly filled and the grout stands at least 25 mm higher all around than the bottom of the base. Enough care should be taken to avoid any air or water pockets beneath the bases. Vibrator shall be used to avoid any air or water pockets.

29.6 **Finishing of the Edges of the Grout**

The poured grout should be allowed to stand undisturbed until it is well set. Immediately thereafter, the dam shall be removed and grout which extends beyond the edges of the structural or equipment base plates shall be cut off, flushed and removed. The edges of the grout shall then be pointed and finished with 1:6 cement mortar pressed firmly to bond with the body of the grout and smoothened with a tool to present a smooth vertical surface. The work shall be done in a clean and scientific manner and the adjacent floor spaces, exposed edges of the foundations, and structural steel and equipment base plates shall be thoroughly cleaned of any spillage of the grout.

All civil materials required such as cement, steel, sand, stone, binding wires, embedded pipe, conduct, shoring and shuttering, nail, water will be supplied by the contractor of his own whatsoever irrespective of mentioning by TPTL which are required to complete the works to the full satisfaction of TPTL.

SECTION- V

SCOPE & TECHNICAL SPECIFICATION

1.0 GENERAL

This Sections deals with the information & criteria for design, manufacture, supply, erection, testing and commissioning and setting to work for 132 KV Transmission lines, tower super structures, conductor, insulators, ground wire and accessories and erection of 132 KV Transmission lines. The Carbon Fiber Composite Core (CFC) type HTLS conductor will be required to be used as substitute for existing ACSR Panther conductor and shall meet technical parameters / requirements as indicated in this section. The offered HTLS Conductor shall be capable of providing the maximum ampacity of 800 A at a continuous operating conductor temperature not exceeding the maximum permissible operating temperature for continuous operation of the offered HTLS Conductor and without exceeding the level of maximum permissible sag.

2.0 SCOPE

2.1.1 The brief description of scope of work covered under this Bidding Document is furnished below:

i) Design, manufacture, testing at manufacturer's works, supply and erection of HTLS (CFC equivalent to ACSR panther) Conductor. The central carbon fiber core is surrounded by high-grade boron-free glass fibers to improve flexibility and toughness while preventing galvanic corrosion between the carbon fibers and the aluminum strands.

ii) Site Inspection; Survey & profiling of existing line route using Total stations, verification of availability of statutory electrical clearances using PLS-CADD software; De-stringing of existing Conductor including dismantling of associated insulators and hardware fittings & accessories from the 132 kV D/C line.

iii) Design, manufacture, testing at manufacture's works, supply and erection of CFCHTLS hybrid carbon and glass fiber composite core.

iv) Design, Manufacture, testing at manufacturer's works, supply and erection of Insulators, Hardware Fittings and other line accessories suitable for CFCHTLS conductor.

v) Installation of necessary hardware, hoisting of insulator strings and stringing of each circuit with HTLS conductor along with all necessary line accessories with the other circuit under live condition including testing & commissioning

vi) The installation & stringing of the offered HTLS conductor for the above transmission line shall be carried out by the transmission line contractor under supervision of the HTLS conductor supplier.

vi) The standard type disc insulators along with hardware fittings and ACSR conductor of

the existing line shall be dismantled and new HTLS conductor, hardware fittings and insulators shall be used for stringing. Accordingly, provision of new HTLS conductor, hardware fittings and insulators has been kept in the scope of the package.

viii) The entire quantity of dismantled ACSR PANTHER conductor, hardware fittings, insulators & conductor accessories removed from the existing line is envisaged to be given to the contractor by the employer on buy back policy.

ix) TPTL shall arrange shut down of one circuit at a time and the other circuit shall be kept under charged condition. The contractor shall destring the existing conductor and restring the circuit with the HTLS conductor section by section and restore the line in original conditions as per program finalized in co-ordination with Engineer –in-charge. Appropriate safety measures along with necessary safety tools and equipments to carry out destringing and stringing operations under the above conditions including mechanical/ structural safety of the towers, shall be the responsibility of the contractor. Necessary calculations shall be carried out by the contractor to ensure that by replacing the existing ACSR PANTHER conductor with HTLS conductor offered, the loadings on the towers due to conductor tensions as well as loads on account of the reconductoring activities shall be within specified limits. These calculations shall be submitted by the contractor during detailed engineering.

x) In case of any damage of existing tower structure or other properties during execution of the work, restoration / rectification of the property will be sole responsibility of the contractor, TPTL will bear no cost or any responsibility in such case.

xi) In case of railway crossings, shutdown might not be available and therefore, contractor shall be required to carry out reconductoring under such condition i.e. without any shutdown of railways. In case of HT, LT line crossing necessary shutdown will be arranged by Owner. Dismantling of HT, LT lines will be in scope of bidder if required during execution of work.

xii) The materials covered in this package shall be supplied complete in all respects, including all components, fittings and accessories which are necessary or are usual for their efficient performance and satisfactory maintenance under the various operating and atmospheric conditions. The supplier shall be responsible for ensuring compatibility with associated fittings and accessories and satisfactory performance of complete conductor system (alongwith associated fittings and accessories) for continuous operation at the designed continuous operating temperature of the offered HTLS conductor. Such parts shall be deemed to be within the scope of the Contract, whether specifically included or not in the Specification or in the Contract Schedules. The Supplier shall not be eligible for any extra charges for such fittings, etc.

xiii) The contractor shall inspect the entire stretch of transmission line and shall accordingly devise appropriate methodology/procedure of carrying out the reconductoring works during detailed engineering.

The contractor shall deploy appropriate tools / equipments / machinery to ensure that the stringing operation is carried out without causing damage to conductor and conductor is installed at the prescribed sag-tension as per the approved stringing charts.

Further, the contractor having requisite experience has freedom to use helicopter for stringing/ destringing. The contractor intending to use helicopter shall furnish detailed description of the procedure, type & number of helicopter & accessories etc., to be deployed for stringing operation.

2.1.2 It is also responsibility of the Contractor to obtain any road permits and any other permits or licenses to execute the works.

3.0 BASIC TECHNICAL DATA

3.1 Service Conditions:

The lines covered under this contract are to run entirely in the State of Tripura, India and shall be suitable for the tropical climatic conditions prevailing in the area as listed below.

a	Peak ambient day temperature in still			-	45°C
b	Minimum night temperatures			-	0°C
c)	Reference ambient day temperature			-	45°C
d)	Relative Humidity	a	Maximum	-	100%
		b	Minimum	-	10%
e	Altitude:	Below 1000 M above MSL			
f)	Maximum wind pressure:	As per IS: 802 latest code (Zone-5)			
g	Other Data:	Refer Meteorological data pertaining to the			

4.0 DRAWINGS AND DOCUMENTS

4.1 The following also shall apply in respect of Contractor Drawings.

4.2 Each drawing should be submitted by the Contractor for approval of the Employer and 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.

4.3 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.

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.

4.4 All drawings shall be prepared using AutoCAD software version 2000 or later only. Drawings which are not compatible to AutoCAD software version 2000 shall not be acceptable. After final approval all the drawings shall be submitted to the Employer in readable CD's.

4.5 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.

SUB-SECTION I

1.0 Technical Specifications on HTLS Conductor (CFC equivalent to ACSR Panther)

1.1 SCOPE

1.1.1 The brief description of scope of work covered under this Bidding Document is furnished below:

Design, manufacture, testing at manufacturer's works, supply and erection of HTLS (CFC equivalent to ACSR panther) Conductor. The central carbon fiber core is surrounded by high- grade boron-free glass fibers to improve flexibility and toughness while preventing galvanic corrosion between the carbon fibers and the aluminum strands.

a) Design, manufacture, testing at manufacture's works, supply and erection of CFC HTLS hybrid carbon and glass fiber composite core.

b) Design, Manufacture, testing at manufacturer's works, supply and erection of Insulators, Hardware Fittings and other line accessories suitable for CFC HTLS conductor.

c) The installation & stringing of the offered HTLS conductor for the above transmission line shall be carried out by the transmission line contractor under supervision of the HTLS conductor supplier.

1.1.2 It is also responsibility of the Contractor to obtain any road permits and any other permits or licenses to execute the works.

1.2.0 SERVICE CONDITIONS

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

a. Peak ambient day temperature in still air : 45°C

b.	Minimum night temperatures	: 0°C
c.	Reference ambient day temperature	: 45°C
d.	Relative Humidity	
	a) Maximum	: 100 %
	b) Minimum	: 10%
e.	Altitude	: 1000 m above MSL
f.	Isokeraunic level	: 100/Year
g.	Full wind pressure	: 52 kg/m2.
h.	Seismic Intensity	: ZONE-V as per IS 1893.
i.	Wind Velocity	: 0.56 m/sec
j.	Solar Absorption coefficient	:0.8
k.	Solar Radiation	: 1045 watt/sq.m
l.	Emisitivity Constant	: 0.45
m.	Effective angle of incidence of sun's rays	: 90 deg

1.3.0 TYPE TEST REPORTS

1.3.1 CFC HTLS conductors with hybrid carbon and glass fiber composite core and related Hardware fittings 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.

1.3.2 All Bids must be accompanied by the full Type Test Certificates of equipment offered. Such type test certificates shall be acceptable only if:-

(a) Tests are conducted in an independent and well known testing laboratory, or

(b) Tests are conducted in manufacturer's own laboratory. In this case the laboratory must have ISO 9000 (or its equivalent) series certification

1.3.3 Test reports to be acceptable must be related directly to the materials offered.

1.3.4 Type Test Reports older than seven (7) years on the date of Technical bid opening shall not be accepted.

1.4 GUARANTEED TECHNICAL PARTICULARS

1.4.2 The Guaranteed Technical Particulars of the various items shall be furnished by the Bidders in the prescribed Schedules of the Section-5 with the Technical Bid. 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.

1.4.3 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.

1.5 TECHNICAL SPECIFICATION OF CFC HTLS CONDUCTOR (Equivalent to ACSR Panther)

1.5.1 GENERAL REQUIREMENTS

The offered CFC HTLS Conductor with hybrid carbon and glass fiber composite core shall be capable of providing the specified maximum ampacity of 800 A at a continuous operating conductor temperature higher than that of not exceeding the maximum permissible operating temperature for continuous operation of the offered HTLS Conductor and without exceeding the level of maximum permissible sag as prescribe in clause no 1.5.5.

The physical and operating performance requirements of the transmission line with type HTLS conductor are mentioned below. The bidder shall offer HTLS conductor complying with the specified requirements. The Bidder shall indicate particulars of the proposed conductor in the relevant GTP schedule of BPS along with calculations to establish compliance with the specified requirements.

1.5.2 Maximum Conductor sag for 320m span at steady state conductor temperature and no wind corresponding to 50 Hz alternating current of 800 Amperes per conductor under ambient conditions specified at clause no. 1.2.1 will be such that the statutory ground clearance will be maintained throughout the route keeping (erection) tension at 25% of UTS of conductor.

The calculations for Ampacity shall be based on IEEE Standard 738. The bidder in his bid shall furnish calculations for the ampacity based on the above Standard for the proposed CFC HTLS conductor.

The design of conductor shall be suitable for operation at a steady state conductor temperature experienced for AC current flow of 800 Amperes under the above ambient conditions based on ampacity calculations mentioned above. The bidder shall also indicate the maximum permissible conductor temperature for continuous operation without any deterioration of its electrical, mechanical & metallurgical properties. The bidder shall also furnish the maximum permissible conductor temperature for short-term operations including permissible duration of such short-term operation.

1.5.3 Each conductor / sub conductor in the bundle of HTLS conductor shall be suitable to carry minimum specified 50 Hz alternating current 800 Amperes of 50 Hz alternating current under the ambient conditions & maximum conductor sag specified below while satisfying other specified technical requirements/ parameters as mentioned in the Service condition above.

Maximum permissible conductor sag for 320 m span at steady state conductor temperature and nil wind corresponding to 50 Hz alternating current of 437 A per conductor under ambient conditions specified above = 7.0 m. In case of HTLS conductor, the maximum permissible conductor temperature for continuous operation shall not be considered more than 180 Deg.

C. The bidder shall also furnish the maximum permissible conductor temperature for short term operations including permissible duration of such short term operation.

1.5.4 Technical Particulars of HTLS Conductor

The HTLS conductor shall meet the following minimum requirements:

Overall diameter of complete conductor	Not exceeding 22.05 mm
Approx. mass of complete conductor (kg/km)	Less than or equal to 970 kg/km
Direction of lay of outer layer	Right Hand

Parameters Required for HTLS Conductors

	ACSR (Panther) Equivalent	**ACSR (Zebra) Equivalent**	**ACSR (Moose) Equivalent**
Cross section in sq. mm	≥ 261.5	≥ 484.5	≥ 597
Conductor diameter in mm	21 ± 5%	28.62 ± 5%	31.77 ± 5%
Weight in kg/km	≤ 974	≤ 1621	≤ 1998
Core Diameter in mm	Should not exceed diameter of HTGS core of existing conductor		
	due for replacement with offered HTLS		
Ultimate Tensile strength in KN	≥ 89.67	≥ 130.3	≥ 159.6
DC Resistance in ohm /km at 20 degree Celsius	≤ 0.139	≤ 0.06869	≤ 0.0559
Current carrying capacity at Max. Temp. (in Amp)	**800**	**1566**	**1778**
Sag in Meters at Max. Temp.	≤ 7.06	≤ 9.24	≤ 10.7
Span in meters	320	350	380

The bidder shall indicate the technical particulars and details of the construction of the conductor in the relevant schedule of GTP. The bidder shall also guarantee the DC resistance of conductor at 20 deg C and AC resistance at the calculated temperature corresponding to

50Hz alternating current flow of 800 amperes at specified ambient conditions (maximum continuous operating temperature).

The bidder shall submit the supporting calculations for the AC resistance at 800 Amperes and at 437 Amperes indicating details & justifications of values of temperature coefficient of resistance & DC to AC resistance conversion factor(s) with due reference to construction / geometry of the conductor.

1.5.5 **Sag-Tension Requirements**

The HTLS conductor shall meet the following sag tension requirements for ruling span of 320 meters

Particulars	Limiting value
Tension at every day condition (32°C, no wind)	≤ 2280 kg & not exceeding 25% of UTS of proposed conductor
Sag at maximum continuous operating temp (corresponding to 800 amperes and ambient conditions specified above)	≤ 7.00 meters
Tension at following wind pressure:-	
i) Tension at 32 deg C, full wind (52 kg/m2)	≤ 2900 kg & not exceeding 50% of proposed conductor
ii) Tension at 5 deg C, 2/3 wind pressure (34.7 kg/m2)	≤ 3080 kg & not exceeding 50% of UTS of proposed conductor

Survey & profiling of existing line route using Total stations, verification of availability of statutory electrical clearances using PLS-CADD software. Sag-Tension calculations at various conditions mentioned above using parabolic equations shall be submitted along with the bid. These calculations shall also include calculations for determination of transition / knee point temperature. The bidders must use PLS-CADD software for Sag-Tension calculations.

The bidder shall also furnish sag & tensions under no wind for various temperatures starting from 0 deg C to maximum continuous operating temperature in steps of 5 deg C.

After award of the contract, the Supplier shall submit Sag-Tension calculations corresponding to various conditions given above for all the existing spans and spans ranging from 50 m to 350 m in intervals of 50 m.

Besides above, the Supplier shall also furnish details of creep characteristics in respect of HTLS conductor based on laboratory investigations/ experimentation (creep test as per IEE1138) conducted on similar type of conductor and shall indicate creep strain values corresponding to 1 month, 6 month, 1 year & 10 year creep at everyday tension & at maximum continuous operating temperature.

1.5.6 Ohmic Loss and Liquidated damage for excessive losses:-

Average ohmic losses= Loss load factor (0.53) X Conductor length (216.033) X (Desirable operating current i.e. 800A) ² X AC resistance corresponding to 800 A. (Considering loss load

factor=0.53) Where Rac is the AC resistance per KM guaranteed by the bidder at temperature corresponding to the continuous operating current of 800 A under normal condition.

Where, Rac is the AC resistance per km of HTLS conductor eq. to ACSR Panther guaranteed by the bidder at temperature corresponding to the continuous operating current of 800 A under normal condition.

Differential price evaluation for the conductors offered by the bidders shall be carried out considering the average ohmic losses calculated as above and considering Rs. 3,30,220/- per kW.

The best parameter of loss (lowest ohmic loss for conductor) corresponding to lowest AC resistance quoted among bidders by any technically responsive and qualified bidder shall be taken as basis and that quoted by the particular bidder shall be used to arrive at differential price to be applied for each bid.

1.5.7 **Workmanship:**

All the conductor strands shall be smooth, uniform and free from all imperfections, such as spills and splits, cracks, die marks, scratches, abrasions, rust etc.

The finished conductor shall be smooth, compact, uniform and free from all imperfections including kinks (protrusion of wires), wire cross over, over riding, looseness (wire being dislocated by finger/hand pressure and/or unusual bangle noise on tapping), material inclusions, white rust, powder formation or black spot (on account of reaction with trapped rain water etc.), dirt, grit etc.

1.5.8 **Joints in Wires**

1.5.8.1 Aluminum OR Aluminum Alloy Wires

During stranding no Aluminum/ aluminum Alloy welds shall be made for the purpose of achieving the required conductor length.

1.5.8.2 Hybrid carbon and glass fiber composite core

There shall be no joint of any kind in the finished core entering into the manufacture of the strand. There shall also be no joints or splices in any length of the completed core. However, during the production run, splicing of the galvanic protection barrier is allowed, provided diameter specifications are maintained.

1.5.9 **Materials**

The materials used for construction of the conductor shall be such that the conductor meets the specified technical and performance requirements.

In case of composite core confirming to ASTM B987, the tolerances shall be ±0.05mm as per ASTM B987.

1.5.10 **Outer layer**

The material of outer layer HTLS conductor shall be of fully annealed aluminium (0 tempered) having purity not less than 99.5% and a copper content not exceeding 0.04%.The strands shall be manufactured through appropriate manufacturing process to ensure consistent electrical, mechanical and metallurgical properties under continuous high temperature operation. Bidder shall guarantee the chemical composition in the schedule GTP of BPS and also furnish description of the manufacturing process in the Bid.

In case of fully annealed type (0 tempered) aluminium strands trapezoidal/Z-shaped wire shall only be accepted.

1.5.11 **Non-Metallic Solid Core**

Hybrid carbon and glass fiber composite core which utilizes a high- temperature epoxy resin matrix to bind hundreds of thousands of individual fibers into a unified load-bearing tensile member will be acceptable. The central carbon fiber core shall be surrounded by high-grade boron- free glass fibers to improve flexibility and toughness while preventing galvanic corrosion between the carbon fibers and the aluminum strands.

Bidder shall furnish properties and composition of the core in the GTP schedule. The composite material for core shall be of such proven quality that its properties are not deteriorated by the normal operating conditions of 132KV transmission line in tropical environment conditions as experienced by the existing lines. The Bidder shall provide adequate details including specifications, Design Validation test reports as per ASTM B987 and performance certificates etc. in support of the suitability of the offered materials. Care to be taken for internal friction due to different material having different thermal coefficient of expansion.

The composite material core shall be in strict compliance with ASTM B987(Latest amendment). Design and material of offered core shall be confirming to internationally accepted standard to any National standard only. Bidders have to submit such support standard (with latest amendment) at the time of bid submission.

Further, the bidder is required to offer a system to confirm the integrity of Composite core at the time of conductor stringing. The contractor must submit reports from past field measurement or a third-party report providing that integrity confirmation does work through proposed system. Further evidence of necessary documentation, training material and manuals to support this system must be submitted within 30 days from date of LOA.

1.6 Supervision in Stringing

1.6.1 The installation & stringing of the offered HTLS conductor for the above transmission line shall be carried out by the transmission line contractor under supervision of the HTLS conductor supplier or Qualified Bidder itself. Bidder's responsibility is to provide Sag-Tension chart based on existing site conditions. It may be noted that TPTL will not consider any modifications (tower extensions etc) on existing tower/span.

1.6.2 The circuit on which the existing ACSR Panther is strung shall be kept under charged condition during the execution. The installation & stringing of the offered HTLS conductor for the above transmission line shall be carried out by the transmission line contractor under supervision of the HTLS conductor supplier or Qualified Bidder is self shall string the circuit with the HTLS conductor section by section and restore the line in original conditions as per program finalized in co-ordination with site. The bidder's engineers are to supervise whether appropriate safety measures along with necessary safety tools and equipment's to carry out stringing operations under the above conditions including mechanical/ structural safety of the towers, are maintained or not.

1.6.3 Necessary calculations shall be carried out by the bidder to ensure that by replacing the existing ACSR PANTHER conductor with the HTLS conductor, the loadings on the towers due to conductor tensions as well as loads on account of the re-conductoring activities shall be within specified limits. These calculations shall be submitted by the bidder along with bid.

1.6.4 The Contractor should deploy stringing/ installation experts during erection of the offered HTLS conductor.

1.7. Tests and Standards

1.7.1 Type Tests

Type Tests on Stranded Conductor/ Stranded wire

The following tests shall be conducted once on sample/samples of conductor from each manufacturing facility:

(i)	On complete Conductor	
a)	DC resistance test on stranded conductor	: As per Annexure-A
b)	UTS test on stranded conductor	: As per Annexure-A
c)	Stress- Strain test on stranded conductor and core at room temperature	: As per Annexure-A
d)	Stress-strain test on stranded conductor and core at elevated temperature	: As per Annexure-A
e)	High temperature endurance & creep test on stranded conductor	: As per Annexure-A :IEC 1089
f)	Sheaves Test	:As per Annexure-A
g)	Axial Impact Test	: As per Annexure-A
h)	Radial Crush Test	: As per Annexure-A
i)	Torsional Ductility Test	: As per Annexure-A
j)	Aeolian Vibration Test`	: As per Annexure-A

k)	Temperature Cycle Test	: As per Annexure-A
(ii)	On Conductor Strand/core	
a)	Heat resistance test on Aluminium Alloy strands	: As per Annexure-A
b)	Bending test on aluminium clad core (if applicable)	As per Annexure-A
c)	Compression test on aluminium clad core (if applicable)	: As per Annexure-A
d)	Coefficient of linear expansion on core wire	: As per Annexure-A
e)	Strand Brittle fracture test (for polymer composite core only)	: As per Annexure-A
f)	Bending test on polymer composite core	: As per Annexure-A

Type tests specified under clause no. 1.7.1 shall not be required to be carried out if a valid test certificate is available for the offered design, i.e., tests conducted earlier (not more than 7 years old at the time of bid opening) should have been conducted in accredited laboratory (accredited based on ISO/IEC guide 25/17025 or EN 45001 by the National Accreditation body of the country where laboratory is located) or witnessed by the representative (s) of CTU or State Transmission Utility.

In the event of any discrepancy in the test report (i.e., any test report not applicable due to any design/ material/manufacturing process change including substitution of components or due to non- compliance with the requirement stipulated in the Technical Specification) the tests shall be conducted by the Contractor at no extra cost to the Employer/ Employer/ Employer.

1.7.2 Acceptance Tests (Whichever applicable to Annealed Al. CFC HTLS Conductor)

a)	Visual and dimensional check on drum	: As per Annexure-A
b)	Visual check for joints scratches etc. and length measurement of conductor by	: As per Annexure-A
c)	Dimensional check on core strands and Aluminium or Aluminium Alloy strands	: As per Annexure-A
d)	Check for lay-ratios of various layers	: As per Annexure-A
e)	Thickness of aluminum on aluminium clad wires	: As per Annexure-A
f)	Torsion and Elongation tests on core strands	: As per Annexure-A
g)	Breaking load test on core strands and Aluminium/Aluminium Alloy strands	: As per Annexure-A
h)	Wrap test on core strands and Aluminium Alloy strands	: As per IEC:888 &

i)	Minimum conductivity test on Aluminium/ thermal resistant Aluminium Alloy strands	: As per IEC : 889
j)	Procedure qualification test on welded joint of Aluminium/Aluminium Alloy strands	: As per Annexure-A
k)	Heat resistance test on Aluminium Alloy strands	: As per Annexure-A
l)	Ageing test on filler (if applicable)	: As per Annexure-A
m)	Minimum conductivity test on aluminium clad core wires (if applicable)	: As per Annexure-A
n)	Glass transition temperature test (For Polymer Composites only)	: As per Annexure-A
o)	Flexural Strength test (For Polymer Composites only)	: As per Annexure-A
p)	Galvanic Protection Barrier Layer Thickness test (For Polymer Composites only)	: As per ASTM B987
Note:	All the above tests except (k) shall be carried out on Aluminium / Aluminium Alloy and core strands after stranding only. In the case of composite core the applicable tests specified above shall be carried out before stranding on as manufactured sample.	

1.7.3 Routine Test

	Check to ensure that the joints are as per Specification
	Check that there are no cuts, fins etc., on the strands.
	Check that drums are as per Specification
	All acceptance tests as mentioned above to be carried out on 10 % of drums

1.7.4 Tests during Manufacture

	Chemical analysis of zinc used for galvanizing	: As per Annexure-A
	Chemical analysis of Aluminium alloy used for making	: As per Annexure-A
	Chemical analysis of core strands	: As per Annexure-A

As indicated in Clause no 1.7.1, no type test charges shall be payable to the supplier.

The entire cost of testing for the acceptance and routine tests and Tests during manufacture as well as type tests, if required, specified herein shall be treated as included in the quoted unit price of conductor, except for the expenses of the inspector/Employer's representative.

The Supplier shall intimate the Employer about carrying out of the type tests along with detailed testing program at least 2 weeks in advance of the schedule date of testing during which the Employer will arrange to depute his representative to be present at the time of carrying out the tests.

1.7.5 Test Reports

Record of routine test reports shall be maintained by the Supplier at his works for periodic inspection by the Employer's representative.

Test Certificates of tests during manufacture shall be maintained by the Supplier. These shall be produced for verification as and when desired by the Employer.

1.7.6 Inspection

The Employer's representative shall at all times be entitled to have access to the works and all places of manufacture, where conductor shall be manufactured and representative shall have full facilities for unrestricted inspection of the Supplier's works, raw materials and process of manufacture for conducting necessary tests as detailed herein.

The Supplier shall keep the Employer informed in advance of the time of starting and of the progress of manufacture of conductor in its various stages so that arrangements can be made for inspection. No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested, unless the inspection is waived off by the Employer in writing. In the latter case also the conductor shall be dispatched only after satisfactory testing for all tests specified herein have been completed.

The acceptance of any quantity of material shall in no way relieve the Supplier of any of his responsibilities for meeting all requirements of the Specification, and shall not prevent subsequent rejection if such material is later found to be defective.

1.7.7 Test Facilities

The following additional test facilities shall be available at the Supplier's works:

a) Calibration of various testing and measuring equipment including tensile testing machine, resistance measurement facilities, burette, thermometer, barometer etc.

b) Standard resistance for calibration of resistance bridges.

c) Finished conductor shall be checked for length verification and surface finish on separate rewinding machine at reduced speed (variable from 8 to 16 meters per minute). The rewinding facilities shall have appropriate clutch system and free of vibrations, jerks etc. with traverse laying facilities.

1.8 Packing

The conductor shall be supplied in non-returnable, strong, wooden/painted steel/hybrid (painted steel cum wood) drums provided with lagging of adequate strength, constructed to protect the conductor against all damage and displacement during transit, storage and subsequent handling and stringing operations in the field. The Supplier shall select suitable drums for supply of conductor and shall be responsible for any loss or damage to conductor and/or drum during transportation handling and storage due to improper selection of drum or packing.

The Bidder should submit their proposed drum drawings along with the Bid.

a One conductor length only shall be wound on each drum.

b The conductor ends shall be properly sealed and secured on the side of one of the flanges to avoid loosening of the conductor layers during transit and handling.

1.9 Marking

Each drum shall have the following information stenciled on it in indelible ink along with other essential data:

a) Contract/Award letter number.
b) Name and address of consignee.
c) Manufacturer's name and address.
d) Drum number
e) Size of conductor
f) Length of conductor in meters
g) Arrow marking for unwinding
h) Position of the conductor ends
i) Distance between outer-most Layer of conductor and the inner surface of lagging.
j) Barrel diameter at three locations & an arrow marking at the location of the measurement.
k) Number of turns in the outer most layer.
l) Gross weight of drum after putting lagging.
m) Tear weight of the drum without lagging.
n) Net weight of the conductor in the drum.

The above should be indicated in the packing list also.

1.10 Verification of Conductor Length

The Employer reserves the right to verify the length of conductor after unreeling at least ten (10) percent of the drums in a lot offered for inspection.

1.11 Standards (Whichever applicable to Annealed Al. non-metallic solid core HTLS Conductor)

The conductor shall conform to the following Indian/International Standards, which shall mean latest revisions, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification.

In the event of the supply of conductor conforming to standards other than specified, the Bidder shall confirm in his bid that these standards are equivalent to those specified. In case of award, salient features of comparison between the standards proposed by the Supplier and those specified in this document will be provided by the Supplier to establish their equivalence.

Sl. No.	Indian Standard	Title	International Standard
1.	IS: 209-1992	Specification for zinc	BS:3436-1986
2.	IS: 398-1982	Specification for Aluminium Conductors for Overhead Transmission Purposes	IEC:1089-1991 BS:215-1970
3.	IS:398-1990 Part- II	Aluminum Conductor Galvanised Steel Reinforced	BS;215-1970 IEC:1089-1991
4.	IS:398-1992 Part- V	Aluminum Conductor Galvanised Steel-Reinforced For Extra High Voltage (400 KV) and above	IEC:1089-1991 BS:215-1970
5.	IS : 1778-1980	Reels and Drums for Bare Conductors	BS:1559-1949
6.	IS : 1521-1991	Method of Tensile Testing of Steel Wire	ISO 6892-1984
7.	IS : 2629-1990	Recommended Practice for Hot Dip Galvanizing of Iron and Steel	
8.	IS : 2633-1992	Method of Testing Uniformity of Coating on Zinc	
9.	IS : 4826-1992	Galvanised Coating on Round Steel Wires	IEC : 888-1987 BS:443-1969
10.	IS : 6745-1990	Methods of Determination of Weight of Zinc Coating of Zinc Coated Iron and Steel	BS:433-1969 ISO1460 – 1973
11.	IS : 8263-1990	Method of Radio Interference Tests on High Voltage Insulators	IEC:437-1973 NEMA:107-1964 CISPR
12.	IS : 9997-1988	Aluminium Alloy Redraw Rods	IEC 104 – 1987
13.		Zinc Coated steel wires for stranded Conductors	IEC : 888-1987
14.		Hard drawn Aluminium wire for overhead line conductors	IEC : 889-1987
15.	IS:398 (Part-IV)	Aluminium Alloy stranded conductor	IEC : 208-1966 BS-3242-1970
16.		Aluminium clad steel wires	IEC:1232
17.		Method of measurement of resistivity of metallic materials	IEC:468
18		Ampacity	IEEE738
19.		Carbon Fiber Thermoset Polymer Matrix Composite Core (CFC) for use in Overhead Electrical Conductors	ASTM B987

ANNEXURE –A

Tests on Conductors

(Tests on Conductor (Whichever applicable to Annealed Al. non-metallic solid core HTLS Conductor)

1.1 UTS Test on Stranded Conductor

Circles perpendicular to the axis of the conductor shall be marked at two places on a sample of conductor of minimum 5 m length between fixing arrangement suitably fixed by appropriate fittings on a tensile testing machine. The load shall be increased at a steady rate upto 50% of minimum specified UTS and held for one minute. The circles drawn shall not be distorted due to relative movement of strands. Thereafter the load shall be increased at steady rate to minimum UTS and held for one minute. The Conductor sample shall not fail during this period. The applied load shall then be increased until the failing load is reached and the value recorded.

1.2 Corona Extinction Voltage Test

The sample of the conductor of 5 m length shall be strung at a height not exceeding 7.01 m above ground. The sample assembly when subjected to power frequency voltage shall have a corona extinction voltage of not less than 154 kV (rms) line to ground under dry condition. There shall be no evidence of corona on any part of the samples. The test should be conducted without corona control rings. However, small corona control rings may be used to prevent corona in the end fittings. The voltage should be corrected for standard atmospheric conditions.

1.3 Radio Interference Voltage Test

Under the conditions as specified under (1.2) above, the conductor samples shall have radio interference voltage level below 1000 microvolts at one MHz when subjected to 50 Hz AC voltage of 154 kV line to ground under dry conditions. This test may be carried out with corona control rings and arcing horns.

1.4 D.C. Resistance Test on Stranded Conductor

On a conductor sample of minimum 5m length two contact-clamps shall be fixed with a predetermined bolt torque. The resistance shall be measured by a Kelvin double bridge or using micro ohm meter of suitable accuracy by placing the clamps initially zero metre and subsequently one metre apart. The test shall be repeated at least five times and the average value recorded. The value obtained shall be corrected to the value at 20deg C as per IS:398- (Part- IV)/(Part-V). The resistance corrected at 20deg C shall conform to the requirements of this Specification.

1.5 Stress-strain test at elevated temperature

Stress-strain test as per IEC-1089 shall be conducted keeping conductor temperature at designed maximum temperature. RTS for this test shall be 70% of UTS guaranteed in the GTP.

1.6 High Temperature endurance & creep test

Two conductor samples of length equal to at least 100 X d + 2 X a (where, d is the conductor diameter and a is the distance between the end fitting and the gauge length) shall be strung at tension equal to 25 % of conductor UTS. The distance, a, shall be at least 25 % of the gauge length or 2 m whichever is the smaller. The conductor samples shall be subjected to tests as indicated below:

i) On one of the conductor samples, the conductor temperature shall be maintained at 20 deg C for 1000 hours. The elongation/creep strain of the conductor during this period shall be measured and recorded at end of 1 hour, 10 hour, 100 hour and subsequently every 100 hour upto 1000 hours time period.

ii) (On other conductor sample, the conductor temperature shall be increased to designed maximum temperature in steps of 20 deg. C and thermal elongation of the conductor sample shall be measured & recorded at each step. The temperature shall be held at each step for sufficient duration for stablisation of temperature. Further, the temperature of the conductor shall be maintained at maximum continuous operating temperature (+10 Deg. C) for 1000 hours. The elongation/creep strain of the conductor during this period shall be measured and recorded at end of 1 hour, 10 hour, 100 hour and subsequently every 100 hour upto 1000 hours time period. After completion of the above, the core of the conductor sample shall be subjected to UTS test as mentioned above at clause 1.1 of Annexure-A. The conductor core shall withstand a load equivalent to 95 % of UTS. In case of polymer composite core conductor, the flexural strength & glass transition temperature of the core shall also be evaluated and the same shall not be degraded by more than 10 % over the value guaranteed in the GTP. The supplier shall plot the thermal elongation with temperature.

The supplier shall furnish details of creep characteristic in respect of the conducted based on laboratory test and other laboratory investigations/ experimental conducted on similar type of conductor and shall indicate creep strain values corresponding to 1 month, 6 month, 1 year, 10 year & 20 year creep at everyday tension & continuous designed temperature as well as room temperature.

1.7 Sheaves Test

The conductor sample of minimum length of 35 meter shall be tensioned at 22 % of the UTS and shall be passed through pulleys having diameter of 32 times that of the conductor with angle of 20 deg. between the pulleys. The conductor shall be passed over the pulleys 36 times a speed of 2 m/sec. After this test UTS test on the conductor shall be carried out. The core shall be inspected for any sign of damage or cracking through dye penetration test as per ASTM D5117/ ASTM B987 section 14. Dye penetrant exposure time shall be 30+0 minutes.

1.8 Axial Impact Test

The conductor sample shall be suspended vertically and load applied by dropping a 650 Kg from an elevation of 4 meters above the sample. The impact velocity shall be not be less than

8 m/sec. with an initial pre-tension of 200 kg. The curve for load vs time shall be recorded and recorded load of failure for core shall not be less than UTS of core.

1.9 Radial Crush Test

A section of conductor is to be crushed between two six inch steel platens. Load shall be held at 350 Kg for 1 minute and then released. Core/ core strands shall be subsequently disassembled and tensile tested. Core/ core strands shall exhibit full strength retention.

1.10 Torsional Ductility Test

The conductor sample of 10-15 m shall be loaded to 20% of UTS and then rotated in increasing steps of +/-180 deg. In case of composite core conductors, after 4 rotations or after separation of aluminium strands, the aluminium wires shall be cut and removed from the conductor and the exposed core shall be twisted and shall withstand upto 16 rotations.

1.11 Aeolian Vibration Test

The conductor and supporting hardware shall be loaded to 25% of RTS. A dynamometer, load cell, calibrated beam or other device shall be used to measure the conductor tension. Some means should be provided to maintain constant tension to allow for temperature fluctuations during the testing. The overall span between system terminations shall be a minimum of 30 m. The span shall be supported at a height such that the static sag angle of the cable to horizontal is (1.5 + 0.5) deg in the active span. Means shall be provided for measuring and monitoring the mid-loop (antinode) vibration amplitude at a free loop, not a support loop. An electronically controlled shaker shall be used to excite the conductor in the vertical plane. The shaker armature shall be securely fastened to the conductor so it is perpendicular tothe conductor in the vertical plane. The shaker should be located in the span to allow for a minimum of six vibration loops between the suspension assembly and the shaker

The test shall be carried out at one or more resonance frequencies (more than 10 Hz). The amplitude at the antinode point shall be one third of conductor diameter. The assembly shall be vibrated for not less than 10 million cycles without any failure. After the test, the conductor should not exhibit any damage (broken strands). The conductor shall be tested to demonstrate that it retains at least 95% RTS.

1.12 Temperature Cycle Test

The purpose of this test is verification of degradation characteristics of metallic and non- metallic material when subjected to thermal cycling temperature cycling can create large internal stresses due to thermal expansion mismatch between constituents.

Test Methods:-

- Mechanical tension 20 % RBS, marks on the conductor at the edge of the conductor.
- 100 cycles from room temperature up to maximum temperature. Hold at maximum temperature + 2.5 deg. C for 5 minutes

- After the above mentioned 100 cycles, the mechanical tension shall be increased up to 70
- % RBS at room temperature and kept at this tension for 24 H. Thereafter, release to 20 % RBS.
- This cycling test shall be repeated 5 times.
- During the test, temperature of connectors, conductor and resistance are recorded according to ANSI C 119.
- A breaking load test is applied at the end of the test. Conductor strength has to be higher
- than 95% RBS.
- In case of polymer composites, the flexural strength and the Glass Transition temperature shall not degrade by more than 10 % of value guaranteed in GTP, after thermal cycling. Flexural strength shall be obtained on the basis of test procedure indicated at 1.32 below.

1.13 Heat Resistance test on Aluminium Alloy wire

Breaking load test as per clause 1.21 above shall be carried out before and after heating the sample in uniform heat furnace at following temperature for one hour. The breaking strength of the wire after heating shall not be less than the 90% of the breaking strength before heating:-

Maximum continuous operating temperature of the conductor	Test Temperature
Upto 150 deg. C	230 degC (+5/-3 degC)
More than 150 deg. C & upto 210 deg. C	280 degC (+5/-3 degC)
More than 210 deg. C & upto 230 deg. C	400 degC (+5/-3 degC)

1.14 Bending test on aluminium clad core wire (if applicable)

A sample of aluminium clad invar strand measuring 30 cm in length shall be subject to bending with help of a vise. The vised length of wire should be 5 cm and radius of bend 4.8

mm. The bending should be first 90 degrees left and 90 degree right. After this operation the strand should cut at the bending point. There should be no separation of core and aluminium at the bending point after this operation.

1.15 Compression test on aluminium clad wires (if applicable)

A sample of aluminium clad core strand 10 mm in length is to be compressed by a plate with a load of 3600 kgs. The aluminium and core strand should not break.

1.16 Coefficient of linear expansion for core/ core wires

The temperature and elongation on a sample shall be continuously measured and recorded at interval of approximately 15 degree C from 15 degree C to maximum continuous operating temperature corresponding to rated current (800 A) by changing the temperature by suitable means. Coefficient of linear expansion shall be determined from the measured results.

1.17 Strand Brittle fracture test (for polymer composite core only)

The sample shall be tensioned to approx. 25 % of UTS with simultaneous application of 1NHNO3 acid directly in contact with naked polymer composite core for 96 hrs. The contact length of acid shall not be less than 40mm and thickness around the core not less than 10mm.The rod shall withstand UTS test after 96 hours.

1.18 Visual and Dimensional Check on Drums

The drums shall be visually and dimensionally checked to ensure that they conform to the approved drawings.

1.19 Visual Check for Joints, Scratches etc.

Conductor drums shall be rewound in the presence of the Employer. The Employer shall visually check for scratches, joints etc. and that the conductor generally conform to the requirements of this Specification. Ten percent (10%) drums from each lot shall be rewound in the presence of the Employer's representative.

1.20 Dimensional Check on Core Wires and Aluminium/ Aluminium Alloy Wires

The individual strands shall be dimensionally checked to ensure that they conform to the requirement of this Specification.

1.21 Check for Lay-ratios of Various Layers

The lay-ratios of various layers shall be checked to ensure that they conform to the guaranteed values furnished by the Contractor.

1.22 Galvanizing Test

The test procedure shall be as specified in IEC: 888. The material shall conform to the requirements of this Specification. The adherence of zinc shall be checked by wrapping around a mandrel four times the diameter of steel wire.

1.23 Aluminum thickness on aluminum clad wires (if applicable)

The thickness of aluminium of the specimen shall be determined by using suitable electrical indicating instruments operating on the direct measurement. Measurements shall be read to three decimal places, and number rounded to two decimal places is considered as measured thickness. For reference purposes, direct measurement shall be used to determine aluminium thickness on specimens taken from the end of the coils.

1.24 Torsion and Elongation Tests on Composite Core

In case of composite core HTLS conductor, the following procedure shall be applicable:-

I. Elongation Test:- The elongation of the composite core sample at shall be determined using extensometer. The load along the core shall be gradually increased.

The elongation achieved on reaching the tensile strength of the core shall not be less than the value guaranteed in the GTP.

1.25 II. Torsion Test: The purpose of the test is to determine the resilience of the composite core to twisting and to show that after the composite core has experienced the prescribed twisting, it will not crack or have a loss in tensile strength due to the twisting. The sample length shall be such that the gauge length in between the gripping fixtures is 170 times the diameter of the core in case of High Strength Grade composite cores, if core length is less than 170 times the core OD, rotate the core to maintain the same rotation to length ratio and 340 times the diameter of the composite core in case of Extra High strength composite core, if core lengths less than 340 times the core OD, rotate the core to maintain the same rotation to length ratio. However, the gauge length shall not be more than 4m. One grip shall then be fixed so that it does not twist and the other end shall be twisted a full 360 degrees and then fixed in this position for 2 minutes. Once the twist time is completed, the core is untwisted an inspected for any crazing or other damage. If no damage is observed, the composite core is then tensile tested to failure and the final load recorded. For the test to be accepted, the composite core must withstand at least 100% of its rated tensile strength. Two samples need to be completed in order to satisfy the testing requirement.

1.26 Breaking load test on Aluminium/ Aluminium Alloy & Composite core and D.C Resistance test on Aluminium/ Aluminium Alloy wire

The above tests shall be carried out as per IEC: 888/889 except in case of composite core which may be tested as per IEC 60888 or other relevant Indian / international standards. The results shall meet the requirements of the specification.

1.27 Wrap test on Core wires (Applicable for steel/Al clad Steel/invar core only)

The wrap test on core strands shall be meet the requirements of IEC: 888. In case of aluminium clad core wire, the same shall be wraped around a mandel of diameter of five times that of the strand to form a helix of eight turns. The strand shall be unwrapped. No breakage of strand shall occurred.

1.28 Minimum conductivity test on thermal resistant aluminium alloy wire

Resistivity test as per IEC-468/IEC 889 shall be conducted to confirm minimum conductivity as per specification requirement

1.29 Procedure Qualification test on welded Aluminium/ Aluminium Alloy wire.

Two Aluminium/ Aluminium Alloy wire shall be welded as per the approved quality plan and shall be subjected to tensile load. The breaking strength of the welded joint of the wire shall not be less than the guaranteed breaking strength of individual strands.

1.30 Ageing Test on Filler (if applicable)

The test shall be done in accordance with Grease drop point test method. The specimen should be drop as a droplet when kept at a temperature 45 deg. C above designed maximum operating temperature of the conductor for 30 minutes. The temperature shall then be increase till one droplet drops and the temperature recorded.

1.31 Aluminium conductivity test on aluminium clad wire (if applicable)

Resistivity test as per IEC-468 shall be conducted to confirm minimum conductivity as per specification requirement.

1.32 Glass Transition Temperature Test (for polymer composite core only)

Test shall be conducted as per ASTM B987. The minimum glass transition temperature shall be either (i) the design maximum continuous operating temperature of the offered HTLS conductor + 35 deg C or (ii) minimum glass transition temperature as per ASTM B987 i.e.180 deg. C + 25 deg C ; Whichever is lower. In case, the design maximum continuous operating temperature of the offered HT/HTLS conductor is more than the minimum glass transition temperature as per ASTM B987 i.e. more than 180 deg. C then, the test shall be conducted as per ASTM B987 & the minimum glass transition temperature shall be the design maximum continuous operating temperature of the offered HTLS conductor + 25 deg C.

1.33 Flexural Strength Test (for polymer composite core only)

Test method shall be as per ASTM D7264, ASTM D4475 or ISO14125.

1.34 Bending Test on Composite Core (Type test)

Bending test on polymer composite core (CFC) before stranding shall be performed as per ASTM B987/B987M-17 on polymer composite core samples taken from composite core at conductor manufacturing unit before stranding of conductor. Alternatively Bending test on polymer composite core (CFC) before stranding may be performed at the core manufacturing unit on the samples taken from the same reel being supplied to conductor manufacturer subject to proper traceability of the same at the conductor manufacturers works.

OR

Bending test on polymer composite core (CFC) shall also be performed as per ASTM B987/B987M-17 on polymer composite core samples taken from stranded conductor. For test after stranding the diameter of cylindrical mandrel shall be as following:

For high strength grade CFC – 60 times the diameter of CFC

For Extra high strength grade CFC – 70 times the diameter of CFC

Acceptance test

Bending test on polymer composite core (CFC) shall be performed as per ASTM B987/B987M-17 on polymer composite core samples taken from stranded conductor. For test after stranding the diameter of cylindrical mandrel shall be as following:

For high strength grade CFC – 60 times the diameter of CFC

For Extra high strength grade CFC – 70 times the diameter of CFC

1.35 Chemical Analysis of Aluminium/ Aluminium Alloy ~~and Composite core~~/ INVAR Core Wires

Samples taken from the Aluminium /Aluminium Alloy and core coils/ strands shall be chemically/spectrographically analyzed. The same shall be in conformity to the particulars guaranteed by the bidder so as to meet the requirements stated in this Specification

1.36 Chemical Analysis of Zinc

Samples taken from the zinc ingots shall be chemically/ spectrographically analyzed. The same shall be in conformity to the requirements stated in the Specification.

SUB-SECTION II

2.0 TECHNICAL SPECIFICATIONS OF HARDWARE FITTINGS & OTHER ACCESSORIES

2.1 General

This section details technical particulars of hardware fittings and suspension clamps & compression type dead end clamps for the HTLS Conductor to be proposed and supplied for replacement of panther conductor by the bidder. Each fitting shall be supplied complete in all respects.

2.2 Hardware Fittings

The hardware fittings shall be suitable for use with composite insulators having ball and socket fittings. Each hardware fitting shall be supplied complete in all respects and shall include the following hardware parts:

2.2.1 Suitable arcing horn as specified in clause 2.9 hereinafter.

2.2.2 Suitable yoke plates complying with the specifications given hereinafter.

2.2.3 Corona control rings/grading ring with fittings for attachment to line side yoke plate.

2.2.4 Suspension and dead end assembly to suit conductor size as detailed in clause 2.12, 2.13 and 2.14 hereinafter.

2.2.5 Other necessary fittings viz D-shackles, eye links, extension links, ball clevis, socket clevis, clevis eye, U clevis and chain link etc. to make the hardware fittings complete.

~~2.2.6 2.5% extra fasteners.~~

~~2.3 The Clamps fittings shall be suitable for attachment to suspension and tension insulator strings alongwith hardware fittings for normal stretches as well as river crossing streches and shall include 2.5 % extra fasteners. The supplier shall be responsible for satisfactory performance of complete conductor system along~~

2.4 Dimensions of Insulator String Along with Hardware Fitting

The various limiting dimensions of the insulator strings shall generally be in conformity with the dimensions of the existing hardware fittings. The Contractor shall be required to verify the dimensions of the existing insulator strings and shall ensure that the new fittings are generally conforming to the dimensions of the existing fittings.

2.5 Interchangeability

The hardware for insulator strings with disc composite insulators together with ball and socket fittings shall be of standard design, so that these hardware are inter- changeable with each other and suitable for use with insulators of any make conforming to relevant Indian/International Standard

2.6 Maintenance

The hardware fittings offered shall be suitable for employment of hot line maintenance technique so that usual hot line operations can be carried out with ease, speed and safety. The technique adopted for hot line maintenance shall be generally bare hand method & hot stick method

2.7 Designation

2.7.1 Ball and Socket Designation

The dimension of the ball and socket shall be 16mm designation for 90KN & 120 KN. The designation should be in accordance with the standard dimensions stated in IS: 2486-(Part-II)/IEC: 60120. The dimensions shall be checked by the appropriate gauge after galvanising only.

2.8 Security Clips and Split Pins

2.8.1 Security clips for use with ball and socket coupling shall be R-shaped, hump type which provides positive locking of the coupling as per IS: 2486-(Part-III)/ IEC: 60372. The legs of the security clips shall be spread after assembly in the works to prevent complete withdrawal from the socket. The locking device should be resilient, corrosion resistant and of suitable mechanical strength. There shall be no risk of the locking device being displaced accidentally or being rotated when in position. Under no circumstances shall the locking devices allow separation of fittings.

2.8.2 The hole for the security clip shall be countersunk and the clip should be of such design that the eye of clip may be engaged by a hot line clip puller to provide for disengagement under energised conditions. The force required to pull the security clip into its unlocked position shall not be less than 50 N (5 kg) or more than 500 N (50 kg)

2.8.3 Split pins shall be used with bolts & nuts.

2.9 Arcing Horn

2.9.1 The arcing horn / shall be either ball ended rod type or tubular type.

2.9.2 The arcing horn shall be provided generally as per existing fitting and shall conform to specification requirements

2.9.3 The air gap shall be so adjusted to ensure effective operation under actual field conditions.

2.10 Yoke Plates

The strength of yoke plate ultimate tensile strength as specified. The plates shall be either triangular or rectangular in shape as may be necessary. The design of yoke plate shall take into account the most unfavorable loading conditions likely to be experienced as a result of dimensional tolerances for disc insulators as well as components of hardware fittings within the specified range. The plates shall have suitable holes for fixing corona control rings/grading ring/arcing horn. All the corners and edges should be rounded off with a radius of atleast 3 mm. Design calculations i.e. for bearing & tensile strength, for deciding the dimensions of yoke plate shall be furnished by the contractor. The holes provided for bolts in the yoke plate should satisfy shear edge condition as per Clause No.10.2.4.2 of IS: 800-2007.

2.11 Corona Control Rings/Grading Ring

2.11.1 The Corona control rings/grading ring shall be provided with hardware fittings. It shall also improve corona and radio interference performance of the complete insulator string along with hardware fittings.

2.11.2 The corona control rings/grading ring shall be made of high strength heat treated aluminium alloy tube of minimum 2.5 mm wall thickness. If mild steel brackets are used then the brackets shall not be welded to the pipe but shall be fixed by means of bolts and nuts on a small aluminium plate attachment welded to the pipe.

The welded center of the corona control ring/grading ring shall be grinded before buffing. Alternately, Aluminium tube/flats of suitable dimensions welded to the corona control rings/grading rings may be used for connection to yoke plate.

2.11.3 The Corona control rings/grading ring should have a brushed satin finish and not a bright glossy surface. No blemish should be seen or felt when rubbing a hand over themetal.

2.11.4 The limiting dimensions of corona control ring shall be as per the specification drawings.

2.11.5 Bidder may quote for grading ring with armour grip suspension assembly. The grading ring shall be of open type design with a gap of 125 mm. The open ends shall be suitably terminated. The outside diameter of the tube shall be 60 mm. The ends of grading ring tube shall be sealed with welded aluminium cap duly buffed.

2.12 Turn Buckle

2.12.1 The turn buckle is to be provided with single/ double tension hardware fitting. The threads shall be of sufficient strength to remain unaffected under the specified tensile load.

2.12.2 The maximum length of the turn buckle from the connecting part of the rest of the hardware fittings shall be 520 mm. The details of the minimum and maximum adjustment possible shall be clearly indicated in the drawing. An adjustment of 150 mm minimum shall be possible with turnbuckle.

2.13 Suspension Assembly

2.13.1 The suspension assembly shall be suitable for the HTLS Conductor, the bidder intends to supply.

The technical details of the conductor shall be as proposed by the bidder

2.13.2 The suspension assembly shall include either free centre type suspension clamp alongwith standard preformed armour rods or armour grip suspension clamp.

2.13.3 The suspension clamp along with standard preformed armour rods set shall be designed to have maximum mobility in any direction and minimum moment of inertia so as to have minimum stress on the conductor in the case of oscillation of the same.

2.13.4 The suspension clamp shall be designed for continuous operation at the temperature specified by the bidder for conductor

2.13.5 The suspension assembly shall be designed, manufactured and finished to give it a suitable shape, so as to avoid any possibility of hammering between suspension assembly and conductor due to vibration. The suspension assembly shall be smooth without any cuts, grooves, abrasions, projections, ridges or excrescence which might damage the conductor.

2.13.6 The suspension assembly/clamp shall be designed so that it shall minimise the static & dynamic stress developed in the conductor under various loading conditions as well as during wind induced conductor vibrations. It shall also withstand power arcs & have required level of Corona/RIV performance.

2.14 Free Centre Type Suspension Clamp

For the Free Centre Suspension Clamp seat shall be smoothly rounded and curved into a bell mouth at the ends. The lip edges shall have rounded bead. There shall be at least two U-bolts for tightening of clamp body and keeper pieces together.

2.15 Standard Preformed Armour Rod Set.

The Preformed Armour Rods Set shall be used to minimise the stress developed in the

conductor due to different static and dynamic loads because of vibration due to wind, slipping of conductor from the suspension clamp as a result of unbalanced conductor tension in adjacent spans and broken wire condition. It shall also withstand power arcs, chafing and abrasion from suspension clamp and localized heating effect due to magnetic power losses from suspension clamps as well as resistance losses of the conductor.

2.15.1 The preformed armour rods set shall have right hand lay and the inside diameter of the helics shall be less than the outside diameter of the conductor to have gentle but permanent grip on the conductor. The surface of the armour rod when fitted on the conductor shall be smooth and free from projections, cuts and abrasions etc.

2.15.2 The pitch length of the rods shall be determined by the Bidder but shall be less than that of the outer layer of conductor and the same shall be accurately controlled to maintain uniformity and consistently reproducible characteristic wholly independent of the skill of linemen.

2.15.3 The length and diameter of each rod shall be furnished by the bidder in the GTP. The tolerance in length of the rods between the longest and shortest rod in complete set should be within the limits specified in relevant Indian/International Standards. The ends of armour rod shall be parrot billed.

2.15.4 The number of armour rods in each set shall be as per supplier's design to suit HTLS Conductor offered Standards. Each rod shall be marked in the middle with paint for easy application on the line.

2.15.5 The armour rod shall not loose their resilience even after five applications.

2.15.6 The conductivity of each rod of the set shall not be less than 40% of the conductivity of the International Annealed Copper Standard (IACS).

2.16 Armour Grip Suspension Clamp

2.16.1 The armour grip suspension clamp shall comprise of retaining strap, support housing, elastomer inserts with aluminium reinforcements and AGS preformed rod set.

2.16.2 Elastomer insert shall be resistant to the effects of temperature up to maximum conductor temperature guaranteed by the bidder corresponding to peak current, Ozone, ultraviolet radiations and other atmospheric contaminants likely to be encountered in service. The physical properties of the elastomer shall be of approved standard. It shall be electrically shielded by a cage of AGS performed rod set. The elastomer insert shall be so designed that the curvature of the AGS rod shall follow the contour of the neoprene insert.

2.16.3 The supplier shall submit relevant type/performance test certificates as per applicable standard/product specifications for elastomer to confirm suitability of the offered elastomer for

the specified application.

2.16.4 The AGS preformed rod set shall be as detailed in clause 3.16.4 to 3.16.5 in general except for the following.

2.16.5 The length of the AGS preformed rods shall be such that it shall ensure sufficient slipping strength and shall not introduce unfavourable stress on the conductor under all operating conditions. The length of the AGS preformed rods shall be indicated in the GTP.

2.17 Envelope Type Suspension Clamp

The seat of the envelope type suspension clamp shall be smoothly rounded & suitably curved at the ends. The lip edges shall have rounded bead. There shall be at least two U-bolts for tightening of clamp body and keeper pieces together. Hexagonal bolts and nuts with split-pins shall be used for attachment of the clamp.

2.18 Dead end Assembly

2.18.1 The dead end assembly shall be suitable for the offered HTLS Conductor.

2.18.2 The dead end assembly shall be of compression type with provision for compressing jumper terminal at one end. The angle of jumper terminal to be mounted should be 30° with respect to the vertical line. The area of bearing surface on all the connections shall be sufficient to ensure positive electrical and mechanical contact and avoid local heating due to I2R losses. The resistance of the clamp when compressed on Conductor shall not be more than 75% of the resistance of equivalent length of Conductor.

2.18.3 Die compression areas shall be clearly marked on each dead-end assembly designed for continuous die compressions and shall bear the words 'COMPRESS FIRST' suitably inscribed near the point on each assembly where the compression begins. If the dead end assembly is designed for intermittent die compressions it shall bear identification marks 'COMPRESSION ZONE' AND 'NON- COMPRESSION ZONE' distinctly with arrow marks showing the direction of compressions and knurling marks showing the end of the zones. The letters, number and other markings on the finished clamp shall be distinct and legible. The dimensions of dead end assembly before & after compression alongwith tolerances shall be guaranteed in the relevant schedules of the bid and shall be decided by the manufacturer so as to suit the conductor size & conform to electrical & mechanical requirement stipulated in the specification. These shall be guaranteed in the relevant schedules of bid.

2.18.4 The assembly shall not permit slipping of, damage to, or failure of the complete conductor or any part thereof at a load less than 95% of the ultimate tensile strength of the conductor.

2.18.5 Jumper bolting arrangement between jumper terminal/cone and terminal pad/plate of dead

end assembly of tension hardware fittings shall be designed to suit the specification requirement of 800A, as the case may be, current and shall conform to the relevant Indian/International standards

2.18.6 For HTLS conductor, dead end assembly shall interalia include collets, collet housing, inner sleeve etc., suitable for the offered design of HTLS conductor.

2.19 Fasteners: Bolts, Nuts and Washers

2.19.1 All bolts and nuts shall conform to IS 6639. All bolts and nuts shall be galvanized as per IS 1367 (Part- 13)/IS 2629. All bolts and nuts shall have hexagonal heads, the heads being forged out of solid truly concentric, and square with the shank, which must be perfectly straight.

2.19.2 Bolts up to M16 and having length up to 10 times the diameter of the bolt should be manufactured by cold forging and thread rolling process to obtain good and reliable mechanical properties and effective dimensional control. The shear strength of bolt for 5.6 grade should be 310 MPa minimum as per IS 12427.Bolts should be provided with washer face in accordance with IS 1363 (Part-1) to ensure proper bearing.

2.19.3 Nuts should be double chamfered as per the requirement of IS 1363 Part- III 1984. It should be ensured by the manufacturer that nuts should not be over tapped beyond 0.4 mm oversize on effective diameter for size upto M16.

2.19.4 Fully threaded bolts shall not be used. The length of the bolt shall be such that the threaded portion shall not extend into the place of contact of the component parts.

2.19.5 All bolts shall be threaded to take the full depth of the nuts and threaded enough to permit the firm gripping of the component parts but no further. It shall be ensured that the threaded portion of the bolt protrudes not less than 3 mm and not more than 8 mm when fully tightened. All nuts shall fit and tight to the point where shank of the bolt connects to the head.

2.19.6 Flat washers and spring washers shall be provided wherever necessary and shall be of positive lock type. Spring washers shall be electro- galvanised. The thickness of washers shall conform to IS: 2016.

2.19.7 The Contractor shall furnish bolt schedules giving thickness of components connected, the nut and the washer and the length of shank and the threaded portion of bolts and size of holes and any other special details of this nature.

2.19.8 To obviate bending stress in bolt, it shall not connect aggregate thickness more than three time its diameter.

2.19.9 Bolts at the joints shall be so staggered that nuts may be tightened with spanners without fouling.

2.19.10 To ensure effective in-process Quality control it is essential that the manufacturer should have all the testing facilities for tests like weight of zinc coating, shear strength, other testing facilities etc, in- house. The manufacturer should also have proper Quality Assurance system which should be in line with the requirement of this specification and IS-.14000 services Quality System standard.

2.19.11 Fasteners of grade higher than 8.8 are not to be used and minimum grade for bolt shall be 5.6

2.20 Materials

The materials of the various components shall be as specified hereunder. The Bidder shall indicate the material proposed to be used for each and every component of hardware fittings stating clearly the class, grade or alloy designation of the material, manufacturing process & heat treatment details and the reference standards.

2.20.1 The details of materials for different component are listed as in Table No-1.

TABLE-1

(Details of Materials)

Sr. No.	Name of item	Material treatment	Process of Standard	Reference	Remarks
1	Security Clips	Stainless Steel/ Phospher Bronze	-	AISI 302 or 304- L/ IS-1385	
For Free Centre /Envelope type clamps					
2	Clamp Body, Keeper Piece	High Strength Al. Alloy 4600/ LM-6 or 6061/65032	Casted or forged & Heat treated	IS:617or ASTM-B429	
	Cotter bolts/ Hangers, shackles, Brackets	Mild Steel	Hot dip galvanised	As per IS-226 or IS-2062	
	U Bolts	Stainless Steel or High Strength	Forged & & Heat treated	AISI 302 or 304-L ASTM B429	
	P. A. Rod	High Strength Al. Alloy 4600/LM-6 or 6061/65032	Heat treatment during manufacturing	ASTM-B429	Min. tensile strength of 35 kg/mm^2

3	**For AGS type clamp**				
(a)	Supporting House	High Strength Corrosion resistant Al. Alloy 4600/ LM-6 or 6061/65032	Casted or forged & Heat treated	IS:617or ASTM-B429	
(b)	Al insert & Retaining strap	High Strength Al. Alloy 4600/ LM-6 or 6061/65032	Casted or forged & Heat treated	IS:617or ASTM-B429	High Strength Al. Alloy 4600/ LM-6 or 6061/65032
(c)	Elastomer	Moulded on Al.			
4.	**For Dead End Assembly**				
(a)	Outer Sleeve	EC grade Al of purity not less than 99.50%			
(b)	Steel Sleeve	Mild Steel	Hot Dip Galvanised	IS:226/ IS-	
5.	Ball & Socket Fittings,	Class-IV Steel	Drop forged & normalized Hot dip galvanised	As per IS: 2004	
6.	Yoke Plate	Mild Steel	Hot dip galvanized	As per IS-226 or IS-2062	
7	Corona Control ring/ Grading ring	High Strength Al. Alloy tube (6061/ 6063/1100 type or 65032/ 63400 Type)	Heat treated Hot dip galvanized	ASTM-B429 or as per IS	Mechanical strength of welded joint shall not be less than 20 KN
8	Supporting Brackets & Mounting Bolts	High Strentgth Al Alloy 7061/ 6063/ 65032/63400 Type) or Mild Steel	Heat treated Hot dip galvanized	ASTM-B429 or as per IS:226 or IS:2062	

Note: Alternate materials conforming to other national standards of other countries also may be offered provided the properties and compositions of these are close to the properties and compositions of material specified. Bidder should furnish the details of comparison of material offered viz a viz specified in the bid or else the bids are liable to be rejected.

2.21 Workmanship

2.21.1 All the equipment shall be of the latest design and conform to the best modern practices adopted in the Extra High Voltage field. The Bidder shall offer only such equipment as guaranteed by him to be satisfactory and suitable for 132 kV transmission lines and will give continued good performance

2.21.2 High current, heat rise test shall be conducted by the supplier to determine the maximum temperature achieved in different components of fittings / accessories under simulated service condition corresponding to operation of conductor at maximum (emergency) operating temperature. The material of the components should be suitable for continued good performance corresponding to these maximum temperatures. The supplier shall submit relevant type/performance test certificates as per applicable standards/product specifications to confirm suitability of the offered material.

2.21.3 The design, manufacturing process and quality control of all the materials shall be such as to give the specified mechanical rating, highest mobility, elimination of sharp edges and corners to limit corona and radio- interference, best resistance to corrosion and a good finish.

All ferrous parts including fasteners shall be hot dip galvanised, after all machining has been completed. Nuts may, however, be tapped (threaded) after galvanising and the threads oiled. Spring washers shall be electro galvanized. The bolt threads shall be undercut to take care of the increase in diameter due to galvanizing. Galvanizing shall be done in accordance with IS 2629 / IS 1367 (Part-13) and shall satisfy the tests mentioned in IS 2633. Fasteners shall withstand four dips while spring washers shall withstand three dips of one minute duration in the standard Preece test. Other galvanized materials shall have a minimum average coating of zinc equivalent to 600 gm/sq.m., shall be guaranteed to withstand at least six successive dips each lasting one (1) minute under the standard preece test for galvanizing.

2.21.4 Before ball fittings are galvanized, all die flashing on the shank and on the bearing surface of the ball shall be carefully removed without reducing the dimensions below the design requirements.

2.21.5 The zinc coating shall be perfectly adherent, of uniform thickness, smooth, reasonably bright, continuous and free from imperfections such as flux, ash rust, stains, bulky white deposits and blisters. The zinc used for galvanising shall be grade Zn 99.95 as per IS: 209.

2.21.6 Pin balls shall be checked with the applicable “GO” gauges in at least two directions. one of which shall be across the line of die flashing, and the other 90o to this line. "NO GO" gauges shall not pass in any direction.

2.21.7 Socket ends, before galvanising, shall be of uniform contour. The bearing surface of socket

ends shall be uniform about the entire circumference without depressions of high spots. The internal contours of socket ends shall be concentric with the axis of the fittings as per IS: 2486/IEC: 120.

2.21.8 The axis of the bearing surfaces of socket ends shall be coaxial with the axis of the fittings. There shall be no noticeable tilting of the bearing surfaces with the axis of the fittings.

2.21.9 In case of casting, the same shall be free from all internal defects like shrinkage, inclusion, blow holes, cracks etc. Pressure die casting shall not be used for casting of components with thickness more than 5 mm.

2.21.10 All current carrying parts shall be so designed and manufactured that contact resistance is reduced to minimum.

2.21.11 No equipment shall have sharp ends or edges, abrasions or projections and cause any damage to the conductor in any way during erection or during continuous operation which would produce high electrical and mechanical stresses in normal working. The design of adjacent metal parts and mating surfaces shall be such as to prevent corrosion of the contact surface and to maintain good electrical contact under service conditions.

2.21.12 All the holes shall be cylindrical, clean cut and perpendicular to the plane of the material. The periphery of the holes shall be free from burrs.

2.21.13 All fasteners shall have suitable corona free locking arrangement to guard against vibration loosening.

2.21.14 Welding of aluminium shall be by inert gas shielded tungsten arc or inert gas shielded metal arc process Welds shall be clean, sound, smooth, uniform without overlaps, properly fused and completely sealed.

There shall be no cracks, voids incomplete penetration, incomplete fusion, under-cutting or inclusions. Porosity shall be minimised so that mechanical properties of the aluminium alloys are not affected. All welds shall be properly finished as per good engineering practices.

2.22 Bid Drawings

2.22.1 The Bidder shall furnish full description and illustrations of materials offered.

2.22.2 Fully dimensioned drawings of the hardwares and their component parts shall be furnished in three copies along with the bid. Weight, material and fabrication details of all the components should be included in the drawings.

(i) Attachment of the hanger or strain plate.

(ii) Suspension or dead end assembly.

(iii) Arcing horn attachment to the string as specified this technical Specification.

(iv) Yoke plates

(v) Hardware fittings of ball and socket type for inter connecting units to the top and bottom Yoke plates.

2.22.3 All drawings shall be identified by a drawing number and bid number. All drawings shall be neatly arranged. All drafting & lettering shall be legible. The minimum size of lettering shall be 3 mm. All dimensions & dimensional tolerances shall be mentioned in mm. The drawings shall include:

(i) Dimensions and dimensional tolerance.

(ii) Material, fabrication details including any weld details & any specified finishes & coatings. Regarding material designation & reference of standards are to be indicated.

(iii) Catalogue No.

(iv) Marking

(v) Weight of assembly

(vi) Installation instructions

(vii) Design installation torque for the bolt or cap screw.

(viii) Withstand torque that may be applied to the bolt or cap screw without failure of component parts.

(ix) The compression die number with recommended compression pressure.

(x) All other relevant terminal details.

2.22.4 After placement of award, the Contractor shall submit fully dimensioned drawing including all the components in four (4) copies to the Owner for approval. After getting approval from the Owner and successful completion of all the type tests, the Contractor shall submit 10 (10) more copies of the same drawings to the Owner for further distribution and field use at Employer's end.

2.23 Accessories for the HTLS Conductor

General

2.23.1 This portion details the technical particulars of the accessories for Conductor.

~~2.23.2 5% extra fasteners, filler plugs and retaining rods shall be provided.~~

2.23.3 The supplier shall be responsible for satisfactory performance of complete conductor system along with accessories offered by him for continuous operation at temperature specified for the HTLS Conductor.

2.24 Mid Span Compression Joint

2.24.1 Mid Span Compression Joint shall be used for joining two lengths of conductor. The joint shall have a resistively less than 75% of the resistivity of equivalent length of conductor. The joint shall not permit slipping off, damage to or failure of the complete conductor or any part thereof at a load less than 95% of the ultimate tensile strength of the conductor. It must be able to withstand the continuous design temperature of conductor.

2.24.2 The dimensions of mid span compression joint before & after compression along with tolerances shall be shall be guaranteed in the relevant schedules of the bid and shall be decided by the manufacturer so as to suit the conductor size & conform to electrical & mechanical requirement stipulated in the specification. For composite core conductor, suitable sleeve, collets, collet housing shall be used for core jointing.

2.25 Repair Sleeve

Repair Sleeve of compression type shall be used to repair conductor with not more than two strands broken in the outer layer. The sleeve shall be manufactured from 99.5% pure aluminium / aluminium alloy and shall have a smooth surface. It shall be able to withstand the continuous maximum operating temperature of conductor. The repair sleeve shall comprise of two pieces with a provision of seat for sliding of the keeper piece. The edges of the seat as well as the keeper piece shall be so rounded that the conductor strands are not damaged during installation. The dimensions of Repair sleeve along with tolerances shall be guaranteed in the relevant schedules of the bid and shall be decided by the manufacturer so as to suit the conductor size & conform to electrical & mechanical requirement stipulated in the specification.

2.26 Vibration Damper

2.26.1 Vibration dampers of 4R-stockbridge type with four (4) different resonances spread within the specified aeolian frequency band width corresponding to wind speed of 1 m/s to 7 m/s are installed in the existing line at suspension and tension points on each conductor in each span to damp out aeolian vibration as well as sub- span oscillations,. One damper minimum on each side per conductor for suspension points and two dampers minimum on each side per conductor for tension points shall be used for a ruling design span of 320 meters.

2.26.2 The bidder shall offer damping system including Stockbridge type dampers for proposed HTLS Conductor for its protection from wind induced vibrations which could cause conductor fatigue /strand breakage near a hardware attachment, such as suspension clamps. Alternate damping systems with proven design offering equivalent or better performance also shall be accepted provided the manufacturer meets the qualifying requirements stipulated in the Specifications. Relevant technical documents including type test reports to establish the technical suitability of alternate systems shall be furnished by the Bidder along with the bid. The damper shall be designed to have resonance frequencies to facilitate dissipation of vibration energy through inter-strand friction of the messenger cable and shall be effective in reducing vibration over a wide frequency range (depending upon conductor dia) or wind velocity range specified above. The vibration damper shall meet the requirement of frequency or wind velocity range and also have mechanical impedance closely matched with the offered HTLS conductor. The vibration dampers shall be installed at suitable positions to ensure damping effectiveness across the frequency range. The power dissipation of the vibration dampers shall exceed the wind power so that the vibration level on the conductor is reduced below its endurance limit i.e 150 micro strain. The bidder shall clearly indicate the method for evaluating performance of dampers including analytical and laboratory test methods. The bidder shall indicate the type tests to evaluate the performance of offered damping system.

2.26.3 The clamp of the vibration damper shall be made of high strength aluminium alloy of type LM-6. It shall be capable of supporting the damper and prevent damage or chafing of the conductor during erection or continued operation. The clamp shall have smooth and permanent grip to keep the damper in position on the conductor without damaging the strands or causing premature fatigue failure of the conductor under the clamp. The clamp groove shall be in uniform contact with the conductor over the entire clamping surface except for the rounded edges. The groove of the clamp body and clamp cap shall be smooth, free from projections, grit or other materials which could cause damage to the conductor when the clamp is installed. Clamping bolts shall be provided with self-locking nuts and designed to prevent corrosion of threads or loosening in service.

2.26.4 The messenger cable shall be made of high strength galvanized steel/stain less steel with a minimum strength of 135 kg/sqmm. It shall be of preformed and post formed quality in order to prevent subsequent drop of weight and to maintain consistent flexural stiffness of the cable in service. The number of strands in the messenger cable shall be 19. The messenger cable other than stainless steel shall be hot dip galvanised in accordance with the recommendations of IS: 4826 for heavily coated wires.

2.26.5 The damper mass shall be made of hot dip galvanised mild steel/cast iron or a permanent mould cast zinc alloy. All castings shall be free from defects such as cracks, shrinkage, inclusions and blowholes etc. The surface of the damper masses shall be smooth.

2.26.6 The damper clamp shall be casted over the messenger cable and offer sufficient and permanent grip on it. The messenger cable shall not slip out of the grip at a load less than the mass pull-off value of the damper. The damper masses made of material other-than zinc alloy shall be fixed to the messenger cable in a suitable manner in order to avoid excessive stress concentration on the messenger cables which shall cause premature fatigue failure of the same. The messenger cable ends shall be suitably and effectively sealed to prevent corrosion. The damper mass made of zinc alloy shall be casted over the messenger cable and have sufficient and permanent grip on the messenger cable under all service conditions.

2.26.7 The damper assembly shall be so designed that it shall not introduce radio interference beyond acceptable limits.

2.26.8 The vibration damper shall be capable of being installed and removed from energised line by means of hot line technique. In addition, the clamp shall be capable of being removed and reinstalled on the conductor at the designated torque without shearing or damaging of fasteners.

2.26.9 The contractor must indicate the clamp bolt tightening torque to ensure that the slip strength of the clamp is maintained between 2.5 kN and 5 kN. The clamp when installed on the conductor shall not cause excessive stress concentration on the conductor leading to permanent deformation of the conductor strands and premature fatigue failure in operation.

2.26.10 The vibration analysis of the system, with and without damper and dynamic characteristics of the damper as detailed under Annexure-A, shall have to be submitted. The technical particulars for vibration analysis and damping design of the system are as follows:

	Description	Technical particulars
1. i	Span length in meters Ruling design span	320 meters
2.	Configuration	Double Circuit single conductor per phase in vertical Configuration.
3.	Tensile load in Conductor at temperature of 0 deg. C and still air	As per Sag – tension calculations
4.	Armour rods used	Standard preformed armour rods/AGS
5.	Maximum permissible dynamic strain ie endurance limit.	+/- 150 micro strains

2.26.11 The damper placement chart shall be submitted for spans ranging from 100m to 1100m. Placement charts should be duly supported with relevant technical documents and sample calculations.

2.26.12 The damper placement charts shall include the following

(i) Location of the dampers for various combinations of spans and line tensions clearly indicating the number of dampers to be installed per conductor per span.

(ii) Placement distances clearly identifying the extremities between which the distances are to be measured.

(iii) Placement recommendation depending upon type of suspension clamps (viz Free centre type/Armour grip type etc.)

(iv) The influence of mid span compression joints, repair sleeves and armour rods (standard and AGS) in the placement of dampers.

2.27 Material and Workmanship

2.27.1 All the equipment shall be of the latest proven design and conform to the best modern practice adopted in the high voltage field. The Bidder shall offer only such equipment as guaranteed by him to be satisfactory and suitable for 132 kV transmission line application with single conductors and will give continued good performance at all service conditions. For employer's review of the offered design of accessories, the supplier shall submit document/design details of similar type of accessories used in past for similar type of HTLS Conductor application

2.27.2 The design, manufacturing process and quality control of all the materials shall be such as to achieve requisite factor of safety for maximum working load, highest mobility, elimination of sharp edges and corners, best resistance to corrosion and a good finish.

2.27.3 High current, heat rise test shall be conducted by the supplier to determine the maximum temperature achieved in different components of fittings under simulated service condition corresponding to continuous operation of conductor at rated maximum temperature. The material of the components should be suitable for continued good performance corresponding to these maximum temperatures.

The supplier shall submit relevant type/ performance test certificates as per applicable standards/product specifications to confirm suitability of the offered material.

2.27.4 All ferrous parts shall be hot dip galvanised, after all machining has been completed. Nuts

may, however, be tapped (threaded) after galvanising and the threads oiled. Spring washers shall be electro galvanised as per grade 4 of IS-1573. The bolt threads shall be undercut to take care of increase in diameter due to galvanising. Galvanising shall be done in accordance with IS:2629/ IS- 1367 (Part-13) and satisfy the tests mentioned in IS-2633. Fasteners shall withstand four dips while spring washers shall withstand three dips. Other galvanised materials shall have a minimum average coating of Zinc equivalent to 600 gm/sqm and shall be guaranteed to withstand at least six dips each lasting one minute under the standard Preece test for galvanising unless otherwise specified.

2.27.5 The zinc coating shall be perfectly adherent, of uniform thickness, smooth, reasonably bright, continuous and free from imperfections such as flux, ash, rust stains, bulky white deposits and blisters. The zinc used for galvanising shall be of grade Zn 99.95 as per IS:209.

2.27.6 In case of castings, the same shall be free from all internal defects like shrinkage, inclusion, blow holes, cracks etc.

2.27.7 All current carrying parts shall be so designed and manufactured that contact resistance is reduced to minimum and localized heating phenomenon is averted.

2.27.8 No equipment shall have sharp ends or edges, abrasions or projections and shall not cause any damage to the conductor in any way during erection or during continuous operation which would produce high electrical and mechanical stresses in normal working. The design of adjacent metal parts and mating surfaces shall be such as to prevent corrosion of the contact surface and to maintain good electrical contact under all service conditions.

2.27.9 Particular care shall be taken during manufacture and subsequent handling to ensure smooth surface free from abrasion or cuts.

2.27.10 The fasteners shall conform to the requirements of IS: 6639-1972. All fasteners and clamps shall have corona free locking arrangement to guard against vibration loosening.

2.28 Compression Markings

Die compression areas shall be clearly marked on each equipment designed for continuous die compressions and shall bear the words 'COMPRESS FIRST' 'suitably inscribed on each equipment where the compression begins. If the equipment is designed for intermittent die compressions, it shall bear the identification marks 'COMPRESSION ZONE' and 'NON-COMPRESSION ZONE' distinctly with arrow marks showing the direction of compression and knurling marks showing the end of the zones. The letters, number and other

markings on finished equipment shall be distinct and legible.

2.29 Bid Drawings

2.29.1 The Bidder shall furnish detailed dimensioned drawings of the equipments and all component parts. Each drawing shall be identified by a drawing number and Contract number. All drawings shall be neatly arranged. All drafting and lettering shall be legible. The minimum size of lettering shall be 3 mm. All dimensions and dimensional tolerances shall be mentioned in mm.

2.29.2 The drawings shall include

(i) Dimensions and dimensional tolerances

(ii) Material fabrication details including any weld details and any specified finishes and coatings. Regarding material, designations and reference of standards are to be indicated.

(iii) Catalogue No.

(iv) Marking

(v) Weight of assembly

(vi) Installation instructions

(vii) Design installation torque for the bolt or cap screw

(viii) Withstand torque that may be applied to the bolt or cap screw without failure of component parts

(ix) The compression die number with recommended compression pressure.

(x) All other relevant technical details

2.29.3 Placement charts for spacer/spacer damper and damper

2.29.4 The above drawings shall be submitted with all the details as stated above along with the bid document. After the placement of award. The Contractor shall again submit the drawings in four copies to the Owner for approval. After Owner's approval and successful completion of all type tests, 20 (twenty) more sets of drawings shall be submitted to Owner for further distribution and field use at Owner's end.

2.30 Test and Standards

2.30.1 Type Test

2.30.1.1 On the complete Disc Insulator Strings with Hardware Fittings

a)	Power frequency voltage withstand test with corona control rings/grading ring and arcing horns under wet condition	:	As per IEC:60383
b)	Impulse voltage withstand test under dry condition	:	As per IEC:60383
c)	Mechanical Strength test	:	As per Annex-A

Note: 1) All the type test given in Clause No. 2.30.1.1 shall be conducted on Single 'I' suspension & Single Tension insulator string.

2) All the type tests given under Clause No. 2.30.1.1 (a) to (c) shall also be conducted on Single I Pilot, Double I Suspension & Double Tension insulator strings

2.30.2 On Hardware Fittings

i) Mechanical Strength Test on Tension Hardware fitting : As per Annex-A

ii) Mechanical Strength Test on Suspension Hardware fitting : As per Annex-A

2.30.3 On Suspension Clamp

i) Magnetic power loss test : As per Annexure-A

ii) Clamp slip strength Vs torque test : As per Annexure-A

iii) Ozone Test on elastomer : As per Annexure-A

iv) Vertical damage load & Failure load test : IEC: 61284

2.30.4 On Dead end Tension Assembly

i) Electrical resistance test for dead end Assembly : As per Annexure-A

ii) Heating cycle test for dead end Assembly : As per IS:2486-(Part-I)

iii) Slip strength test for dead end assembly :As per IS:2486-(Part-I)

iv) Ageing test on filler (if applicable) : As per Annexure-A

2.30.5 Mid Span Compression Joint for Conductor

i)	Chemical analysis of materials	: As per Annexure-A
ii)	Electrical resistance test	:As per IS:2121 (Part-II)
iii)	Heating cycle test	:As per Annexure-A
iv)	Slip strength test	: As per Annexure-A
v)	Corona extinction voltage test (dry)	: As per Annexure-A
vi)	Radio interference voltage test (dry)	: As per Annexure-A

2.30.6 Repair Sleeve for Conductor

i)	Chemical analysis of materials	: As per Annexure-A
ii)	Corona extinction voltage test (dry)	: As per Annexure-A
iii)	Radio interference voltage test (dry)	: As per Annexure-A

2.30.7 Vibration Damper for Conductor

i)	Chemical analysis of materials	: As per Annexure-A
ii)	Dynamic characteristics test*	: As per Annexure-A
iii)	Vibration analysis	: As per Annexure-A
iv)	Clamp slip test	: As per Annexure-A
v)	Fatigue tests	: As per Annexure-A
vi)	Magnetic power loss test	: As per Annexure-A
ix)	Corona extinction voltage test (dry)	: As per Annexure-A
viii)	Radio interference voltage test (dry)	: As per Annexure-A
ix)	Damper efficiency test	: As per IS:9708

2.30.8 Type tests specified under Clause 2.30.1 to 2.30.7 shall not be required to be carried out if a valid test certificate is available for a similar design, i.e., tests conducted earlier should have been conducted in accredited laboratory (accredited based on ISO/IEC guide 25/17025 or EN

45001 by the National Accreditation body of the country where laboratory is located) or witnessed by the representative (s) Central/State Power Utility.

In the event of any discrepancy in the test report (i.e., any test report not applicable due to any design / material/manufacturing process change including substitution of components or due to non-compliance with the requirement stipulated in the Technical Specification) the tests shall be conducted by the Contractor at no extra cost to the Employer/ Employer/ Employer.

2.31 Acceptance Tests

2.31.1 On Both Suspension Clamp and Tension Hardware Fittings

i)	Visual Examination	: As per IS:2486-(Part-I)
ii)	Verification of dimensions	: As per IS:2486-(Part-I)
iii)	Galvanising/Electroplating test	: As per IS:2486-(Part-I)
iv)	Mechanical strength test of each component	: As per Annexure-A
v)	Mechanical strength test for corona control ring/ grading ring and arcing horn	: As per BS:3288(Part-I)
vi)	Test on locking device for ball and socket coupling	: As per IEC:372 (2)
vii)	Mechanical Strength test of welded joint	: As per Annexure-A
viii)	Chemical analysis, hardness tests, grain size, inclusion rating & magnetic particle inspection for forgings/castings	: As per Annexure-A

2.31.2 On Suspension Clamp only

a)	Clamp Slip strength Vs Torque test for suspension clamp	: As per Annexure-A
b)	Shore hardness test of elastomer cushion for AG suspension clamp	: As per Annexure-A
c)	Bend test for armour rod set	: As per IS:2121(Part-I), Clause 7.5,7,10 & 7.11
d)	Resilience test for armour rod set	: As per IS:2121(Part-I), Clause 7.5,7,10 & 7.11

	e) Conductivity test for armour rods set	: As per IS:2121(Part-I), Clause 7.5,7,10 & 7.11
2.31.3	On Tension Hardware Fittings only	
	a) Slip strength test for dead end assembly	: As per IS:2486 (Part-I) Clause 5.4
	b) Ageing test on filler (if applicable)	: As per Annexure-B
2.31.4	On Mid Span Compression Joint for Conductor	
	a) Visual examination and dimensional verification	: As per IS:2121 (Part-II), Clause 6.2, 6.3 7 6.7
	b) Galvanizing test	: As per Annexure-B
	c) Hardness test	: As per Annexure-B
	d) Ageing test on filler (if applicable)	: As per Annexure-B
2.31.5	Repair Sleeve for Conductor	
	a) Visual examination and dimensional verification	: As per IS: 2121(Part-II) Clause 6.2, 6.3
2.31.6	Vibration Damper for Conductor	
	a) Visual examination and dimensional verification	: As per IS: 2121(Part-II) Clause 6.2, 6.3 7 6.7
	b) Galvanizing test	: As per Annexure-B
	(i) On damper masses	: As per Annexure-B
	i) On messenger cable	: As per Annexure-B
	c) Verification of resonance frequencies	: As per Annexure-B
	d) Clamp slip test	: As per Annexure-B
	e) Clamp bolt torque test	As per Annexure-B
	f) Strength of the messenger cable	: As per Annexure-B
	g) Mass pull off test	: As per Annexure-B
	h) Dynamic characteristics test*	: As per Annexure-B

Applicable for 4 R stockbridge dampers. For alternate type of vibration dampers (permitted as per clause 2.26), as an alternative to dynamic characteristic test, damper efficiency test as per IEEE-664 may be proposed/ carried out by the supplier.

2.32 Routine Tests

2.32.1 For Hardware Fittings

a) Visual examination : IS:2486-(Part-I)

b) Proof Load Test : As per Annexure-A

2.32.2 For conductor accessories

a) Visual examination and dimensional verification : As per IS: 2121(Part-II) Clause 6.2, 6.3 7 6.7

2.32.3 Tests During Manufacture on all components as applicable

a) Chemical analysis of Zinc used for galvanizing :IS: 2486-(Part-I)

b) Chemical analysis mechanical metallographic test and magnetic particle inspection for malleable castings : As per Annexure-A

c) Chemical analysis, hardness tests and magnetic particle inspection for forging : As per Annexure-A

2.33 Testing Expenses

2.33.1 As indicated in clause 2.30.8 no type test charges shall be payable.

2.33.2 In case type testing is required due to non-availability of type test reports, or type test on the complete insulator string, the Contractor has to arrange similar insulators at his own cost.

2.33.3 Bidder shall indicate the laboratories in which they propose to conduct the type tests. They shall ensure that adequate facilities for conducting the tests are available in the laboratory and the tests can be completed in these laboratories within the time schedule guaranteed by them in the appropriate schedule.

2.33.4 The entire cost of testing for type tests, acceptance and routine tests and tests during manufacture specified herein shall be treated as included in the quoted Ex-works/CIF Price.

2.33.5 In case of failure in any type test, repeat type tests are required to be conducted, then, all the expenses for deputation of Inspector/ Owner's representative shall be deducted from the

contract price. Also if on receipt of the Contractor's notice of testing, the Owner's representative/Inspector does not find material & facilities to be ready for testing the expenses incurred by the Owner's for re- deputation shall be deducted from contract price.

2.33.6 The Contractor shall intimate the Owner about carrying out of the type tests along with detailed testing programme at least 3 weeks in advance of the scheduled date of testing during which the Owner will arrange to depute his representative to be present at the time of carrying out the tests.

2.34 Schedule of Testing and Additional Tests

2.34.1 The Bidder has to indicate the schedule of following activities in their bids

(a) Submission of drawing for approval.

(b) Submission of Quality Assurance programme for approval.

(c) Offering of material for sample selection for type tests.

(d) Type testing.

2.34.2 The Employer reserves the right of having at his own expense any other test(s) of reasonable nature carried out at Contractor's premises, at site, or in any other place in addition to the aforesaid type, acceptance and routine tests to satisfy himself that the material comply with the specifications.

2.34.3 The Employer also reserves the right to conduct all the tests mentioned in this specification at his own expense on the samples drawn from the site at Contractor's premises or at any other test centre. In case of evidence of noncompliance, it shall be binding on the part of Contractor to prove the compliance of the items to the technical specifications by repeat tests, or correction of deficiencies, or replacement of defective items, all without any extra cost to the Employer.

2.35 Test Reports

2.35.1 Copies of acceptance test report shall be furnished in atleast six copies. One copy shall be returned, duly certified by the Employer, only after which the materials will be despatched.

2.35.2 Record of routine test report shall be maintained by the Contractor at his works for periodic inspection by the Employer's representative.

2.35.3 Test certificates of tests during manufacture shall be maintained by the Contractor. These shall be produced for verification as and when desired by the Employer.

2.36 Inspection

2.36.1 The Owner's representative shall at all times be entitled to have access to the works and all places of manufacture, where the material and/or its component parts shall be manufactured and the representatives shall have full facilities for unrestricted inspection of the Contractor's, sub- Contractor's works raw materials. manufacturer's of all the material and for conducting necessary tests as detailed herein.

2.36.2 The material for final inspection shall be offered by the Contractor only under packed condition. The engineer shall select samples at random from the packed lot for carrying out acceptance tests.

2.36.3 The Contractor shall keep the Employer informed in advance of the time of starting and of the progress of manufacture of material in its various stages so that arrangements could be made for inspection.

2.36.4 Material shall not be dispatched from its point of manufacture before it has been satisfactorily inspected and tested unless the inspection is waived off by the Owner in writing. In the latter case also the material shall be dispatched only after all tests specified herein have been satisfactorily completed.

2.36.5 The acceptance of any quantity of material shall in no way relieve the Contractor of his responsibility for meeting all the requirements of the Specification, and shall not prevent subsequent rejection, if such materials are later found to be defective.

2.37 Packing and Marking

2.37.1 All material shall be packed in strong and weather resistant wooden cases/crates. The gross weight of the packing shall not normally exceed 200 Kg to avoid handling problems.

2.37.2 The packing shall be of sufficient strength to withstand rough handling during transit, storage at site and subsequent handling in the field.

2.37.3 Suitable cushioning, protective padding, dunnage or spacers shall be provided to prevent damage or deformation during transit and handling.

2.37.4 Bolts, nuts, washers, cotter pins, security clips and split pins etc. shall be packed duly installed and assembled with the respective parts and suitable measures shall be used to prevent their loss.

2.37.5 Each component part shall be legibly and indelibly marked with trade mark of the manufacturer and year of manufacture. However, in such type of component/item, which consists of many parts and are being supplied in assembled condition(suspension clamp, vibration damper, etc.), the complete assembly shall be legibly and indelibly marked on main body/on one of the parts.

2.37.6 All the packing cases shall be marked legibly and correctly so as to ensure safe arrival at their destination and to avoid the possibility of goods being lost or wrongly despatched on account of faulty packing and faulty or illegible markings. Each wooden case/crate shall have all the markings stencilled on it in indelible ink.

2.38 Standards

2.38.1 The Hardware fittings; conductor and earthwire accessories shall conform to the following Indian/International Standards which shall mean latest revisions, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification.

2.38.2 In the event of the supply of hardware fittings; conductor accessories conforming to standards other than specified, the Bidder shall confirm in his bid that these standards are equivalent to those specified. In case of award, salient features of comparison between the Standards proposed by the Contractor and those specified in this document will be provided by the Contractor to establish their equivalence.

Sl. No.	Indian Standard	Title	International Standard
1.	IS: 209-1992	Specification for zinc	BS:3436-1986
2.	IS:398-1992 Part-V	Aluminum Conductor Galvanised Steel-Reinforced For Extra High Voltage (400 KV) and above	IEC:1089-1991 BS:215-1970
3.	IS 1573	Electroplated Coating of Zinc on iron and Steel	
4.	IS : 2121 (Part-II)	Specification for Conductor and Earthwire Accessories for Overhead Power lines:	
5.	IS:2486 (Part-I)	Mid-span Joints and Repair Sleeves for Conductors Specification for Insulator Fittings for Overhead power Lines with Nominal Voltage greater than 1000 V: General Requirements and Tests	

6.	IS:2629	Recommended Practice for Hot Dip Galvanising of Iron and Steel	
7.	IS:2633	Method of Testing Uniformity of Coating on Zinc Coated Articles	
8.		Ozone test on Elastomer Tests on insulators of Ceramic material or glass for overhead lines with a nominal voltage greater than 1000V	ASTM- D1 171
10.	IS:4826	Galvanised Coating on Round Steel Wires	ASTM A472-729
			BS:443-1969
11.	IS:6745	Methods of Determination of Weight of Zinc Coating of Zinc Coated Iron and Steel	BS:433
12.	IS:8263	Method of Radio Interference Tests on High Voltage Insulators	IEC:437 NEMA:107 CISPR
13.	IS:6639	Hexagonal Bolts for Steel Structures	ISO/R-272
14.	IS:9708	Specification for Stock Bridge Vibration Dampers for Overhead Power lines	

ANNEXURE - A

1. Tests on Complete Strings with Hardware Fittings

1.1 Mechanical Strength Test

The complete insulator string along with its hardware fitting excluding arcing horn, corona control ring, grading ring and suspension assembly/dead end assembly shall be subjected to a load equal to 50% of the specified minimum ultimate tensile strength (UTS) which shall be increased at a steady rate to 67% of the minimum UTS specified. The load shall be held for five minutes and then removed. After removal of the load, the string components shall not show any visual deformation and it shall be possible to disassemble them by hand. Hand tools may be used to remove cotter pins and loosen the nuts initially. The string shall then be reassembled and loaded to 50% of UTS and the load shall be further increased at a steady rate till the specified minimum UTS and held for one minute. No fracture should occur during this period. The applied load shall then be increased until the failing load is reached and the value recorded.

1.2 Mechanical Strength Test for Suspension/Tension Hardware Fittings

The complete string without insulators excluding arcing horn, corona control rings/grading ring and suspension assembly/dead end assembly shall be subjected to a load equal to 50% of the specified minimum ultimate tensile strength (UTS) which shall be increased at a steady rate to 67% of the minimum UTS specified. This load shall be held for five minutes and then removed. After removal of the load, the string component shall not show any visual deformation and it shall be possible to disassemble them by hand. Hand tools may be used to remove cotter pins and loosen the nuts initially. The string shall then be reassembled and loaded to 50% of UTS and the load shall be further increased at a steady rate till the specified minimum UTS is reached and held for the one minute. No fracture should occur during this period. The applied load shall then be increased until the failing load is reached and the value recorded.

1.3 Magnetic Power Loss Test for Suspension Assembly

An alternating current over the range of 1000 amps to 1500 shall be passed through each tube. The reading of the wattmeter with and without suspension assemblies alongwith line side yoke plate, clevis eye shall be recorded. Not less than three suspension assemblies shall be tested. The average power loss for suspension assembly shall be plotted for each value of current. The value of the loss corresponding to 1000 Amperes shall be read off from the graph and the same shall be limited to the value guaranteed by the supplier.

1.4 Galvanising/Electroplating Test

The test shall be carried out as per Clause no. 5.9 of IS: 2486-(Part-1) except that both uniformity of zinc coating and standard preecee test shall be carried out and the results obtained shall satisfy the requirements of this specification.

1.5 Mechanical Strength Test of Each Component

Each component shall be subjected to a load equal to the specified minimum ultimate tensile strength (UTS) which shall be increased at a steady rate to 67% of the minimum UTS specified. The load shall be held for five minutes and then removed. The component shall then again be loaded to 50% of UTS and the load shall be further increased at a steady rate till the specified UTS and held for one minute. No fracture should occur. The applied load shall then be increased until the failing load is reached and the value recorded.

1.6 Mechanical Strength Test of Welded Joint

The welded portion of the component shall be subjected to a Load of 2000 kgs for one minute. Thereafter, it shall be subjected to die-penetratration/ ultrasonic test. There shall not be any

crack at the welded portion.

1.7 Clamp Slip Strength Vs Torque Test for Suspension Clamp

The suspension assembly shall be vertically suspended by means of a flexible attachment. A suitable length of conductor shall be fixed in the clamp. The clamp slip strength at various tightening torques shall be obtained by gradually applying the load at one end of the conductor. The Clamp slip strength vs torque curve shall be drawn. The above procedure is applicable only for free centre type suspension clamp. For AG suspension clamp only clamp slip strength after assembly shall be found out. The clamp slip strength at the recommended tightening torque shall be as indicated in GTP.

1.8 Heating Cycle Test

Heating cycle test shall be performed in accordance with IS 2486 (Part-I) with following modifications:-

i) Temperature of conductor during each cycle: 40 deg. C above designed maximum operating temperature of the conductor, but not to exceed the maximum use temperature of the conductor.

ii) Number of cycle: 100

iii) Slip strength test shall also be carried out after heating cycle test.

1.9 Ageing Test on Filler (if applicable)

The test shall be done in accordance with Grease drop point test method. The specimen should be drop as a droplet when kept at a temperature 40 deg. C above designed maximum operating temperature of the conductor for 30 minutes. The temperature shall then be increase till one droplet drops and the temperature recorded.

1.10 Shore Hardness Test for Elastomer Cushion for AG Suspension Assembly

The shore hardness at various points on the surface of the elastomer cushion shall be measured by a shore hardness meter and the shore hardness number shall be between 65 to 80.

1.11 Proof Load Test

Each component shall be subjected to a load equal to 50% of the specified minimum ultimate

tensile strength which shall be increased at a steady rate to 67% of the UTS specified. The load shall be held for one minute and then removed. After removal of the load the component shall not show any visual deformation.

1.12 Tests for Forging Casting and Fabricated Hardware

The chemical analysis, hardness test, grain size, inclusion rating and magnetic particle inspection for forging, castings and chemical analysis and proof load test for fabricated hardware shall be as per the internationally recognized procedures for these tests. The sampling will be based on heat number and heat treatment batch. The details regarding test will be as in the Quality Assurance programme.

1.13 Ozone Test for Elastomer

This test shall be performed in accordance with ASTM D-1171 by the Ozone chamber exposure method (method B). The test duration shall be 500 hours and the ozone concentration 50 PPHM. At the test completion, there shall be no visible crack under a 2 x magnification.

2.0 Tests on Accessories for Conductor

2.1 Mid Span Compression Joint for Conductor

(a) Slip Strength Test

The fitting compressed on conductor shall not be less than one meter in length. The test shall be carried out as per IS:2121 (Part-ii)-1981 clause 6-4 except that the load shall be steadily increased to 95% of minimum ultimate tensile strength of conductor and retained for one minute at this load. There shall be no movement of the conductor relative to the fittings and no failure of the fit tings during this one minute period.

(b) Heating Cycle Test

Heating cycle test shall be performed in accordance with IS 2121 (Part-II-1981) with following modifications:-

i) Temperature of conductor during each cycle: 40 deg. C above designed maximum operating temperature of the conductor.

ii) Number of cycle: 100

iii) Slip strength test shall also be carried out after heating cycle test.

2.2 Vibration Damper for Conductor

(a) Dynamic Characteristics, Test

The damper shall be mounted with its clamp tightened with torque recommended by the manufacturer on shaker table capable of simulating sinusoidal vibrations for aeolian vibration frequency band ranging from 5 to 40 Hz for damper for conductor. The damper assembly shall be vibrated vertically with a + 1 mm amplitude from 5 to 15 Hz frequency and beyond 15 Hz at ± 0.5mm to determine following characteristics with the help of suitable recording instruments:

(i) Force Vs Frequency
(ii) Phase angle Vs frequency
(iii) Power dissipation Vs. frequency

The Force Vs frequency curve shall not show steep peaks at resonance frequencies and deep troughs between the resonance frequencies. The resonance frequencies shall be suitably spread within the aeolian vibration frequency-band between the lower and upper dangerous frequency, limits determined by the vibration analysis of conductor without dampers.
Acceptance criteria for vibration damper.

(i) The above dynamic characteristics test on five damper shall be conducted. The above dynamic characteristics test on five damper shall be conducted.

(ii) The mean reactance and phase angle Vs frequency curves shall be drawn with the criteria of best fit method.

(iii) The above mean reactance response curve should lie within 0.191 f to 0.762f Kgf/mm limits where f is frequency in Hz.

(iv) The above mean phase angle response curve shall be between 25^0 to 130^0 within the frequency range of interest.

(v) If the above curve lies within the envelope, the damper design shall be considered to have successfully met the requirement.

(vi) Visual resonance frequencies of each mass of damper is to be recorded and to be compared with the guaranteed values.

(b) Vibration Analysis

The vibration analysis of the conductor shall be done with and without damper installed on the span. The vibration analysis shall be done on a digital computer using

energy balance approach. The following parameters shall be taken into account for the purpose of analysis:

(i) The analysis shall be done for single conductor without armour rods as per the parameters given of this part of the Specification. The tension shall be taken from Sag & Tension calculation (0 deg. C & no wind condition and 320 m ruling span) for a span ranging from 50 m to 1100.

(ii) The self damping factor and flexural stiffness (EI) for conductor shall be calculated on the basis of experimental results. The details for experimental analysis with these data should be furnished.

(iii) The power dissipation curve obtained from Dynamic Characteristics Test shall be used for analysis with damper.

(iv) Examine the aeolian vibration level of the conductor with and without vibration damper installed at the recommended location or wind velocity ranging from 0 to 30 Km per hour, predicting amplitude, frequency and vibration energy input.

(v) From vibration analysis of conductor without damper, anti-node vibration amplitude and dynamic strain levels at clamped span extremities as well as antinodes shall be examined and thus lower and upper dangerous frequency limits between which the Aeolian vibration levels exceed the specified limits shall be determined.

(vi) From vibration analysis of conductor with damper/dampers installed at the recommended location, the dynamic strain level, at the clamped span extremities, damper attachment point and the antinodes on the conductor shall be determined. In addition to above damper clamp vibration amplitude and anti-node vibration amplitudes shall also be examined.

The dynamic strain levels at damper attachment points, clamped span extremities and antinodes shall not exceed the specified limits. The damper clamp vibration amplitude shall not be more than that of the specified fatigue limits.

(c) Clamp Slip and Fatigue Tests

(i) Test Set Up

The clamp slip and fatigue tests shall be conducted on a laboratory set up with a minimum effective span length of 30 m. The conductor shall be tensioned at tension corresponding to 0 deg & no wind condition and ruling span 320 from sag –tension calculation and shall not be equipped with protective armour rods at any point. Constant tension shall be maintained within the span by means of lever arm arrangement. After

the conductor has been tensioned, clamps shall be installed to support the conductor at both ends and thus influence of connecting hardware fittings are eliminated from the free span. The clamps shall not be used for holding the tension on the conductor. There shall be no loose parts, such as suspension clamps, U bolts on the test span supported between clamps mentioned above. The span shall be equipped with vibration inducing equipment suitable for producing steady standing vibration. The inducing equipment shall have facilities for stepless speed control as well as stepless amplitude arrangement. Equipment shall be available for measuring the frequency, cumulative number of cycles and amplitude of vibration at any point along the span.

(ii) Clamp Slip test

The vibration damper shall be installed on the test span. The damper clamp, after lightning with the manufacturer's specified tightening torque, when subjected to a longitudinal pull of 2.5 kN parallel to the axis of conductor for a minimum duration of one minute shall not slip i.e. the permanent displacement between conductor and clamp measured after removal of the load shall not exceed 1.0 mm. The load shall be further increased till the clamp starts slipping. The load at which the clamp slips shall not be more than 5 kN.

(iii) Fatigue Test

The vibration damper shall be installed on the test span with the manufacturer's specified tightening torque. It shall be ensured that the damper shall be kept minimum three loops away from the shaker to eliminate stray signals influencing damper movement.

The damper shall then be vibrated at the highest resonant frequency of each damper mass. For dampers involving resonant frequencies, tests shall be done at torsional modes also in addition to the highest resonant frequencies at vertical modes. The resonance frequency shall be identified as the frequency at which each damper mass vibrates with the maximum amplitude on itself. The amplitude of vibration of the damper clamp shall be maintained not less than ± 25/f mm, where f is the frequency in Hz.

The test shall be conducted for minimum ten million cycles at each resonant frequency mentioned above. During the, test if resonance shift is observed the test frequency shall be tuned to the new resonant frequency.

The clamp slip test as mentioned hereinabove shall be repeated after fatigue test without re-torquing or adjusting the damper clamp, and the clamp shall withstand a minimum load equal to 80% of the slip strength for a minimum duration of one minute.

After the above tests, the damper shall be removed from conductor and subjected to dynamic characteristics test. There shall not be any major deterioration in the

characteristic of the damper. The damper then shall be cut open and inspected. There shall not be any broken, loose, or damaged part. There shall not be significant deterioration or wear of the damper. The conductor under clamp shall also be free from any damage.
For the purpose of acceptance, the following criteria shall be applied.

1) There shall not be any frequency shift by more than +2 Hz for frequencies lower than 15 Hz and ± 3 Hz for frequencies higher than 15 Hz.

2) The force response curve shall generally lie within guar anteed % variation in reactance after fatigue test in comparison with that before fatigue test by the Contractor.

3) The power dissipation of the damper shall not be less than guaranteed % variation in power dissipation before fatigue test by the Contractor. However, it shall not be less than minimum power dissipation which shall be governed by lower limits of reactance and phase angle indicated in the envelope.

2.3 Corona Extinction Voltage Test (Dry)

The sample when subjected to power frequency voltage shall have a corona extinction voltage of not less than 105 kV rms line to ground under dry condition. There shall be no evidence of corona on any part of the sample. The atmospheric condition during testing shall be recorded and the test results shall be accordingly corrected with suitable correction factor as stipulated in IS:731- 1971.

2.4 Radio Interference Voltage Test (Dry)

Under the conditions as specified under (3.8) above, the sample shall have a radio interference voltage level below 1000 microvolts at one MHz when subjected to 50 Hz AC voltage of 154 kV rms line to ground under dry condition. The test procedure shall be in accordance with IS : 8263.

2.5 Tests on All components (As applicable)

2.5.1 Chemical Analysis of Zinc used for Galvanizing

Samples taken from the zinc ingot shall be chemically analysed as per IS-209-1979. The purity of zinc shall not be less than 99.95%.

2.5.2 Tests for Forgings

The chemical analysis hardness tests and magnetic particle inspection for forgings, will be as per the internationally recognized procedures for these tests. The, sampling will be based on

heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the Contractor and Employer in Quality Assurance Programme.

2.5.3 Tests on Castings

The chemical analysis, mechanical and metallographic tests and magnetic particle inspection for castings will be as per the internationally recognised procedures for these tests. The samplings will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the Contractor and Employer in Quality Assurance Programme.

ANNEXURE – B

Acceptance Tests

1. Mid Span Compression Joint for Conductor

(a) Hardness Test

The Brinnel hardness at various points on the steel sleeve of conductor core and tension clamp shall be measured.

2. Vibration Damper for Conductor

(a) Verification of Resonance Frequencies

The damper shall be mounted on a shaker table and vibrate at damper clamp displacement of +/-0.5 mm to determine the resonance frequencies. The resonance shall be visually identified as the frequency at which damper mass vibrates with maximum displacement on itself. The resonance frequency thus identified shall be compared with the guaranteed value. A tolerance of ± 1 Hz at a frequency lower than 15 Hz and ± 2 Hz at a frequency higher than 15 Hz only shall be allowed.

(b) Clamp Slip Test

Same as Clause 2.2 (c) (ii) of Annexure-A.

(c) Clamp Bolt Torque Test

The clamp shall be attached to a section of the conductor/earthwire. A torque of 150 percent of the manufacturer's specified torque shall be applied to the bolt. There shall

be no failure of component parts. The test set up is as described in Clause 2.2 (c) (i), Annexure-A.

(d) Strength of the Messenger Cable

The messenger cable shall be fixed in a suitable tensile testing machine and the tensile load shall be gradually applied until yield point is reached. Alternatively, each strand of messenger cable may be fixed in a suitable tensile testing machine and the tensile load shall be gradually applied until yield point is reached. In such a case, the 95% of yield strength of each wire shall be added to get the total strength of the cable. The load shall be not less than the value guaranteed by the Contractor

(e) Mass Pull off Test

Each mass shall be pulled off in turn by fixing the mass in one jaw and the clamp in the other of a suitable tensile testing machine. The longitudinal pull shall be applied gradually until the mass begins to pull out of the messenger cable. The pull off loads shall not be less than the value guaranteed by the Contractor.

(f) Dynamic Characteristics Test

The test will be performed as acceptance test with the procedure mentioned for type test with sampling mentioned below :
Vibration Damper of

- 1 Sample for 1000 Nos. & below Conductor
- 2 Samples for lot above 1000 & up to 5000 nos.
- Additional 1 sample for every additional 1500 pieces above 5000.

The acceptance criteria will be as follows

i. The above dynamic characteristics curve for reactance & phase angle will be done for frequency range of 5 Hz to 40 Hz.

ii. If all the individual curve for dampers are within the envelope as already mentioned for type test for reactance & phase angle, the lot passes the test.

iii. If individual results do not fall within the envelope, averaging of characteristics shall be done.

a. Force of each damper corresponding to particular frequency shall be taken & average force of three dampers at the frequency calculated.

b. Similar averaging shall be done for phase angle.

c. Average force Vs frequency and average phase Vs frequency curves shall be plotted on graph paper. Curves of best fit shall be drawn for the entire frequency range.

d. The above curves shall be within the envelope specified.

SUB-SECTION III

3.0 Technical Specification of Composite Long Rod Insulators

3.1 Details of Composite Long Rod Insulators

3.1.1 The insulators of the strings shall consist of composite long rod insulators for transmission system application in a very heavily polluted environment. Couplings shall be ball and socket type.

3.1.2 Bidder shall quote such composite insulators which have proven use under foggy/ humid operational conditions in polluted industrial environment combined with smoke and dust particles. The Bidder shall furnish evidence in the form of certification from the power utilities that the similar type of product supplied to them had been performing satisfactory. The Bidder shall also submit certified test report for an accelerated ageing test of 5000 hours such as that described in Appendix-C of IEC-61109.

3.1.3 Insulators shall have sheds of the “open aerodynamic profile without any under ribs” with good self- cleaning properties. Insulator shed profile, spacing projection etc. shall be strictly in accordance with the recommendation of IEC-60815.

3.1.4 The size of long rod insulator, minimum creepage distance, and the number to be used in different type of strings, their electromechanical strength and mechanical strength of insulator string along with hardware fittings shall be as per the standard technical particulars enclosed at Annexure-B.

3.2 Dimensional Tolerance of Composite Insulators

The tolerances on all dimensions e.g. diameter, length shall be allowed as follows:

± (0.04d+1.5) mm when d≤300 mm.

± (0.025d+6) mm when d>300 mm.

Where, d being the dimensions in millimeters for diameter, length as the case may be.

The tolerance in creepage distance shall be based on design dimensions and their tolerances. However, no negative tolerance shall be applicable to creepage distance specified in clause 3.1.4.

3.3 Interchangeability

The composite long rod insulators inclusive of the ball & socket connection shall be standard design suitable for use with the hardware fittings of any make conforming to relevant IEC standards.

3.4 Corona and RI Performance

All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and shall not generate any radio interference beyond specified limit under the operating conditions.

3.5 Maintenance

3.5.1 The long rod insulators offered shall be suitable for employment of hot line maintenance technique so that usual hot line operation can be carried out with ease, speed and safety.

3.5.2 All insulators shall be designed to facilitate cleaning and insulators shall have the minimum practical number of sheds and grooves. All grooves shall be so proportioned that any dust deposit can be removed without difficulty either by wiping with a cloth or by remote washing under live line condition.

3.6 Materials

3.6.1 Core

It shall be a glass-fiber reinforced (FRP rod) epoxy resin rod of high strength. The rod shall be resistant to hydrolysis. Glass fibers and resin shall be optimized. The rod shall be electrical grade corrosion resistant (ECR), boron free glass and shall exhibit both high electrical integrity and high resistance to acid corrosion.

3.6.2 Housing & Weather sheds

The FRP rod shall be covered by a sheath of a silicone rubber compound of a thickness of minimum 3 mm. The housing & weather sheds should have silicon content of minimum 30% by weight. It should protect the FRP rod against environmental influences, external pollution and humidity. It shall be extruded or directly molded on the core. The interface between the housing and the core must be uniform and without voids. The strength of the bond shall be

greater than the tearing strength of the polymer. The manufacturer shall follow non-destructive technique (N.D.T.) to check the quality of jointing of the housing interface with the core. The technique to be followed with detailed procedure and sampling shall be furnished by the Supplier and finalized during finalization of MQP.

The weather sheds of the insulators shall be of alternate shed profile. The weather sheds shall be vulcanized to the sheath (extrusion process) or molded as part of the sheath (injection molding process) and free from imperfections. The vulcanization for extrusion process shall be at high temperature and for injection molding shall be at high temperature & high pressure. Any seams / burrs protruding axially along the insulator, resulting from the injection molding process shall be removed completely without causing any damage to the housing. The track resistance of housing and shed material shall be class 1A 4.5 according to IEC60587. The strength of the weather shed to sheath interface shall be greater than the tearing strength of the polymer. The composite insulator shall be capable of high pressure washing.

3.6.3 End Fittings

End fittings transmit the mechanical load to the core. They shall be made of malleable cast iron spheroidal graphite or forged steel. They shall be connected to the rod by means of a controlled compression technique. The manufacturer shall have in-process Acoustic emission arrangement or some other arrangement to ensure that there is no damage to the core during crimping. This verification shall be in- process and done on each insulator. The system of attachment of end fitting to the rod shall provide superior sealing performance between housing and metal connection. The end fitting shall either be over-moulded or shall be sealed by a flexible silicone rubber compound. The sealing shall stick to both housing and metal end fitting. The sealing must be humidity proof and durable with time.

End fittings shall have suitable provisions for fixing grading rings at the correct position as per design requirements.

3.6.4 Grading Rings

Grading rings shall be used for each composite insulator unit as per Standard Technical particulars enclosed at Annexure-B for reducing the voltage gradient on and within the insulator and to reduce radio and TV noise to acceptable levels. Covered grading rings (having minimum 2 mm sheet thickness of the cover) shall be provided on suspension insulator strings at cross-arm/ cold end as per Standard Technical particulars enclosed at Annexure-B and drawing attached of Technical specification to reduce deposition of bird excreta on polymer insulator sheds. The covered grading ring shall have sloping surface so as to facilitate natural cleaning/ removal of any deposition on its surface. The grading ring shall

essentially be a round extruded Aluminium Alloy tube of minimum 50 mm diameter & minimum wall thickness of 2.5 mm. The fixing arms of the grading ring shall consist of a holder & a keeper. While the holder shall be either welded or riveted on the corona ring, the keeper shall be bolted onto the holder. To avoid possibility of loosening/ opening of grading ring during service, suitable additional locking measures viz. Lock nut/ bolt patch/ locking washer etc. shall be provided by the supplier.

The size and placement of the metallic grading rings shall be designed to eliminate dry band arcing/ corona cutting/ exceeding of permissible electrical stress of material. Also for ensuring correct installation of grading rings, a proper slot shall be provided at the outside edge of the End fittings and on grading ring holders. The design of the grading rings shall be such that it will only fit in the designated slot facing correct installation direction. The position of the slots shall be at suitable distance on end fittings to ensure acceptable levels of radio and TV noise and voltage gradient on and within the insulator.

The insulator supplier shall furnish design calculations using appropriate electric field software showing electric field at surface of housing, inside housing & core and at the interface of housing and metal fittings with the proposed placement and design of corona. Grading rings shall be capable of installation and removal with hot line tools without disassembling any other part of the insulator assembly.

The design & supply of grading rings shall be in the scope of the composite insulator supplier. Supplier shall supply extra 10% quantities of grading rings as spares at no extra cost to the Purchaser.

3.7 Workmanship

3.7.1 All the materials shall be of latest design and conform to the best modern practices adopted in the extra high voltage field. Bidders shall offer only such insulators as are guaranteed by him to be satisfactory and suitable for transmission lines specified and will give continued good service.

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

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

3.7.4 The core shall be sound and free of cracks, impurities and voids that may adversely affect the insulators.

3.7.5 Weather sheds/ Housing shall be uniform in quality. It shall be free from voids and impurities. Weather sheds/ Housing shall be clean, sound, smooth and free from gross defects and excessive flashing at parting lines.

3.7.6 End fittings shall be free from cracks, seams, shrinks, air holes and rough edges. End fittings should be effectively, sealed to prevent moisture ingress, effectiveness of sealing system must be supported by test documents. All surfaces of the metal parts shall be perfectly smooth with the projecting points or irregularities which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.

3.7.7 All ferrous parts shall be hot dip galvanized to give a minimum average coating of zinc equivalent to 600 gm/sq.mm. and shall be in accordance with the requirement of ISO:1461 (E) and shall satisfy the tests mentioned in ISO:1460 (E). The zinc used for galvanizing shall be of purity of 99.95%. The zinc coating shall be uniform, adherent, smooth, reasonably bright continuous and free from imperfections such as flux, ash rust stains, bulky white deposits and blisters. The galvanized metal parts shall be guaranteed to withstand at least six successive dips each lasting for one (1) minute duration under the standard preece test. The galvanizing shall be carried out only after any machining.

3.8 Equipment Marking

3.8.1 Each composite long rod unit shall be legibly and indelibly marked with the trade mark of the manufacturer, name of TPTL and month & year of manufacture. The guaranteed combined mechanical and electrical strength shall be indicated in kilo Newton followed by the word 'kN' to facilitate easy identification and to ensure proper use.

3.8.2 One 10 mm thick ring or 20 mm thick spot of suitable quality of paint shall be marked on the cap/end fitting of each composite long rod of particular strength for easy identification of the type of insulator. The paint shall not have any deteriorating effect on the insulator performance. Following codes shall be used as identification mark:

For 70 kN long rod unit : Black

For 90 kN long rod unit : Red

For 120 kN long rod unit : Yellow

3.9 Bid Drawings

3.9.1 The Bidder shall furnish full description and illustration of the material offered.

3.9.2 The Bidder shall furnish along with the bid the outline drawing of each insulator unit along with grading rings including a cross sectional view of the long rod insulator unit. The drawing shall include but not limited to the following information:

a) Major Dimensions with manufacturing tolerances

b) Number of sheds

c) Minimum Creepage distance with positive tolerance

d) Protected creepage distance

e) Unit mechanical and electrical characteristics

f) Size and weight of ball and socket parts

g) Weight of composite long rod units

h) Materials

3.9.3 After placement of award, the Supplier shall submit full dimensioned insulator drawings containing all the details as given in Clause No. 2.20 of Sub-Section II, in four (4) copies to Purchaser for approval. After getting approval from Purchaser, the Supplier shall submit 10 more copies of the same drawing along with a soft copy to the Purchaser for further distribution and field use at Purchaser's end.

3.9.4 After placement of award the Supplier shall also submit fully dimensioned insulator crate drawing for different type of insulators.

3.10 Tests and Standards

3.10.1 Type Tests

The required type tests on composite long rod units, components, materials and complete strings are stipulated hereunder.

The specified type tests under the following clause shall not be required to be carried out if a valid test certificate is available for a similar design. The tests certificate shall be considered valid if:

i. Tests conducted earlier is either conducted in accredited laboratory (accredited based on ISO/IEC vide 25/17025 or EN 45001 by the National accreditation body of the country where laboratory is located) or witnessed by the representative(s) of TPTL. Tests have been conducted not prior to 5 (five) years from the date of bid opening. In

case the test have been conducted earlier than the above stipulated period or in the event of any discrepancy in the test report (i.e., any test not applicable due to any design/manufacturing change including substitution of components or due to non-compliance with the requirement stipulated in the Technical Specifications), the tests shall be conducted by the Supplier at no extra cost to the Purchaser.

a) On the complete composite Long Rod Insulator String with Hardware Fittings:

Sl. No.	Tests	Ref	Strings on which test to be conducted*.
a)	Power frequency / DC voltage withstand test with corona control rings/grading ring and arcing horns under wet condition	IEC: 383-1993/ IEC:60-1	All strings
b)	Switching surge voltage withstand test under wet condition	IEC:383-1993	All strings
c)	Impulse voltage withstand test under dry condition	IEC:383-1993	All strings
d)	Corona (AC / DC) and RIV test under dry condition (applicable for 400kV & above voltage level)	Annex-A	All strings
e)	Mechanical Strength test	As per Annex-A/ B	All strings
f)	Vibration test	As per Annex-A/ B	All strings except Pilot *
g)	AC Salt-fog pollution withstand test / DC Pollution withstand test	Annex-A	All strings except Pilot*

b) On Composite Insulator Units

(a)	Tests on interfaces and connections of metal fittings	IEC: 61109-2008
(b)	Assembled core load time test	IEC: 61109-2008
(c)	Damage limit proof test and test of tightness of interface between end fittings and insulator housing.	IEC: 61109-2008
(d)	High Pressure washing test	Annexure-A
(e)	Brittle fracture resistance test	Annexure-A
(f)	Dye penetration test	IEC: 61109-2008

(g)	Water diffusion test	IEC: 61109-2008
(h)	Tracking and erosion test	IEC: 61109-2008
(i)	Hardness test	IEC: 61109-2008
(j)	Accelerated weathering test	IEC: 61109-2008
(k)	Flammability test	IEC: 61109-2008
(l)	Silicone content test	Annexure-A
(m)	Recovery of Hydrophobicity test	Annexure-A
(n)	Torsion test	Annexure-A

Hardness test, Accelerated weathering test & Flammability test specified under Clause No.4.1.2 above shall be conducted on housing/ weather shed of anyone rating of composite long rod Insulator for the same type of material.

3.10.2 Acceptance Tests:

a) For Composite Long Rod Insulators

a)	Verification of dimensions	IEC : 61109-2008
b)	Galvanizing test	IEC : 60383
c)	Verification of end fittings	IEC: 61109 -2008
d)	Recovery of Hydrophobicity	Annexure-A
e)	Verification of tightness of interface between end fittings and insulator housing and of specified	IEC : 61109-2008
f)	Tests on interfaces and connections of metal fittings	IEC: 61109-2008
g)	Silicone content test	Annexure-A
h)	Brittle Fracture Resistance Test	Annexure-A
i)	Dye Penetration Test	IEC :61109-2008
j)	Water Diffusion Test	IEC : 61109-2008

The test 3.10.2. (f) to (j) shall be carried out as acceptance test on any one lot.

In the event of failure of the sample to satisfy the acceptance test(s) specified in 3.10.2 above, the retest procedure shall be as per IEC 61109.

3.10.3 Routine Tests

a) For Composite Long Rod Insulator Units

a)	Visual Examination	As per IEC:61109-2008
b)	Mechanical routine test	As per IEC:61109 -2008

3.10.4 Tests During Manufacture

On all components as applicable

a)	Chemical analysis of zinc used for galvanizing	As per Annexure-A
b)	Chemical analysis, mechanical, metallographic test and magnetic particle inspection for malleable castings.	As per Annexure-A
c)	Chemical analysis hardness tests and magnetic particle inspection for forgings	As per Annexure-A
d)	Tracking and erosion test on insulating material	IEC 60587

3.10.5 Testing Expenses

a) As mentioned under clause 3.10.1 above, no type test charges shall be payable to the supplier.

b) For Type Tests which involves the tests on the complete insulator string with hardware fitting, standard hardware fittings similar to existing insulator strings shall be arranged and used by the insulator supplier at his own cost.

c) In case of failure in any type test the supplier is either required to modify the design of the material & successfully carryout all the type tests as has been detailed out in Clause 3.10 of this specifications or to repeat that particular type test at least three times successfully at his own expenses.

d) Bidder shall indicate the laboratories in which they propose to conduct the type tests. They shall ensure that adequate facilities are available in the laboratory and the tests can be completed in these laboratories within the time schedule guaranteed by them in the appropriate schedule.

e) The entire cost of testing for acceptance and routine tests and tests during manufacture specified herein shall be treated as included in the quoted Ex-works/CIF Price.

f) In case of failure in any type test, if repeat type tests are required to be conducted, then all the expenses for deputation of Inspector/ Purchaser's representative shall be deducted from the contract price. Also if on receipt of the Supplier's notice of testing, the Purchaser's representative does not find the material or test setup / equipments to be ready for testing, the expenses incurred by the Purchaser for re-deputation shall be deducted from contract price.

g) The Supplier shall intimate the Purchaser about carrying out of the type tests along with detailed testing programme at least 3 weeks in advance (in case of testing in India) and at least 6 weeks advance (in case of testing abroad) of the scheduled date of testing during which the Purchaser will arrange to depute his representative to be present at the time of carrying out the tests.

3.10.6 Sample Batch for Type Testing

a) The Supplier shall offer material for sample selection for type testing only after getting Quality Assurance Programme approved by the Purchaser. The Supplier shall offer at least three times the quantity of materials required for conducting all the type tests for sample selection. The sample for type testing will be manufactured strictly in accordance with the Quality Assurance Programme approved by the Purchaser.

b) Before sample selection for type testing, the Supplier shall be required to conduct all the acceptance tests successfully in presence of Purchaser's representative.

3.10.7 Schedule of Testing

a) The Bidder has to indicate the schedule of following activities in their bids :

a) Submission of drawing for approval.

b) Submission of Quality Assurance Programme for approval.

c) Offering of material for sample selection for type tests.

d) Type testing.

3.10.8 Additional Tests

a) The Purchaser reserves the right of having at his own expenses any other test(s) of reasonable nature carried out at Supplier's premises, at site, or in any other place in addition to the aforesaid type, acceptance and routine tests to satisfy himself that the material comply with the Specifications.

b) The Purchaser also reserves the right to conduct all the tests mentioned in this specification at his own expense on the samples drawn from the site at Supplier's premises or at any other test center. In case of evidence of non-compliance, it shall be binding on the part of the Supplier to prove the compliance of the items to the technical specifications by repeat tests or correction of deficiencies or replacement of defective items, all without any extra cost to the Purchaser.

3.10.9 Guarantee

The Supplier of insulators shall guarantee overall satisfactory performance of the insulators.

3.10.10 Test Reports

a) Copies of type test reports shall be furnished in at least six (6) copies alongwith one original. One copy shall be returned duly certified by the Purchaser only after which the commercial production of the concerned material shall start.

b) Copies of acceptance test reports shall be furnished in at least six (6) copies. One copy shall be returned duly certified by the Purchaser, only after which the material shall be dispatched.

c) Record of routine test reports shall be maintained by the Supplier at his works for periodic inspection by the Purchaser's representative.

d) Test certificates of test during manufacture shall be maintained by the Supplier. These shall be produced for verification as and when desired by the Purchaser.

3.10.11 Inspection

a) The Purchaser's representative shall at all times be entitled to have access to the works and all places of manufacture, where insulator, and its component parts shall be manufactured and the representatives shall have full facilities for unrestricted inspection of the Supplier's and sub-Supplier's works, raw materials, manufacture of the material and for conducting necessary test as detailed herein.

b) The material for final inspection shall be offered by the Supplier only under packed condition as detailed in clause No. 3.12 of the specification. The Purchaser shall select samples at random from the packed lot for carrying out acceptance tests. The lot should be homogeneous and should contain insulators manufactured in 3-4 consecutive weeks.

c) The Supplier shall keep the Purchaser informed in advance of the time of starting and the progress of manufacture of material in their various stages so that arrangements could be made for inspection.

d) No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested unless the inspection is waived off by the Purchaser in writing. In the latter case also the material shall be dispatched only after satisfactory testing for all tests specified herein have been completed.

e) The acceptance of any quantity of material shall be no way relieve the Supplier of his responsibility for meeting all the requirements of the specification and shall not prevent subsequent rejection, if such material are later found to be defective.

3.11 Packing and Marking

a) All insulators shall be packed in suitable PVC/ plastic tubes of at least 3 mm thickness or water resistant packing material and the packaging shall not break during storage & transportation even in overhang condition during transportation. Further, last 20% quantity of insulators shall be packed in PVC/ plastic tubes only to ensure long storage of about 5 years. The packing shall provide protection against rodent. The Supplier shall furnish detailed design of the packing. For marine transportation, crates shall be palleted.

b) The packing shall be of sufficient strength to withstand rough handling during transit, storage at site and subsequent handling in the field.

c) Suitable cushioning, protective padding, or dunnage or spacers shall be provided to prevent damage or deformation during transit and handling.

d) All packing cases shall be marked legibly and correctly so as to ensure safe arrival at their destination and to avoid the possibility of goods being lost or wrongly dispatched on account of faulty packing and faulty or illegible markings. Each case/crate shall have all the markings stenciled on it in indelible ink.

e) The Supplier shall guarantee the adequacy of the packing and shall be responsible for any loss or damage during transportation, handling, storage and installation due to improper packing.

3.12 Standards

The insulator strings and its components shall conform to the following Indian / International Standards which shall mean latest revision, with amendments /changes adopted and published, unless specifically stated otherwise in the Specification.

a) In the event of supply of insulators conforming to standards other than specified, the Bidder shall confirm in his bid that these standards are equivalent or better to those specified. In case of award, salient features of comparison between the standards proposed by the Bidder and those specified in this document will be provided by the Supplier to establish equivalence.

Sl. No	Indian Standard	Title	International Standard
1.	IS:209-1992	Specification for zinc	BS:3436
2.	IS:406-1991	Method of Chemical Analysis of Slab Zinc	BS:3436
3.	IS:731-1991	Porcelain insulators for overhead Power lines with a nominal voltage greater than 1000 V	BS:137- (I&II) IEC:60383
4.	IS:2071 Part (I) – 1993 (Part(II)-1991 Part(III)- 1991	Methods of High Voltage Testing	IEC:60060-1
5.	IS:2486 Part- I-1993 Part- II-1989 Part III 1991	Specification for Insulator fittings for Overhead Power Lines with a nominal voltage greater than 1000V General Requirements and Tests Dimensional Requirements Locking Devices	BS:3288 IEC:60120 IEC:60372
6.	IS:2629-1990	Recommended Practice for Hot, Dip Galvanization for iron and steel	ISO-1461 (E)
7.	IS:2633-1992	Testing of Uniformity of Coating of zinc coated articles	
8.	IS:6745-1990	Determination of Weight of Zinc Coating on Zinc coated iron and steel articles	BS:433-1969 ISO:1460-1973
9.	IS:8263-1990	Methods of RI Test of HV insulators	IEC:60437 NEMA
10.	IS:8269-1990	Methods for Switching Impulse test on HV insulators	IEC:60506
11.		Thermal Mechanical Performance test and mechanical performance test on string insulator units	IEC: 60575

12.		Salt Fog Pollution Voltage Withstand Test	IEC:60507
13.		Composite insulators for A.C. Overhead lines with nominal voltage greater than 1000V – Definitions, test methods and acceptance criteria	IEC 61109
14.		Selection and dimensioning of high voltage insulators intended for use in polluted conditions: Polymer Insulators for AC systems	IEC:60815-3
15.		Tests on insulators of Ceramic material or glass or glass for overhead lines with a nominal voltage greater than 1000V	IEC:60383
16.		Composite string insulator units for overhead lines with a nominal voltage above 1000V : Standard strength classes and end fittings	IEC 61466-1
17.		Composite string insulator units for overhead lines with a nominal voltage above 1000V : Dimensional and electrical characteristics	IEC 61466-2
18		Electrical Insulating materials used under severe ambient conditions –Test methods for evaluating resistance to tracking and erosion	IEC 60587
19		Polymeric insulators for indoor and outdoor use with nominal voltage greater than 1000V- General definitions, tests, methods and acceptance criteria.	IEC 62217

The standards mentioned above are available from:

Reference Abbreviation	Name and Address
BS	British Standards, British Standards Institution 101, Pentonvile Road, N - 19-ND, UK
IEC/CISPR	International Electro technical Commission, Bureau Central de la Commission, electro Technique international, 1 Rue de verembe, Geneva, SWITZERLAND
BIS/IS	Beureau Of Indian Standards. ManakBhavan, 9, Bahadur Shah ZafarMarg, New Delhi - 110001.INDIA

ISO	International Organisation for Standardization. Danish Board of Standardization Danish Standardizing Sraat, Aurehoegvej-12 DK-2900, Heeleprup, DENMARK
NEMA	National Electric Manufacture Association, 155, East 44th Street. New York, NY 10017U.S.A.
ASTM	American Society for Testing and Materials, 1916 Race St. Philadelphia, PA19103 USA

ANNEXURE - A

1. Tests on Complete Strings with Hardware Fittings

1.1 Mechanical Strength Test

The complete insulator string along with its hardware fitting excluding arcing horn, corona control ring, grading ring and suspension assembly/ dead end assembly shall be loaded to reproduce design conditions. The testing programme varies with string and tower types according to following table:

String Type	Total Test Load* (kN)	Direction** of Load	Duration of Load (Min.)	Sequence of Testing ***
(Type of Conductor)				
Double I Suspension	94 140 F****	1 1 1	5 1 -	1 2 3
Single I Suspension	47 70 F****	1 1 1	5 1 -	1 2 3
Single Tension	60 90 F****	1 1 1	5 1 -	1 2 3
Double Tension	120 180 F****	1 1	5 1 -	1 2 3

Notes:

*: There total test must be established gradually at a steady rate.

**: Direction of load

1. following string axis
2. following bisector of string angle.
3. Following with respect to vertical, half the string angle, along the axis of one of the arm of the V- string
4. Following with respect to vertical, half the string angle +15 deg, along the axis of one of the arm of the V- string

*** : The insulator string must be completely unloaded and examined, then the proper direction of loading established before proceeding to the next sequential test.

****: F denotes Failure load

The insulator string shall be deemed acceptable if, for all tests loads except failure load, the string components do not show any visual signs of deformation or fracture, and the same components may be disassembled by hand, except for removal of cotter pins and initial loosening of the nuts. The failure load shall be recorded and must be greater than all previous tests loads.

1.2 Vibration Test

The suspension string shall be tested in suspension mode, and tension string in tension mode itself in laboratory span of minimum 30 meter. In the case of suspension string a load equal to 600 kg shall be applied along the axis of the suspension string by means of turn buckle. The insulator string along with hardware fittings and specified no. of sub-conductors each tensioned at 25 % of UTS of the conductor shall be secured with clamps. The system shall be suitable to maintain constant tension on each sub-conductors throughout the duration of the test. Vibration dampers shall not be used on the test span. Both the sub- conductors shall be vertically vibrated simultaneously at one of the resonance frequencies of the insulators string (more than 10 Hz) by means of vibration inducing equipment. The peak to peak displacement in mm of vibration at the antinode point, nearest to the string, shall be measured and the same shall not be less than 1000/f 1.8 where f is the frequency of vibration in cycles/sec. The insulator string shall be vibrated for not less than 10 million cycles without any failure. After the test the insulators shall be examined for looseness of pins and cap or any crack in the cement. The hardware shall be examined for looseness, fatigue failure and mechanical strength test. There shall be no deterioration of properties of hardware components and insulators after the vibration test. The insulators shall be subjected to the following test for a tension of 25 KN (132kV line) as per relevant standards:

1.1 AC Salt-fog pollution withstand test

This test shall be carried out in accordance with IEC: 60507. The salinity level for composite

long rod insulators shall be 160Kg/m3 NACL.

1.2 DC pollution withstand test

This test shall be carried out as per IEC-61245 with solid layer method. The D.C. pollution withstand voltage (negative) shall be 500kV for +/-500kV HVDC insulators as applicable at average ESDD of 0.1 mg / sq. cm.

2.0 Composite Long rod Insulator Units

2.1 Brittle Fracture Resistance Test

The test arrangement shall be according to Damage limit proof test with simultaneous application of 1N- HNO3 acid directly in contact with naked FRP rod. The contact length of acid shall not be less than 40mm and thickness around the core not less than 10mm.The rod shall withstand 80% of SML for 96 hours.

2.2 Recovery of Hydrophobicity Test

(1) The surface of selected samples shall be cleaned with isopropyl alcohol. Allow the surface to dry and spray with water. Record the HC classification. Dry the sample surface.

(2) Treat the surface with corona discharges to destroy the hydrophobicity. This can be done utilizing a high frequency corona tester, Holding the electrode approximately 3mm from the sample surface, slowly move the electrode over an area approximately 1" x 1". Continue treating this area for 2 – 3 minutes, operating the tester at maximum output.

(3) Immediately after the corona treatment, spray the surface with water and record the HC classification. The surface should be hydrophilic, with an HC value of 6 or 7. If not, dry the surface and repeat the corona treatment for a longer time until an HC of 6 or 7 is obtained. Dry the sample surface.

(4) Allow the sample to recover and repeat the hydrophobicity measurement at several time intervals. Silicone rubber should recover to HC 1 – HC 2 within 24 to 48 hours, depending on the material and the intensity of the corona treatment.

2.3 Silicone content test

Minimum content of silicone as guaranteed by supplier shall be verified through FT-IR spectroscopy & TGA analysis or any other suitable method mutually agreed between Purchaser& Supplier in Quality Assurance Program.

2.4 High Pressure washing test

The washing of a complete insulator of each E&M rating is to be carried out at 3800kPa with nozzles of 6mm diameter at a distance of 3m from nozzles to the insulator. The washing shall be carried out for 10minutes. There shall be no damage to the sheath or metal fitting to housing interface. The verification shall be 1 minute wet power frequency withstand test at 275kV r.m.s for 132 KV.

2.5 Torsion Test

Three complete insulators of each E&M rating shall be subjected to a torsional load of 55 Nm. The torsional strength test shall be made with test specimen adequately secured to the testing machine. The torsional load shall be applied to the test specimen through a torque member so constructed that the test specimen is not subjected to any cantilever stress. The insulator after torsion test must pass the Dye Penetration Test as per IEC 61109.

2. Tests on All components (As applicable)

2.1 Chemical Analysis of Zinc used for Galvanizing

2.2 Samples taken from the zinc ingot shall be chemically analyzed as per IS: 209-1979. The purity of zinc shall not be less than 99.95%.

2.3 Tests for Forgings

The chemical analysis hardness tests and magnetic particle inspection for forgings, will be as per the internationally recognized procedures for these tests. The sampling will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the Supplier and Owner in Quality Assurance Programme.

2.4 Tests on Castings

The chemical analysis, mechanical and metallographic tests and magnetic, particle inspection for castings will be as per the internationally recognized procedures for these tests. The samplings will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the Supplier and Owner in Quality Assurance Programme.

2.5 Autoclave Test

For cement used in the assembly of the insulators six samples from different batches shall be tested in accordance with ASTM C-151. The cement shall have an expansion less than 0.12%.

SUB-SECTION IV

4.0 Technical Specifications for stringing activities of HTLS Conductor (equivalent to ACSR Panther)

4.1 Site Inspection

4.1.1 Site Inspection Report

The contractor shall visit the site to inspect the transmission line and collect observations/information which would be useful for stringing activity & bidding. Complete BOQ of the each transmission line for reconductoring shall be furnished in the report & is to be got approved.

a) All observations/ information which the Contractor thinks would be useful to implement the reconductoring of the existing transmission line mentioned under scope of work are to be reported & timely.

b) The detailed procedure for carrying out the reconductoring shall be submitted to the site Engineer- in-charge before taking up the work

c) Suggestions regarding location for setting up stores during line construction in consultation with Employer representative shall also be provided by the contractor.

d) Working months available during various seasons along the transmission line, with period, time of sowing & harvesting of different type of crops and the importance attached to the crops particularly in the context of way leave problems and compensation payable shall be stated by the Contractor.

e) Some portions of the line may require clearance from various authorities. The Contractor shall indicate the portion of the line so affected, the nature of clearance required and the name of concerned organizations such as local bodies, municipalities, P&T (name of circle), Inland navigation, Irrigation Department, Electricity Boards and Zonal railways, Divisional Forest Authorities etc.

f) All the requisite data for processing the case of statutory clearances such as PTCC, Forest and Railway shall be provided along with the report.

g) Six copies of survey reports shall be furnished by the contractor to the Employer.

4.2 Environmental Conditions

4.2.1 Forest

The line route passing through forest stretches if any shall be indicated to the successful Bidder.

~~4.2.2 General Climatic Conditions~~

~~Climatic conditions shall be of tropical nature having summer period for 8 months and winter period for 4 months in a year. Working season shall be approximately 9 months/year and balance 3 months shall be monsoon period. The maximum temperature during summer shall be of the order of 50°C and the minimum temperature in the winter shall be of the order of 4°C. Normal everyday temperature is 32°C.~~

4.2.3 Statutory Regulations and Standards

4.2.3.1 Statutory Regulations

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

4.2.3.2 Reference Standards

The Codes and/or standards referred to in the specifications shall govern, in all cases wherever such references are made. In case of a conflict between such codes and/or standards and the specifications, latter shall govern. Such codes and/or standards, referred to shall mean the latest revisions, amendments/changes adopted and published by the relevant agencies.
Other internationally accepted standards which ensure equal or better performance than those specified shall also be accepted, subject to prior approval by the Employer.

4.3 Span and clearances

4.3.1 Normal Span

The normal ruling span of the line on panther conductor is 320 m..

4.3.2 Wind Span

The wind span is the sum of the two half spans adjacent to the support under consideration. For normal horizontal spans this equals to normal ruling span.

4.3.3 Weight span

The weight span is the horizontal distance between the lowest point of the conductors on the two spans adjacent to the tower.

4.4 Electrical Clearances

4.4.1. Ground Clearance

The minimum ground clearance from the bottom conductor is not to be less than 6100 mm for 132KV line, at the maximum sag conditions corresponding to maximum continuous operating temperature and still air.

4.5 Stringing of Conductor and Installation of Line Materials

4.5.1 General

a) The scope of erection work shall include the cost of all labour, tools and plant and all other incidental expenses in stringing work. The contractor shall have to string with the equivalent HTLS Conductor section wise and restore the line in original conditions as per program finalized in co-ordination with site. Stringing of the line shall be carried out under induced voltage condition i.e. one circuit under charged condition. Adequate safety measures and precautions shall be taken by the Contractor during this erection work.

b) The Contractor shall be responsible for transportation to site of all the materials to be provided by the Contractor as well as proper storage and preservation of the same at his own cost, till such time the erected line is taken over by the Employer. Similarly, the Contractor shall be responsible for proper storage, safe custody, and loss or damage of all Employer's supplied items, if any, as well as its transportation to site for incorporation in the lines and shall maintain and render proper account of all such materials at all times. The Contractor shall reimburse the cost of any of the materials lost or damaged during storage and erection beyond the limits permitted under this specification.

c) Contractor shall set up required number of stores along the line and the exact location of such stores shall be discussed and agreed upon with the Employer.

d) Payment for stringing shall be done on the basis of per kilometer and irrespective of number of tension/suspension towers.

e) The complete work including installation of line materials (insulator strings, hardware and accessories for conductor) shall be supervised by a team of supplier/Contractor's engineers / supervisory staff/ workmen already experienced in stringing work associated with the type of HTLS Conductor being supplied. The contractor shall furnish experience details of the engineers /supervisory staff proposed to be deployed.

f) The scope of work of the contractor shall inter-alia include the following:-

i. Installation of necessary hardware, hoisting of insulator strings, installing & stringing of HTLS Conductor including fixing of conductor accessories. Corona control rings/arcing horn shall be fitted in an approved manner. Torque wrench shall be used for fixing various line materials and components.

4.5.2 Handling of Conductor

a. Running Out of the Conductors

The conductors shall be run out of the drums form the top in order to avoid damage. The Contractor shall be entirely responsible for any damage to tower or conductors during stringing.

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

The sequence of running out shall be from the top down. Unbalanced loads on towers shall be avoided as far as possible. Inner phase of line conductors shall be strung before the stringing of the outer phases is taken up.

Tower not designed for one sided stringing shall be well guyed and step taken by contractor to avoid damage. Guying proposal along with necessary calculation shall be submitted by the contractor to Employer for approval. All expenditure related to this work is deemed to be included in the bid price and no extra payment shall be made for the same.

The Contractor shall take adequate safety precautions to protect personnel; from the potentially dangerous voltage build up due to electromagnetic and electrostatic coupling in the pulling wire, conductors during stringing operations. These precautions includes measures taking in account the other circuit on the line under live conditions.

The Contractor shall also take adequate safety precautions to protect personnel from potentially dangerous voltage build up due to distant electrical storms/energized lines.

b. Running Blocks

The groove of the running blocks shall be of such a design that the seat is semicircular and larger than the diameter of the conductor and it does not slip over or rub against the slides. The grooves shall be lined with hard rubber or neoprene to avoid damage to conductor and shall be mounted on properly lubricated bearings.

The running blocks shall be suspended in a manner to suit the design of the cross-arm.

All running blocks, especially at the tensioning end will be fitted on the cross-arms with jute cloth wrapped over the steel work and under the slings to avoid damage to the slings as well as to the protective surface finish of the steel work.

c. Repairs to Conductors

The conductor shall be continuously observed for loose or broken strands or any other damage during the running out operations. Repairs to conductor where no more than two strands in the outermost layer are broken shall be carried out with repair sleeve with approval of Engineer-Incharge.

Repairing of the conductor surface shall be carried out only in case of minor damage, scuff marks, etc. The final conductor surface shall be clean, smooth and free from projections, sharp points, cuts, abrasions, etc. The Contractor shall be entirely responsible for any damage to the towers during stringing.

d. Crossings

Derricks or other equivalent methods ensuring that normal services need not be interrupted nor damage caused to property shall be used during stringing operations where roads, channels, telecommunication lines, power lines and railway lines have to be crossed. In case of railway crossings, shutdown might not be available and therefore, contractor shall be required to carry out reconductoring under such condition i.e. without any shutdown of railways. However, shut down shall be obtained when working at crossings of overhead power lines. The Contractor shall be entirely responsible for the proper handling of the conductor and accessories in the field.

4.5.3 Stringing of Conductor

a. The stringing of the equivalent HTLS conductor shall be done by the standard stringing method suitable for the type of HTLS Conductor offered.

The Contractor shall deploy appropriate tools/ equipments/ machinery to ensure that the stringing operation is carried out without causing damage too conductor and the conductor is installed at the prescribed sag tension as per the approved stringing chart. Prior to taking up stringing work the contractor shall submit for approval of Site-In charge the complete details of stringing methods he proposes to follow.

If any special tools and tackles other than those generally used for stringing of AAAC conductors are deployed for stringing of HTLS Conductor by the contractor, a set of those tools & tackles shall be supplied by the contractor to the Employer, on completion of the project, at no extra cost. The quantity of such tools & tackles shall be sufficient to carry out stringing operations of the longest section (from angle tower to angle tower) of

the existing transmission line.

b. The contractor shall submit, for approval of site in-charge, the complete details of the stringing methods he proposes to follow. Prior to stringing the Contractor shall submit the stringing charts for the conductor showing the initial and final sags and tension for various temperatures and spans along with equivalent spans in the lines for the approval of the Employer.

c. Conductor creep are to be compensated by over tensioning the conductor at an appropriate temperature lower than the ambient temperature based on creep calculations to be furnished by the Contractor.

4.5.4 Jointing

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

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

c. All the joints on the conductor shall be of the compression type, in accordance with the recommendations of the manufacturer, for which all necessary tools and equipment like compressors, dies etc., shall be obtained by the Contractor. Each part of the joint shall be cleaned by wire brush till it is free of dust or dirt etc., and be properly greased with anti- corrosive compound. If required and as recommended by the manufacturer, before the final compression is carried out with the compressors. For HTLS Conductor suitable sleeve, collets, collet housing shall be used for jointing of core as per the offered design and methodology applicable for similar type of design/application.

d. All the joints of splices shall be made at least 30 meters away from the tower structures. No joints or splices shall be made in spans crossing over main roads, railways and small river tension spans. Not more than one joint per sub conductor per span shall be allowed. The compression type fittings shall be of the self-centering type or care shall be taken to mark the conductors to indicate when the fitting is centered properly. During compression or splicing operation; the conductor shall be handled in such a manner as to prevent lateral or vertical bearing against the dies. After compressing the joint the aluminium sleeve shall have all corners rounded, burrs and sharp edges removed and smoothened.

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

4.5.5 Tensioning and Sagging Operations

a. The tensioning the sagging shall be done in accordance with the approved stringing charts or sag tables. The "initial" stringing chart shall be used for the conductor. The conductors shall be pulled up to the desired sag and left in running blocks for at least one hour after which the sag shall be rechecked and adjusted, if necessary, before transferring the conductors from the running blocks to the suspension clamps.

b. The sag will be checked in the first and the last section span for sections up to eight spans, and in one additional intermediate span for sections with more than eight spans. The sag shall also be checked when the conductors have been drawn up and transferred from running blocks to the insulator clamps.

c. The running blocks, when suspended from the transmission structure for sagging, shall be so adjusted that the conductors on running blocks will be at the same height as the suspension clamp to which it is to be secured.

d. At sharp vertical angles, conductor and earth wire sags and tensions shall be checked for equality on both sides of the angle and running block. The suspension insulator assemblies will normally assume verticality when the conductor is clamped.

e. Tensioning and sagging operations shall be carried out in calm whether when rapid changes in temperature are not likely to occur.

4.5.6 Clipping In

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

b. Jumpers at section and angle towers shall be formed to parabolic shape as per existing tower line diagrams to ensure minimum clearance requirements.

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

4.5.7 Fixing of Conductors Accessories

Conductor accessories including spacers, spacer dampers (for bundle conductor) and vibration dampers shall be installed by the Contractor as per the design requirements and manufacturer's instruction within 24 hours of the conductor clamping. While installing the conductor accessories, proper care shall be taken to ensure that the surfaces are clean and smooth and that no damage occurs to any part of the accessories or of the conductors. Torque wrench shall be used for fixing the Dampers/Spacer Dampers, Suspension Clamps etc. and torque recommended by the manufacturer of the same shall be applied

4.5.8 Final checking, Testing and Commissioning

After completion of the works, final checking of the line shall be carried out by the Contractor to ensure that all foundation works, tower erection and stringing have been done strictly according to the specifications and as approved by the Employer. All the works shall be thoroughly inspected in order to ensure that:

a) The stringing of the conductors has been done as per the approved sag and tension charts and desired clearances are clearly available;

b) All conductor accessories are properly installed;

c) The original tracings of profile are submitted to the Employer for reference and record.

d) The insulation of the line as a whole is tested by the Supplier through provision of his own equipment, labour etc., to the satisfaction of the Employer.

e) The line is tested satisfactorily for commissioning purpose.

SCHEDULE -I

GUARANTEED TECHNICAL PARTICULARS OF HTLS CONDUCTOR

Sl.	Description	Unit	Value guaranteed by the Bidder
1.	Name & address of Manufacturer		
2.1	Type of HTLS Conductor (HTLS Technology)		
2.2	Construction of conductor/ Designation of conductor as per IEC:1089		
3.1	**PARTICULARS OF RAW MATERIALS**		
3.1	Outer Layers a) Applicable Standard(if any) b) Type of Aluminumalloy c) Minimum purity ofaluminum d) Maximum Coppercontent e) Zirconiumcontent i) Maximum ii) Minimum f) Other elements---------- i) ---------- ii) ----------	 % % % % % %	
3.2	Inner Core a) Applicable Standard(if any) b) Material ofcore c) Chemical composition of core i) ---------- ii) ----------	 % %	
3.3	Zinc used for galvanization of inner core (if applicable) a) Minimum purity of zinc	 %	
3.4	Chemical Composition of Misch Metal coating on core wires (if applicable) i) Zinc ii) Aluminium iii) Other elements----------	 % % %	
3.5	Aluminium used for Aluminium Cladding (if applicable) a) Minimum purity ofaluminum b) Maximum Coppercontent c) Other elements---------- i)---------- ii)……..	 % % % %	
4.	OUTER STRANDS AFTER STRANDING		

4.1	Number of outer layers	**Nos.**	
4.2	Number of strands a) 1st Layer fromcore b) 2nd Layer fromcore c) 3rd Layer fromcore …… ……..	 **Nos.** **Nos.** **Nos.** **…….** **…….**	
Sl.	**Description**	**Unit**	**Value guaranteed by the Bidder**
4.2	Diameter of strands a)Nominal b)Maximum c)Minimum	 **mm** **mm** **mm**	
4.3	Minimum Breaking load of strand a) Before stranding b) After stranding	 **kN** **kN**	
4.4	Resistance of 1m length of strand at 20 deg. C	**Ohm**	
4.5	Final Modulus of elasticity	**Kg/sq. mm**	
4.6	Final Coefficient of linear expansion	**Per 0 C**	
5	INNER CORE STRANDS/ INNER CORE AFTER STRANDING		
5.1	Number of layers in inner core (excluding central wire)		
5.2	Number of strands a) 1st Layer from centre (excluding central wire) b) 2nd Layer from centre c) 3rd Layer from centre …… ……..	 **Nos.** **Nos.** **Nos.** **…….** **…….**	
5.3	Diameter a)Nominal b)Maximum c)Minimum	 **mm** **mm** **mm**	
5.3	Minimum Breaking load of strand/Core a) Before stranding b) After stranding	 **kN** **kN**	
5.4	Resistance of 1m length of strand at 20 deg. C	**Ohm**	
5.5	Final Modulus of elasticity	**Kg/sq. mm**	

5.6	Final coefficient of linear expansion	**Per 0 C**	
5.7	Minimum no. of twists in a guage length equal to 100 times diameter of wire which the strands can withstand in the torsion test		
	a)Before stranding	**Nos.**	
	b)After stranding	**Nos.**	
Sl.	**Description**	**Unit**	**Value guaranteed by the Bidder**
5.8	Minimum elongation of strand for a gauge length of 250 mm	**%**	
5.9	**Aluminum cladding of INVAR core (if applicable)**		
	a) Thickness of cladding		
	i) Maximum	mm	
	ii) Minimum	mm	
5.10	**Galvanising/ Misch Metal coating (if applicable)**		
	a) Minimum mass of zinc / Misch metal coating per sqm. of uncoated wire surface.	gm	
5.11	**Composite core (if applicable)**		
a)	Flexural Strength of core	N/mm2	
b)	Glass Transition temperature of core (Tg)	Deg C	
6	**FILLER (if applicable)**		
6.1	Type & Designation of Filler		
6.2	Chemical composition of Filler		
6.3	Mass of Filler	Kg/km	
7	**COMPLETE HTLS CONDUCTOR**		
7.1	Cross section drawing of the offered conductor enclosed	Yes/No	
7.1.1	Cross section area of Conductor	mm^2	
7.1.2	Cross section area of aluminium/ aluminium alloy	mm^2	
7.1.3	Cross section area of Core	mm^2	
7.2	Diameter of conductor a)Nominal b)Maximum c)Minimum	 mm mm mm	
7.2.1	Diameter ofcore a)Nominal b)Maximum c)Minimum	 mm mm mm	
7.3	UTS (minimum) of Conductor	kN	
7.3.1	UTS (minimum) of Core	kN	

7.4	Lay ratio of conductor a) 1st layer from centre (excluding central wire) b) 2ndLayer		Maximum	Minimum
	c) 3rdLayer d) 4thLayer			
7.5	DC resistance of conductor at 20 deg C	Ohm/km		
7.6	Final Modulus of elasticity			
Sl.	**Description**	**Unit**	**Value guaranteed by the Bidder**	
	a) Upto transition temperature	Kg/sq. mm		
	b) Above transition temperature	Kg/sq. mm		
7.7	Coefficient of linear expansion			
	a) Upto transition temperature	Per deg C		
	b) Above transition temperature	Per deg C		
7.8	Calculation for transition temperature enclosed	Yes/No		
7.9	Transition temperature (corresponding to 350 m ruling span and tension at ruling condition as per 7.19)	Deg C		
7.10	Minimum Corona ExtinctionVoltage (line to ground) under Drycondition	kV(rms)		
7.11	RIV at 1MHz and 154 kV (rms) under dry conditions	Micro-volts		
7.12	Maximum permissible conductor temperature for continuous operation	Deg C		
7.13	Maximum permissible conductor temperature for short term operation	Deg C		
7.14	Permissible duration of above short term operation	Minutes		
7.15	Steady state conductor temperature at conductor current of 800 A and under Ambient conditions detailed in Clause 1.2.1 of Sub –Section I of the Technical Specification	Deg C		
7.16	AC resistance at maximum continuous operating temperature corresponding to specified maximum operating current (800 A under ambient condition enclosed as per Clause 1.2.1 of Sub- Section I of the Technical Specification	Ohm/km		

7.17	AC resistance at continuous operating temperature corresponding to specified operating current of 428A (under ambient condition enclosed as per Clause 1.2.1 of Sub- Section I of the Technical Specification	Ohm/km	
7.18	Details of Creep characteristic for HTLS conductor enclosed (as per Clause 1.4.3 of Sub-Section I of the Technical Specification)	Yes/No	
7.19	**Sag Tension Calculation**		
7.19.1	Sag Tension Calculation enclosed (clause 1.4.1 of Sub-Sec I of TS)	Yes/No	
7.19.2	Tension at 32 deg. C & no wind	Kg	
7.19.3	Sag & tension at maximum continuous operating temperature (corresponding to current of 800 A and Ambient conditions detailed in Clause 1.5.5 of Sub-Section I of the Technical Specification	Meters & Kgs	
Sl.	**Description**	**Unit**	**Value guaranteed by the Bidder**
i)	Tension at 32 deg. C & full wind pressure of 136.72 kg/m2		
7.19.4	Tension at transition temperature	kg	
7.20	Direction of lay for outside layer		
7.21	Linear mass of the Conductor a)Standard b)Minimum c)Maximum	 Kg/km Kg/km Kg/km	
7.22	Standard length of conductor	M	
7.23	Maximum length of conductor that can be offered as single length	M	
7.24	Tolerance on standard length of conductor	%	
7.25	Drum is as per specification	Yes/No	
7.26	No. of cold pressure butt welding equipment available at works	Nos.	

SCHEDULE -II

GUARANTEED TECHNICAL PARTICULARS OF SUSPENSION HARDWARE FITTINGS

Sl.	Description	Unit	Value guaranteed by the Bidder
1.	Name & address of Manufacturer		
2.	Address of Manufacturer		
3.	Drawing enclosed	Yes/No	
4.	Maximum magnetic power loss of suspension clamp at conductor current of 1574 amperes	Watt	
5.	Slipping strength of suspension assembly (clamp torque Vs slip curve shall be enclosed)	kN	
6.	**Particulars of standard/AGS Standard / AGS preformed armour rod set for suspension assembly**		
	a) No. of rods per set	No.	
	b) Direction of lay		
	c) Overall length after fitting on conductor	mm	
	d) Actual length of each rod along its helix	mm	
	e) Diameter of each rod	mm	
	f) Tolerance in		
	i) Diameter of each rod	±mm	
	ii) Length of each rod	±mm	
	iii) Difference of length between the longest and shortest rod in a set	±mm	
	g) Type of Aluminium alloy used for manufacture of PA rod set		
	h) UTS of each rod	Kg/mm^2	
7.	**Particulars of Elastomer (For AGS Clamp only)**		
	a) Supplier of elastomer		
	b) Type of elastomer		
	c) Shore hardness of elastomer		
	d) Temperature range for which elastomer is designed		
	e) Moulded on insert		Yes/No

8.	UTS of suspension clamp		Yes/No
9.	Purity of Zinc used for galvanising	%	
11.	Minimum corona extinction voltage under dry condition	kV (rms)	
12.	Radio interference voltage at 1 Mhz for phase to earth voltage of 154 kV (dry condition)		
13.	Maximum permissible continuous operating temperature of		
	i) Clamp body		
	ii) Standard/AGS preformed rods		

SCHEDULE-III

GUARANTEED TECHNICAL PARTICULARS OF TENSION HARDWARE FITTINGS

Sl.	Description	Unit	Value guaranteed by the Bidder	
1.	Name of Manufacturer			
2.	Address of Manufacturer			
3.	Drawing enclosed		Yes/ No	
4.	Purity of aluminum used for aluminum sleeve	%		
5.	**Material for steel sleeve**			
	(i) Type of material with chemical composition			
	(ii) Range of Hardness of material (Brinnel Hardness)	BHN	From to	
	(iii) Weight of zinc coating	gm/m^2		
			Aluminium/ Alloy	Steel
6.	**Outside** diameter of sleeve **before** compression	mm		
7.	**Inside** diameter of sleeve **before** compression	mm		
8.	Length of sleeve before compression	mm		
9.	Dimensions of sleeve **after** compression			
	(a) Corner to Corner	mm		
	(b) Surface to Surface	mm		
10.	Length of sleeve **after** compression	mm		
11.	**Weight of sleeve**			

	(a) Aluminium/ aluminum alloy	kg	
	(b) Steel	kg	
	(c) Total	kg	
12.	Electrical resistance of dead end assembly as a percentage of equivalent length of Conductor	%	
13.	Slip strength of dead end assembly	kN	
14.	UTS of dead end assembly	kN	
10.	Purity of Zinc used for galvanising	%	
12.	Design calculation of yoke plates and sag adjustment plate enclosed.		Yes/ No
13.	Minimum corona extinction voltage under dry condition	kV (rms)	
14.	Radio interference voltage at 1 Mhz for phase to earth voltage of 154 kV (dry condition)		
15.	Maximum permissible continuous operating temperature of dead end assembly		

SCHEDULE-IV

GUARANTEED TECHNICAL PARTICULARS OF MID SPAN COMPRESSION JOINT FOR HTLS CONDUCTOR

Sl.	**Description**	**Unit**	**Value guaranteed by the Bidder**
1.	Name of Manufacturer		
2.	Address of Manufacturer		
3.	Drawing enclosed		Yes/No
4.	Suitable for conductor size	mm	
5.	Purity of aluminium used for aluminium sleeve	%	
6.	**Material for steel sleeve**		
	(i) Type of material with chemical composition		
	(ii) Range of Hardness of material (Brinnel Hardness)	BHN	From to

	(iii) Weight of zinc coating	gm/m^2		
			Aluminium/ alloy	Steel
7.	**Outside** diameter of sleeve **before** compression	mm		
8.	**Inside** diameter of sleeve **before** compression	mm		
9.	Length of sleeve before compression			
10.	Dimensions of sleeve **after** compression			
	(a) Corner to Corner			
	(b) Surface to Surface			
11.	Length of sleeve **after** compression			
12.	**Weight of sleeve**			
	(a) Aluminium	kg		
	(b) Steel	kg		
	(c) Total	kg		
13.	Slip strength	kN		
14.	Resistance of the compressed unit expressed, as percentage of the resistivity of equivalent length of bare conductor.	%		
15.	Minimum Corona extinction voltage under dry condition	kV (rms)		
16.	Radio interference voltage at 1 MHz for phase to earth voltage of 154 kV under dry condition	Microvolt		
17.	Maximum permissible continuous operating temperature of mid span compression joint	Deg. C		

SCHEDULE-V

GUARANTEED TECHNICAL PARTICULARS OF REPAIR SLEEVE FOR HTLS CONDUCTOR

Sl.	Description	Unit	Value guaranteed by the Bidder
1.	Name of Manufacturer		
2.	Address of Manufacturer		
3.	Drawing enclosed		Yes/ No
4.	Suitable for conductor size	mm	
5.	Purity of Aluminium / Al Alloy type	%	
6.	Dimension of sleeve before compression		
	i) Inside diameter of sleeve	mm	
	ii) Outside dimensions of sleeve	mm	
	iii) Length of sleeve	mm	
7.	Dimension of sleeve after compression		
	i) Corner to Corner	mm	
	ii) Surface to Surface	mm	
	iii) Length of sleeve	mm	
8.	Weight of sleeve	Kg	
9.	Minimum Corona extinction voltage under dry condition	kV (rms)	
10.	Radio interference voltage at 1 MHz for phase to earth voltage of 154 kV dry condition)	µV	
11.	Maximum permissible continuous operating temperature of Repair Sleeve	Deg. C	

SCHEDULE-VI

GUARANTEED TECHNICAL PARTICULARS OF VIBRATION DAMPER FOR HTLS CONDUCTOR

Sl.	Description	Unit	Value guaranteed by the Bidder	
1.	Name of Manufacturer			
2.	Address of Manufacturer			
3	**Drawing enclosed**			
	(a) Design Drawing		YES / NO	
	(b) Placement Chart		YES / NO	
4.	Suitable for conductor size	mm		
5.	Total weight of one damper	kg		
			Right	Left
6.	Diameter of each damper mass	mm		
7.	Length of each damper mass	mm		
8.	Weight of each damper mass	kg		
9.	Material of damper masses			
10.	Material of clamp			
11.	Material of the stranded messenger cable			
12.	Number of strands in stranded messenger cable			
13.	Lay ratio of stranded messenger cable			
14.	Minimum ultimate tensile strength of stranded messenger cable	Kg/mm^2		
15.	Slip strength of stranded messenger cable (mass pull off)	kN		
			Right	Left
16.	Resonance frequencies			
	(a) First frequency	Hz		
	(b) Second frequency	Hz		
17	Designed clamping torque	Kg-m		
18.	Slipping strength of damper clamp			
	(a) Before fatigue test	kN		
	(b) After fatigue test	kN		
19.	Magnetic power loss per vibration damper watts for 1574 amps, 50 Hz Alternating Current	watts		
20.	Minimum corona Extinction voltage kV (rms) under dry condition	kV		
21.	Radio Interference Voltage at 1 MHz for phase to earth voltage of 154 kV (rms) Microvolts under dry condition	µV		
22.	Maximum permissible continuous operating temperature of Vibration Damper	Deg. C		
23.	Percentage variation in reactance after fatigue test in comparison with that . before fatigue test	%		
24.	Percentage variation in power dissipation after fatigue test in comparison with that before fatigue test	%		

SUB-SECTION - IV
TECHNICAL SPECIFICATION

TECHNICAL SPECIFICATION OF CURRENT TRANSFORMER

1.0 GENERAL REQUIREMENTS:

The current transformers shall be single phase, oil immersed and self cooled type, suitable for the services indicated and conforming to the best modern practice of design and manufacture. The design of current transformers shall be such that its accuracy shall not be affected by the presence of pollution on the external surface of its insulators. **The design of CT shall comply IS: 2705 (Part – I) for general requirements, IS 2705 (Part-II & III) with latest amendments for accuracy of protection and metering cores.**

The locations for installation of current transformers are situated in seismic zone – V. The design and construction shall be such as to provide necessary protection against the earthquake forces. Dampers and / or additional supporting structures may be provided with the current transformers, if necessary, to cater for their operation in the seismic zone.

2.0 CORES:

The cores for the current transformers shall be of high grade non-ageing electrical silicon laminated steel of low hysteresis loss and high permeability to ensure high accuracy at both normal and over current.

The cores to be used for metering and indicating instruments shall have a saturation factor low enough not to cause any damage to meters and instruments in the event of maximum short circuit currents.

The cores to be used for distance protection and differential protection shall have a high saturation factor. Magnetization characteristics curves of these cores shall be furnished along with the bid.

3.0 WINDINGS:

Primary winding consisting of suitable number and size of conductors shall be insulated with special paper having high mechanical strength, high electrical withstand properties and good ageing qualities. The primary winding shall be of suitably insulated electrolytic copper wire.

The rating of the secondary windings shall be **one / five Ampere as per NIT scope.** The secondary terminal shall be brought out in a compartment for easy access. The secondary terminals shall be provided with shorting arrangements. The secondary taps shall be adequately reinforced to withstand the normal handling without damage. Suitably insulated copper wire of electrolytic grade shall be used for secondary windings.

4.0 TANK:

Each current transformer shall be of Live Tank type to be supplied filled with insulating oil and shall be hermetically sealed to prevent atmosphere from coming into contact with oil, avoid filtration and change of oil. In case, the tenderer intends to use nitrogen or any other inert gas above the oil level as to permit expansion and contraction of oil, the same shall be stated in the tender.

Both expansion chamber and tank of the current transformer shall be made of high quality steel and shall be able to withstand full vacuum and pressure occurring during transit, and thermal and mechanical stresses resulting from maximum short circuit current during operation.

All interiors or exteriors of tanks, secondary box and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, grease or other adhering foreign matters. All steel surfaces in contact with insulating oil as far as accessible shall be painted with not less than two coats of heat resistant oil insulating varnish. Steel surface exposed to atmosphere if not hot dip galvanized shall be given a priming coat of zinc chromate and two coats of light grey rust preventing paint. Other ferrous parts shall be hot-dip galvanized as per relevant standard.

The metal tank shall have bare minimum number of welded joints so as to minimize possible locations of oil leakage.

Metal tank of the current transformer shall be provided with two separate earthing terminals for bolted connection to 50 X 6 mm M.S. flat to be provided by the purchaser for connection to the station earth mat. The earthing terminals shall be provided complete with adequate size washers, nuts and bolts.

The current transformer shall be provided with suitable lifting arrangement for lifting of the entire unit. The lifting arrangement (lifting eye) shall be positioned such that the porcelain bushings and tank shall not be damaged during lifting for transportation / installation.

5.0 TERMINAL CONNECTORS:

Appropriate number of terminal connectors suitable for ACSR Moose / Panther conductor shall be supplied. Suitable terminal connectors for earth connections shall also be supplied.

6.0 BUSHINGS:

The bushing and terminal insulator, where provided for the current transformer shall conform to the latest edition of IS: 2099. The bushings shall be made of homogeneous, vitreous porcelain of high mechanical and dielectric strength. Glazing of porcelain shall be of uniform brown or dark brown colour with smooth surface, arranged to shed away rain water or condensed water particles.

The bushings shall have ample insulation, mechanical strength and rigidity for the conditions under which they will be used and shall be designed to prevent accumulation of explosive gases and to provide adequate oil circulation to remove internal heat. There shall be no undue stressing of any part of the bushings due to temperature changes and adequate means shall be provided to accommodate conductor expansion.

The bushings shall be so designed that when operating at the specified highest system voltage there will be no electric discharge between the conductors and bushings. No corrosion or injury would be cause to conductor, insulation or supports by the formation of substances produced by chemical action. The insulation of bushing shall be coordinated with that of the current transformer such that flash-over will occur only externally to the current transformers. The bushing should not cause radio disturbances when operated at rated voltage.

7.0 TERMINAL BOX AND JUNCTION BOX:

All secondary terminals shall be brought out in a weatherproof terminal box on one side of each current transformer. The exterior of this terminal box shall be hot dip galvanized. A terminal board for short circuiting of secondary terminals shall be provided.

Cable box along with necessary glands for receiving control cables suitable for mounting on the bottom plate of the terminal box shall be included in the scope of supply.

A door with locking arrangements shall be provided in the front of the terminal box so as to permit easy access to the secondary terminals. The door shall have suitable arrangement to check ingress of moisture into the terminal box.

All terminals shall be clearly marked with identification number to facilitate connection to external wiring.

Polarity shall be indelibly marked on each primary and secondary terminal.

In addition to terminal box on each current transformer, tenderer shall also supply a common junction box for each set of three current transformers of each circuit. The junction box shall be weather proof type suitable for mounting on the steel structure.

The terminal boxes and junction boxes shall be suitable for outdoor installation and shall conform to IP55 protection class.

8.0 OIL LEVEL GAUGE:

An oil level gauge shall be provided in indicate the oil level in the current transformer. The oil gauge shall be mounted in such a way that the oil level can be seen from the ground level.

9.0 PRESSURE RELIEVING DEVICES:

Each current transformer shall be provided with a pressure relieving device so as to prevent bursting of current transformer even under unfavourable conditions.

10.0 OIL DRAIN COCK:

An oil drain cock along with a stop cock shall be provided in the bottom flange so as to permit taking of oil samples for testing.

11.0 OIL FILLING COCK:

An oil filling cock along with a stop cock shall be provided for filling the oil in the current transformer.

12.0 MOUNTING STRUCTURES:

The current transformers shall be mounted on steel structures, at a height of 2.5m from ground level. The tenderer shall ensure that the CTs supplied can be mounted on the existing steel (galvanized) structures. Necessary connecting materials, such as clamps, bolts, nuts, washers, etc. as well as foundation bolts for the supporting structures shall be supplied by the tenderer.

13.0 RATING PLATE:

Each current transformer shall be provided with a non-corrosive rating plate in accordance with latest edition of IS: 2705 Part-I. Following additional particulars shall also be marked on the rating plate of each current transformer.

a) Purpose (measurement or protection), rated output at 0.9 PF lagging, rated accuracy factor and rated class of accuracy of each secondary winding in terms of IS: 2705.

b) Terminal numbering of each secondary winding with class of accuracy.

c) Knee point voltage.

d) Maximum exciting current at knee point voltage.

e) Secondary winding resistance at 75°C.

f) Rated instrument security factor in respect of winding meant for measurement and metering.

14.0 INSULATING OIL:

The quantity of oil for first filling of each CT and the complete specifications of oil proposed to be used shall be stated. It would be desirable to use oil conforming to the provisions of latest IS: 335.

15.0 TESTS:

ROUTINE TESTS:

Each current transformer shall be subjected to routine tests as specified in the latest edition of IS: 2705 (Part I to IV). If the purchaser wishes to have a representative, tests shall be performed in his presence so as to be witnessed by him.
The routine tests shall consist of the following:

i) Verification of terminal markings and polarity

ii) Power frequency dry withstand tests on primary winding

iii) Power frequency dry withstand test on secondary windings

iv) Over voltage inter-turn test

v) Partial discharge tests

vi) Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class as per individual parts of IS: 2705.

vii) Knee-point voltage and exciting current for PS Class cores

viii) Secondary winding resistance for PS Class cores

ix) Turns ratio for PS Class cores

TYPE TESTS:

The bidder shall furnish four sets of all the type test reports carried out at CPRI / Govt. recognized test house / NABL accredited laboratory along with the offer. Successful Bidder may require to produce original copies of type test reports during detail engineering if asked by TPTL.
The type tests shall be in accordance with the latest edition of IS: 2705 (Part I to IV), and shall consist of the following:

(a) Short-time current test

(b) High voltage power frequency wet withstand test

(c) Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class as per individual parts of IS: 2705.

(d) Temperature rise test

(e) Lightning impulse voltage test

(f) Degree of protection tests of secondary terminal, junction box

All the test reports shall be submitted and got approved by the purchaser, before despatch of the equipment.

SPECIAL TESTS:

The special tests shall consist of the following:

a. Chopped lightning impulse test as a type test

b. Measurement of dielectric dissipation factor for oil immersed current transformers

c. Mechanical test

16.0 INSTRUCTION MANUALS:

As soon as possible after the award of the contract, the manufacturer shall supply six copies of the following drawings which shall describe the equipment in full details for approval and shall subsequently provide eight complete sets of final approved drawings, one of which shall be auto positive / soft copy suitable for reproduction.

i) Outline dimensional drawings.

ii) Assembly Drawings.

iii) Cross sectional view of the current transformer.

iv) Drawings giving details of supporting structures and foundation.

v) Drawing showing the details of terminal connectors.

vi) Magnetising curves.

vii) Wiring diagram with polarity mark.

In addition to the above drawings, the tenderer may supply any other drawing, which in his opinion is required to describe the equipment in full details.
After the completion of the erection work, the contractor shall furnish seven sets (including one reproducible on soft copy) of the completion drawings. Six copies of instruction manuals covering instruction for installation and maintenance check tests shall be supplied by the contractor as a part of this contract.

17.0 SPARE:

Spare CT's to be supplied as per NIT spares List.

18.0 COMPLETENESS OF EQUIPMENT:

The tenderer shall be complete in all respect and include all accessories which may not be specifically mentioned in this specification but which are essential for the completeness of equipment ordered.

19.0 GUARANTEED TECHNICAL PARTICULARS:

Guaranteed technical particulars shall be furnished along with the tender. Any tender lacking the complete information in this respect is likely to be rejected.

20.0 SCHEDULE OF INSTALLATION:

Tenderer shall furnish a list of similar equipment supplied by him and presently in service.

21.0 PACKING & FORWARDING:

The equipment shall be packed in suitable crates so as to withstand handling during transport and outdoor storage. The supplier must be responsible for any damage to the equipment during transit due to improper and inadequate packing. Any material found short / damaged shall be replaced by the supplier without any extra cost.

22.0 TECHNICAL REQUIREMENT FOR 132 KV Current Transformer.

The Current Transformers under this specification shall conform to the parameters given below:-

Sl. No.	Item	Specification
		132 KV
1.	Type of CT / Installation Single phase out-door type	Single phase, live tank, oil filled, hermetically sealed, outdoor, self cooled.
2.	Type of mounting	Pedestal type
3.	Suitable for system frequency	50 HZ ± 5 %
4.	Rated voltage (KV rms)	132
5.	Nominal system voltage (KV rms)	132
6.	Highest system voltage (KV rms)	145
7.	Current ratio (A/A)	1600-800/1-1-1-1-1 A
8.	Method of earthing the system where the current transformer will be Installed	Solidly effectively earthed
9.	Rated continuous thermal current (A)	120 % of rated primary current
10.	Acceptable limit of temperature rise above 50°C ambient temperature for continuous operation at rated continuous thermal current.	
	1.1 Winding	45°C
	1.2 Oil	40°C
	1.3 External surface of the core, metallic parts in contact with or adjacent to, insulation.	45°C
11.	Acceptable partial discharge level	Less than 10 Pico coulombs
12.	Maximum radio interference voltage at 1.1 times the maximum rated voltage.	Less than 500 micro volts
13.	1.2/50 micro second lightning impulse withstand voltage (KVP) (dry)	650
14.	1 minute dry power frequency withstand voltage primary (KV rms)	275
15.	Switching Impulse with stand and voltage (KVP)	
16.	1 Minute dry power frequency withstand voltage secondary (KV rms)	3
17.	Minimum creepage distance of porcelain Housing (mm)	3625

18.	Rated short time withstand current for I second at all ratios (KA rms)	31.5 KA
19.	Instrument security factor at all ratios for metering core.	Not more than 5.0
20.	Minimum rated short time thermal current density of the primary winding at all ratios (A/mm^2)	As per IS: 2705 (Part-I) / I992
21.	Application, current ratio, output burden, accuracy class, minimum knee point voltage, secondary winding resistance, maximum excitation current at minimum knee point voltage etc.	Enclosed in separate sheets for each rating of the Current Transformers.
22.	Type of core	Torroidal type
23.	Seismic acceleration	0.15g (Vertical) 0.3g (Horizontal)
24.	Dielectric dissipation factor at 145/1.732 KV (for 132 KV C.T.) at ambient temperature	0.005 or less
25.	Accuracy class of standard C.T. to be used during testing towards determination of ratio errors and phase angle errors for metering cores.	0.05 or better

The current transformers of different ratings shall have the following characteristics.

Voltage Rating	**Rated transformation ratio / core**	**Accuracy class at all ratios**	**Rated Burden at all ratios**	**Accuracy limit factor/ instrument security factor at all ratios**	**Knee point voltage at all ratios**	**Max^m resistance at 75^{0}C**	**Purpose**
132 KV	a) 1600-800/1-1-1-1-1 A						
	Core-I	0.2s	30 VA	ISF ≤ 3.5	-		Metering
	Core-II	5P	30 VA	ALF : 10	-		O/C & E/F protection
	Core-III	PS	-	-	600		Distance protection
	Core-IV						
	Core-V						

SUB-SECTION - IV

TECHNICAL SPECIFICATION FOR 132 KV ISOLATOR

1.0 TECHNICAL PARAMETERS:

Sl.	Particulars	132 KV
1.	Main switch	Double end break centre post rotating, gang operated type
2.	Service	Outdoor
3.	Applicable standard	IS : 9921 / IEC-129/IEC-62271-102
4.	Pole	3 pole gang operator
5.	Rated voltage in KV	132/145
6.	Rated frequency	50 Hz
7.	System earthing	Effectively earthed
8.	Temperature rise	As per relevant IS/IEC
9.	Insulation level impulse with stand voltage :	
	a) Across Isolating distance (kV peak)	750
	b) To earthed & between poles (kV Peak)	650
10.	1 minute power frequency with stand voltage	
	a) Across Isolating distance (kV rms)	315
	b) To earthed & between poles (kV rms)	275
11.	Rated current	2500
12.	Rated short time Current for 3 sec.	31.5 kA
13.	Operating mechanism	Motor / Manual
14.	Auxiliary power supply	
	a) DC Voltage	220/110
	b) AC Voltage for Motor, heater & lamp	240
15.	Safe duration of overload	
	a) 150% of rated current	5 min
	b) 120% of rated current	30 min
16.	Minimum creepage distance of support and Rotating insulator	25 mm / KV
17.	Mounting structure	Upright on steel structure
18.	Terminal connector type --	Bi-metallic clamp size as per requirement
19.	Control	Local / Remote

2.0 SCOPE

This specification provides for design, manufacturer, testing at manufacturer's Works and delivery erection, commissioning of outdoor station type 132 KV, three phase triple pole double break gang operated centre

rotating type Isolator with or without earth switches, with electrical & mechanical inter lock, insulators and complete in all respect with bimetallic connectors arcing horns operating mechanism, auxiliary switches, indicating devices, fixing detail etc.

3.0 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.

4.0 TYPE

The Isolators shall be outdoor type with three phase double break centre rotating type 132 KV and suitable for electrical (for only 132 KV) as well as manual operation and local / remote operation. 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 rated current of 2500 amp for 132 KV.

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 31.5 kA for 3 second for 132 KV 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. 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.

5.0 MAIN CONTACTS

All Isolators shall have heavy duty, self aligning and high pressure line type 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 2500 Amps in 132 KV. The hard dawn electrolytic copper strips should be silver plated 10 micron thickness and fixed contacts should be backed by powerful phosphor bronze / stainless steel springs of suitable numbers. However, the thickness and contact area of the contact should conform to the drawing approved. These fixed and moving contacts shall be able to carry the rated current continuously and the maximum fault current of 31.5 KA for 132 KV 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 by one inch (maximum), closing of the switches, proper seating of the blades in between contacts and adequate pressure to give enough contact surfaces is ensured. Wherever possible, the blades shall be counter balanced by weights and springs. The contact shall be self cleaning by the wiping action created by the movements of the blades. The surface of the contacts shall be tendered smooth and silver-plated. The

Isolator shall be self-cleaning type so that when isolator remains 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.

6.0 ARCING HORN AND GRADING HORN

Suitable arcing horn made of tinned electrolytic copper which is 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.

7.0 ELECTRICAL INTERLOCK / MECHANICAL INTERLOCK

The disconnecting switches whenever required shall be with an approved type electrical interlock (in 132 KV Isolator only) for interlocking with the associated circuit breakers and earth switch. Electrical interlock assembly should be more rigid in construction and properly mounted to ensure reliable operation. The design should be such that the electrical circuit for the interlocking mechanism will only remain energized during operation of the switches.

8.0 AUXILIARY SWITCHES

All isolators and earthing switches shall be provided with 220V / 110 V DC 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 – 3 normally open and 3 normally closed and 2 normally open and 2 normally closed for earth switch. Separate auxiliary switches shall be provided for isolating and earth switches. Two 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.

9.0 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 phase 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.

10.0 OPERATING MACHANISM

The operating mechanism shall be simple and shall ensure quick and effective 1000 operation. The design shall be such as to enable one man to operate it with nominal effort. 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 drilled and fitted accurately so as to prevent slackness and lost

motion. 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. The functions of all control facilitate operating isolators. Provision shall be made in the control cabinet to disconnect power supply to prevent local / remote power operation. Limit switches for open and close positions of re-isolations and earth switches.

11.0 DESIGN, MATERIALS AND WORKMANSHIP

The live parts shall be designed to eliminate sharp points, edges and similar 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 / aluminum. 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 switches should not need lubrication of any parts except at very long interval of five year minimum.

12.0 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 (Preece tests) except the threaded portions which should withstand four dips.

13.0 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 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. Insulator shall have a minimum cantilever strength of 800 kgs. 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 within 500 micro-volts. Casing shall be free from blow holes cracks and such other defects. 14. Control Cabinet: The

control cabinet of the operating mechanism shall be made out of 10mm thick aluminium 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.

14.0 Motor : (for 132 KV Isolator)

Motors rated 1 KW and above shall be 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 tripping device. The motor shall, in all other respects, conform to the requirement of I.S. 325.

15.0 Gear :

The 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 aluminum 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 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.

16.0 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.

17.0 Terminal block and Wirings – Each operating mechanism shall be provided with 1100V grade stud type terminal block. All auxiliary switches, 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 insulated 2.5 sq.mm copper wires.

18.0 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.

19.0 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.

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

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

A) Isolator Base

Name: TPTL

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

B) Earthing Switch

Name: TPTL

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 – TPTL

Name of manufacturer –

Order No.

Type Designation –

Reduction gear ratio –

D) AC motor

i) Rated auxiliary voltage

ii) Starting current

iii) Designation of AC motor as per I.S 4722/325

iv) Starting torque at 80% of supply voltage

v) Over travel in degrees after cutting off supply

E) Total operating time in seconds

i) Close operation – Electrical

ii) Open operation – electrical

iii) Open operation – manual

22.0 Painting Galvanizing and Climate Proofing

At interiors and exteriors of enclosures, cabinets and other metal parts (other than made up of aluminum) shall be thoroughly cleaned to remove all rust, scales, corrosion, grease and other adhering foreign matter and the surfaces treated by phosphate (e.g. seven tank phospating sequence). After such preparation of surfaces, two coats of zinc oxide primer shall be given by suitable stoving and air drying before final painting. 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 Complete details of painting, galvanizing and climate proofing of the equipment shall be furnished in the offer.

23.0 TESTS:

Acceptance and Routine Test:

All acceptance test as stipulated in the relevant standards shall be carried out by the supplier in presence of Purchaser's representative at the cost of the bidder. 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 sub-station site. Immediately after finalization of the programme of acceptance test, the supplier shall give sufficient advance intimation (clear 15 days advance intimation) to TPTL.

Test certificates of various items including but not limited to the following shall be furnished at the time of acceptance 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) Auxiliary switch

i) Limit switch

j) Timer

k) Overload / single phase preventer relay

l) Interlocking devices

m) Terminal block

n) Any other item

24.0 GUARENTED TECHNICAL PARTICULARS OF ISOLATORS:

(To be filled by the bidders in separately for Disconnectors of 132 KV classes and types)

1) Type / installation
2) Manufacturer's Name and Country of manufacture
3) Standards according to which the isolator are manufactured
4) Maximum design voltage at which the isolator can operate (KV)
5) Frequency (Hz)
6) Rated Voltage (KV)
7) Max. current that can be safely interrupted by the isolator Inductive (A & % PF) Capacitive (A & % PF)
8) Continuous current rating (Amps)
9) Rated short time current
    i) For 3 second (KA rms)
    ii) Rated peak short time current (KVp)
10) Current density at the minimum cross-section of
    a) Moving blade (Amps / Sq.mm)
    b) Terminal pad
    c) Contacts
    d) Terminal Connector
11) Load across the terminal connector side (Kg.)
12) Max. temp rise of current carrying parts when carrying rated current continuously. (deg. C)
13) De-rating factor for specified site conditions.
14) Insulation levels.
15) Impulse withstand voltage (KV peak)
    a) Phase to Earth
    b) Across isolating Distance
        i) Switching surge withstand voltage (KV peak)
            a) Phase to Earth
            b) Across isolating Distance
        ii) Power frequency withstand voltage (kV rms)
            a) Phase to Earth
            b) Across isolating distance
        iii) Radio interference voltage at 1.1 times maximum line to ground voltage (micro volts)

iv) Corona inception voltage (KV rms)

v) Corona extinction voltage (KV rms)

16) Minimum clearance in air:

i) Between poles (mm)

ii) Between live parts and earth (mm)

iii) Between live part when switch is open

a) On the same pole (mm)

b) Between adjacent poles (mm)

17) Rated mechanical terminal load

i) Load along the terminal connector side (kg)

a) Gears

b) Limit switches

c) Contactors

d) Over load relay

e) Single-phase preventer

f) Auxiliary switch

g) Terminal blocks

h) Insulated wire wires

i) HRC fuses

j) Pole discrepancy relay

k) Timer

l) Space Heater

m) Interlocks

18) Insulators

a) Type

b) No. of units per insulator stack.

c) Rating of insulator (kV)

d) Height of each insulator stack (mm)

e) Bolt circle diameter (mm)

f) Tensile strength (kg)

g) Compressive strength

h) Torsional strength (kg. m)

i) Cantilever strength upright (kg)

j) Power frequency dry flash over voltage (kV) rms
k) Power frequency wet flash over voltage (kV) rms
l) Power frequency puncture voltage (kV) rms
m) Impulse flash over voltage (positive wave) (kV) peak
n) Impulse withstand voltage (kV) peak
o) Power frequency withstand voltage (kV) rms
p) Visual discharge voltage level (kV) rms
q) Creepage distance Total (mm), Protected (mm)
r) Dry arcing distance (mm)
s) Size material and grade in other parts
t) Insulator base plate material and size of plate below insulators
u) Bearings.
    i) Material and size of housing
    ii) No. of bearings, location and size
v) Tandem pipe
    i) Size class and no. of pipes
    ii) Size of shackle, screw
    iii) No. of bearings / bush and its material and size
w) Type of inter lock
x) Down pipe size and class
y) Type of universal / swivel joint
    i) Between bearing and down pipe
    ii) Between down pipe and operating mechanism

19) Operating mechanism
    a) Control cabinet
        i) Material and thickness
        ii) Degree of protection
        iii) Type size and no. of cable glands
        iv) Whether removable gland plate provided
    b) Make type, rating and qty. of motors per isolator.

20) Base
    a) Size of steel sections used
    b) Overall size

c) Total weight

21) Terminal connectors

22) Clamp Body

i) Alloy Composition

ii) Plating if any

iii) Area at min. cross section

a) Bolts and nuts size

i) Alloy composition

ii) Tensile strength

b) Type of washers used

c) Materials of braids

d) Temperature rise when carrying rated current at 50 °C ambient (deg.C)

e) Weight of each type of clamp (kg)

f) Torque required to operate the switch in Kg. m.

23) Contact zone

i) Horizontal deflection (mm)

ii) Vertical deflection (mm)

iii) Total amplitude of longitudinal movement w.r.t. conductor supporting fixing contact (mm)

24) Design and Construction

i) No. of Insulators per pole

ii) Contacts

a) Material and grade

b) Cross-sectional area in sq.mm

iii) Moving Blades

a) Material and grade

b) Cross sectional area

iv) Contact Support

a) Material and size of channel / block

b) Material and size of plate

v) Rain hood – Material grade and size

vi) Turn and twist mechanism

a) Material and size of clamps

b) Material and size of springs

c) Whether springs are encased

25) Nuts and Bolts

Size, material and grade in live parts.

Section – VI

Price Bidding Schedule

Given separately in MS excel Sheet in http:// www.tripuratenders.gov.in.

APPENDIX: A

DETAILS INSTRUCTION TO THE TENDERER: -

i) **The bidders must quote their rates in the prescribed price bidding schedule in the downloaded tender document otherwise the bid shall be treated as non-responsive and shall be liable for rejection**

ii) The tender should complete in all respects as mentioned in the NIT must be submitted to this office in sealed cover.

iii) The tender for the work should be accompanied by a deposit of earnest money in the form of **demand draft/Bank Guarantee** in favour of TRIPURA STATE ELECTRICITY CORPORATION LIMITED on any schedule Bank payable at Agartala, West Tripura

iv) TPTL reserves the right to reject any or all the tenders and even the lowest tender without assigning any reason.

v) Any bidder who has been debarred / blacklisted by any Central (GOI) / State Govt. owned Power Utility, for similar nature of work during last 5 years for whatever reasons and thereby shall stand disqualified automatically at the very pre-qualification stage. **Therefore, the Bidder submitting the tender documents is liable to enclose a "Declaration" to this effect with due certification by "NOTARY"** depicting full name & designation **(As per Annexure – IV).**

vi) The Bidder, including each of the partners of a joint venture, should provide information in separate sheet on any **history of litigation or arbitration** resulting from contracts executed in the last 5 (five) years or currently under execution **(As per Annexure – V).**

vii) The successful tenderer shall be responsible for the completion and satisfactory execution of the work.

viii) All equipments, lose materials like should be properly packed and sent to site.

ix) The validity of offer shall not be less than 180 days from the date of opening of the tender.

x) The contractor shall be responsible for packing delivery of all materials to work site for any loss or damage of materials contractor shall make good free of cost. Similarly demurrage and wharf charges shall be borne by the contractor.

xi) INCOME TAX will be deducted in line with I.T. rules in force from the total contract value. The deduction shall be made from each running bill.

xii) The contractor shall arrange at his own cost tools & other appliances required in full and proper execution of said work entrusted to him.

xiii) All the works shall be carried out under direction and reasonable satisfaction of the TPTL.

xiv) The TPTL may withhold for any payment for erection claimed by the contractor for loss account of
   a) Defective work remedied for guaranteed not meet.
   b) In adequate progress of work.

xv) If the contractor neglects to execute the work with any reasonable orders given to him in written by this TPTL or his authorized representative in connection with the work the TPTL may given notice in writing to the contractor calling upon him to make good the failure, neglects, contravention complained of.

xvi) During erection the contractor shall without any additional payment at all times keeps the working and storage areas used by him free from accumulations of waste materials or rubbish.

xvii) The contractor shall employ at least one competent representative whose name(s) and shall previously being communicated in writing to the TPTL by the contractor.

xviii) The route is to be followed as per survey conducted TPTL.

xix) Bidders shall submit the hard copy of price bid neatly typed in excel format both in figures and in words. The total amount shall be indicated in the price bid both in figures and in words. Bidders shall also submit Soft copy of price schedule in CD for evaluation purpose. The CD in sealed condition shall be kept inside the price bid envelope.

ANNEXURE – I

PROFORMA OF BANK GUARANTEE FOR CONTRACT PERFORMANCE
(To be stamped in accordance with stamp Act)

Ref. …… **Bank Guarantee No. ……**

Date ……

To
The Dy. General Manager
Transmission Division
Tripura State Electricity Corporation Limited
Agartala.

Dear Sir,

In consideration of **Tripura State Electricity Corporation Limited** (hereinafter referred to as the 'Owner', which expression shall unless repugnant to the contest or meaning there of include its successors, administrators and assigns) having awarded to M/s …….. with its registered/Head office at ……(hereinafter referred to as 'Contractor' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns), a Contract by issued of Owner's Letter of Award No……..dated…….and the same having been acknowledged by the Contractor, .valued at ……for ……(scope of contract) and the Contactor having agreed to provide a Contract Performance Guarantee for the faithful performance of the entire Contract equivalent to ……being 10% (Ten per cent) of the said value of the Contract to the Owner.

We, …… (Name & Address) having its Head Office at……..(hereinafter referred to as the 'Bank', which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators , executors and assigns) do hereby guarantee and undertake to pay the Owner, on demand any all monies payable by the Contractor to the extent of ……..as aforesaid at any time up to……**……(days / month / year) without any demur, reservation, contest, recourse or protest and/or without any reference to the Contractor.

Any such demand made by the Owner on the bank shall be conclusive and binding notwithstanding any difference between the Owner and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. The Bank undertakes not to revoke this guarantee during its currency without previous consent of the Owner and further agrees that the guarantee herein contained shall continue to be enforceable till the Owner discharges this guarantee.

The Owner shall have the fullest liberty without affecting in any way the liability of the Bank under the guarantee, from time to time to extend the time for performance or the Contract by the Contractor. The Owner shall have the fullest liberty, without affecting this guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Contractor, and to exercise the same at any time in any manner, and either to enforce or to for bear to enforce any covenants, contained or implied, in the Contact between the Owner and the Contractor or any other course or remedy or security available to the Owner. The Bank shall not be released to its obligations under these presents by any exercise by the Owner of its liberty with reference to the matters aforesaid or any of them or by reason of any other act of omission or commission on the part of the Owner or any other indulgences shown by the Owner or by any other matter or thing what so ever which under law would, but for this provision have the effect of relieving the Bank.

The bank also agrees that the Owner at its option shall be entitled to enforce this guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and not withstanding any security or other guarantee the Owner may have in relation to the Contactor's liabilities.

Notwithstanding anything contained herein above our liability under this guarantee is restricted to ……..and it shall remain in force up to and including ……..and shall be extended from time to time for such period (not exceeding one year), as may be desired M/s …….on whose behalf this guarantee has been given.

Dated this …… day of ……2025…… At ……

WITNESS

…… ……..

(Signature) (Signature)

…… ……...

(Name) (Name)

…… ……

(Official Address) (Official Address)

Attorney as per Power
Of Attorney No. …… Date……

ANNEXURE – II

APPLICATION FOR EXTENSION OF TIME
(Part – I)

1. Name of Contractor _____
2. Name of work (as given in the contract) _____
   _____
   _____
3. Agreement of _____
4. Estimate amount put to tender _____
5. Date of Commencement of work _____
6. Period allowed for completion of work (as per agreement) _____
7. Date of completion stipulated in the agreement _____
8. Period for which extension of time has been given previously if any _____

a) 1st extension vide No. _____
b) 2nd extension vide No._____
c) 3rd extension vide No. _____
d) 4th extension vide No. _____

9. Period for which extension have been previously given (Copies of the previous application should be attached).
10. Hindrances on account of which extension is applied for with date on which hindrances occurred.

Sl. No.	Nature of hindrances	Date of occurrence	Period of which hindrances is likely to last	Extension of time applied for by the contractor	Overlapping period, if any, giving reference to items which overlap	Period for which extension is applied for.	Remarks as to why the hindrances occurred and justification for extension of time

11. Total period for which extension is now applied for on account of hindrances mentioned above.
12. Extension of time required for extra work: - _____ Months. _____ days.
13. Detailed for extra work and the amount involved: -
14.

    a) Total value of extra work: -

    b) Proportionate period of extension of time based on estimated amount put to tender on account of extra work: -

15. Total extension of time required for 11 & 12: -
16. The price shall remain Firm even during extended period whatsoever.

Signature of Contractor

APPLICATION FOR EXTENSION OF TIME

(Part – II)

(To be filled in by TPTL)

1. Date of receipt of application from _____ contractor for the work of _____ _____in the Sub-Divisional _____.
2. Acknowledgement issued by the Sr. Manager, vide his No. _____ _____ Dated _____.
3. Recommendation of Sr. Manager, in – charge of the Sub-Division is to whether the reasons given by the Contractor are correct and what extension, if any, recommended by him, if he does not recommended the extension, reasons for rejection should be given

Dated ……..

Signature of the Sr. Manager in-charge of Sub-Division.

APPLICATION FOR EXTENSION OF TIME

(Part – III)

(To be filled in by TPTL)

1. Date of receipt in the Divisional office: _____
2. Report of DGM, in-charge of the Division regarding hindrances mentioned by the contractor
   _____

Sl. no.	Nature of hindrances	Date of occurrence	Period for which hindrances is likely to last	Extension of time applied for by the contractor	Overlapping period, if any, giving reference to items which overlap	Net extension applied for	Remarks as to why the hindrances occurred and justification for extension recommended

3. Recommendation / Approval of the DGM, in-charge of the Division: -
   (The present progress of work should be stated and whether the work is likely to be completed by the date upto which extension is applied for, if extension of time is not recommended, what compensation is proposed to be levied under **clause 13 of section – III**.

Signature of DGM

4. Recommendation / Approval of the AGM, in-charge of the Circle: -

Signature of AGM

5. Recommendation / Approval of the GM (Technical): -

Signature of GM (Technical)

6. Recommendation / Approval of the CMD: -

Signature of CMD

ANNEXURE – III

(TO BE SUBMITTED WITH DUE ATTESTATION BY NOTARY IN COVER NO.1)

Refer NIT No._____ Date_____

To
The Deputy General Manager,
Transmission Division,
Tripura State Electricity Corporation Limited,
Agartala.

Declaration

Sir,

I / We hereby on behalf of (the name of the Vendor / Firm……) declare that we are not "De-barred/Black listed" by any Central (GOI) / State Govt. owned Power Utility, for similar nature of work during last 3 (three) years for whatever reasons.

Yours faithfully

Date:……

(Signature of the Tenderer)

With rubber Stamp

Attestation Signature of Notary

With Rubber Stamp

Date:

ANNEXURE – IV

Litigation History

Name of the Bidder:

Year	Award FOR or AGAINST Applicant	Name of client, cause of litigation and matter in dispute	Disputed amount

(Signature of the Tenderer)

With rubber Stamp

Annexure – V

MAKERS LIST OF MATERIALS

Sl. No.	Items	Manufacturer
1.	**HTLS Conductor (ACCC equivalent to ACSR Panther)**	Reputed manufacturer having credentials of supplying to different Central / State power utilities.
2.	Hardware fittings	Reputed manufacturer having credentials of supplying to different Central / State power utilities.
3.	Composite Long Rod Insulators	Reputed manufacturer having credentials of supplying to different Central / State power utilities.
4.	132 KV CT	Alstom / CGL / Siemens / ABB / Hepta Care
5.	132 KV Isolator	Alstom / CGL / Siemens / ABB / Project Electricals

Annexure – VII

DECLARATION

I / We hereby declare that I / we have personally gone through the Bid-Documents of Contract, Technical Specifications, other instructions / Special instructions etc. incorporated in the Bidding Document for the works / Supply and I / We do agree to abide by all the rules and regulations of TPTL.

SIGNATURE OF THE TENDERER / BIDDER

ANNEXURE-IX

PROFORMA OF BANK GUARANTEE FOR EMD

(On non-judicial stamp paper of appropriate value to be purchased in the name of executing Bank)

Ref. …… **Bank Guarantee No. ……**

Date ……

WHEREAS M/s. ---------- (Name and address of the Firm) having heir registered Office at ---------- --(Address of the Firm's registered Office) (hereinafter called "**the bidder"**) wish to participate in the Tender No.---------- Date---------- for the work of **"Re-conductoring of 132kV Intra-State Transmission line by HTLS Conductor with allied accessories.** for **Tripura State Electricity Corporation Limited and** WHEREAS a Bank Guarantee for (hereinafter called **"Employer")** Rs. (Amount of EMD) valid till ----------

We ---------- (Name of Bank and address of the branch giving the Bank Guarantee) having our registered office at ---------- ---------- (Address of Bank's registered office) here by give this Bank Guarantee No. -- ---------- dated ---------- and hereby agree unequivocally and unconditionally to pay immediately on demand in writing from the **Tripura State Electricity Corporation Limited or any officer authorized by it in this behalf any amount not exceeding Rs. ---------- ----------(amount of EMD) (Rupees----------) (in words)** to the said **Tripura State Electricity Corporation Limited on behalf of the tenderer.**

We, ----------(Name of the Bank) also agree that withdrawal of the tender or part thereof by the Tenderer with in it's validity or non- submission of Security deposit by the tenderer within one month from the date of tender or a part thereof has been accepted by the **Tripura State Electricity Corporation Limited would constitute a default on the part of the Tenderer and that this Bank Guarantee is liable to be invoked and encashed within its validity by the Employer in case of occurrence of a default on the part of the Tenderer and that the encashed amount is liable to be forfeited by the Employer.**

This agreement shall be valid and binding on this Bank upto and inclusive of---------- (mentioned here the date of validity of the Bank Guarantee) and shall not be terminated by notice or by Guarantor change in the Constitution of the Bank or the Firm of Tenderer or by any reason whatsoever and our liability here under shall not be impaired or discharged by any extension of time or variations or alterations made, given , conceded with or without our knowledge of consent by or between **the Tenderer and Tripura State Electricity Corporation Limited.**

NOT WITHSTANDING anything contained hereinbefore our liability under this guarantee is restricted to Rs.---------- (amount of EMD) (Rupees---------- ---------- (in words). Our Guarantee shall remain in force till ---------- (date of validity of the Guarantee). Unless demands or claims under this Bank Guarantee are made to us in writing on or before ----------(date should be 1 month after the above validity period of BG), all rights of Employer under this Bank Guarantee shall be forfeited and we shall be released and discharged from all liabilities there under.

Place:

Date:

Please mention here complete Postal Address of the Bank with Branch Code, Telephone , Fax Nos, and Mobile No.

Signature of the Bank's authorized Signatory with Official Seal.