NOIDA METRO RAIL CORPORATION (NMRC) LIMITED

REQUEST FOR PROPOSAL (RFP)

RFP for Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment.

E tender No. NMRC/Tr/OHE/ Misc./2026/452

April 2026

Issued by:

Noida Metro Rail Corporation (NMRC) Limited
Block-III, 3rd Floor,
Ganga Shopping Complex, Sector-29, Noida -201301,
District Gautam Budh Nagar, Uttar Pradesh, India

Disclaimer

This Request for Proposal (RFP) Document (or "E-Tender" or "Bid") for "**RFP for Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment**" contains brief information about the scope of work and selection process for the Bidder ('the Contractor" or "the Tenderer"). The purpose of the Document is to provide the Bidders with information to assist the formulation of their Bidding Documents.

While all efforts have been made to ensure the accuracy of information contained in this RFP Document, this document does not purport to contain all the information required by the Bidders. The Bidders should conduct their own independent assessment, investigations and analysis and should check the reliability, accuracy and completeness of the information at their end and obtain independent advice from relevant sources as required before submission of their Bid/s. Noida Metro Rail Corporation Ltd. ("NMRC" or "the Corporation" or "the Employer") or any of its employees or advisors shall incur no liability under any law, statute, rules or regulations as to the accuracy or completeness of the RFP Document.

NMRC reserves the right to change any or all conditions/information set in this RFP Document by way of revision, deletion, updating or annulment through issuance of appropriate addendum as NMRC may deem fit without assigning any reason thereof.

NMRC reserves the right to accept or reject any or all Bids without giving any reasons thereof. NMRC will not entertain or be liable for any claim for costs and expenses in relation to the preparation of the Bid/s to be submitted in terms of this RFP Document.

Glossary

a) "**Addendum / Amendment**" means any written amendment / addendum /corrigendum to this RFP, from time to time issued by NMRC to the prospective bidders
b) **"Agreement"** means the Contract Agreement to be executed between NMRC and the Selected Bidder
c) **"Applicable Laws"** means all the laws including local, state, national or other laws, brought into force and effect by Govt. of India, State Governments, local bodies, statutory agencies and any other, and rules / regulations / notifications issued by them from time to time. It also include judgments, decrees, injunctions, writs and orders of any court or judicial authority as may be in force and effected from time to time
d) **"Bidder"** or **"Tenderer"** means any entity which is a sole proprietorship firm, a partnership firm or a company, in title and assigns which is submitting its bid pursuant to RFP Documents
e) **"Bid Due Date" means** Bid Submission end date and time given in the E-tender
f) **"Earnest Money Deposit (EMD)"** means the refundable amount to be submitted by the Bidder along with RFP documents to NMRC
g) **"NMRC"** means Noida Metro Rail Corporation Limited (or "Corporation" or "Employer")
h) **"Party"** means Contractor or Corporation (together they are called **"Parties"**)
i) **"Performance Bank Guarantee/ Security Deposit"** means interest free amount to be deposited by the Contractor with NMRC as per terms and conditions of Contract Agreement as a security against the performance of the Contract agreement
j) **"Permits"** shall mean and include all applicable statutory, environmental or regulatory Contracts, authorization, permits, consents, approvals, registrations and franchises from concerned authorities
k) **"Re. or Rs. or INR"** means Indian Rupee
l) **"Revenue Operations Date (ROD)"** means the date of operation of Metro
m) **"Selected Bidder"** means the bidder who has been selected by NMRC, pursuant to the bidding process for award of Contract

The words and expressions beginning with capital letters and defined in this document shall, unless repugnant to the context, have the meaning ascribed thereto hereinabove.

Date Sheet

1	Name of the Bid	**RFP for Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment.**
2	Approximate Cost of Work	INR **94,72,634.00 (including GST)**
3	Time-period of contract	One Year
4	Method of selection	Cost Based Selection (Lowest –L1)
5	Bid Processing Fee	INR 5900 (including GST) (Rupees Five Thousand Nine Hundred only) through RTGS/NEFT only payable in favour of Noida Metro Rail Corporation Limited
6	Ernest Money Deposit (EMD)	INR 1,89,452.68 (Rupees One Lakh Eighty Nine Thousand Four Hundred Fifty Two and Sixty Eight Paise only)
7	Financial Bid to be submitted together with Technical Bid	Yes
8	Name of the Corporation's official for addressing queries and clarifications	DGM (Electrical) Noida Metro Rail Corporation, Block-III, 3rd Floor, Ganga Shopping Complex, Sector-29, Noida 201301 Email: dgm_elec@nmrcnoidal.com, am_tr@nmrcnoida.com nmrcohetender@gmail.com Website:www.nmrcnoida.com, http://etender.up.nic.in
9	Bid Validity Period	180 days
10	Bid Language	English
11	Bid Currency	INR
12	**Schedule of Bidding Process**	
	Head	Key Dates
	Uploading of Bid	28.04.2026
	Pre Bid Meeting	05.05.2026
	Last date of seeking clarification	12.05.2026
	Last date of issuing amendment, if any	19.05.2026
	Last Date of Sale of tender	25.05.2026, 1100 hrs
	Last Date of Bid Submission	25.05.2026, 1300 hrs
	Date of Technical Bid Opening	25.05.2026, 1400 hrs
13	JV/Consortium to be allowed	No
14	Account details	**For Bid Processing Fee & EMD** State Bank of India (04077) – Sector 18, Noida Gautam Budh Nagar, Uttar Pradesh -201301 IFSC Code: SBIN0004077 **A/c No. 37707840592** **Noida Metro Rail Corporation Ltd.**

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Section 1: General Information

1.1 Basic Information

a. Noida and Greater Noida are being developed as the satellite towns to New Delhi and more and more people from Delhi and other areas are shifting to these towns in search of fresh air, greenery and better infrastructure. There is a need of providing an efficient, reliable and comfortable transportation system for the population intending to settle in these towns and also the public coming to these areas for education, service and business.

b. Noida Metro Rail Corporation is a Special Purpose Vehicle (SPV) formed by Noida and Greater Noida Authorities for planning and executing urban transport projects in Noida, Greater Noida regions. The Corporation desires to provide a world-class Public Transportation System with state-of-the-art technology. As such, the overarching criterion for setting up of the Corporation is to help create an efficient, safe, reliable, economical and affordable public transport system**.**

c. An elevated metro line between Noida and Greater Noida is already operational and for the OHE maintenance work breakdown vehicle is prime necessity, hence

NMRC invites Bids for selection of Contractor for Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment. In this regard, the Corporation now invites the interested Bidder/s to submit their proposals as per provisions of this RFP Document.

d. NMRC will shortlist the Bidders on the basis of evaluation criteria mentioned in this RFP Document. On the basis of the minimum evaluation criteria, qualified Bidders will be shortlisted and financial proposal of only qualified Bidders will be opened.

1.2 About Metro Location

The metro corridor is 29.7 km long and is known as Noida Greater Noida Metro Rail Corridor. It comprises 21 metro stations starting from Sector 51 in Noida and ends up at Depot Station in Greater Noida. The map is in Appendix 1: Metro Alignment

1.3 Communication

All communications should be addressed to -

DGM (Electrical)
Noida Metro Rail Corporation,
Block-III, 3rd Floor, Ganga Shopping Complex,
Sector-29, Noida 201301
Email: dgm_elec@nmrcnoidal.com, am_tr@nmrcnoida.com,
nmrcohetender@gmail.com
Website:www.nmrcnoida.com,http://etender.up.nic.in

Section 2: Terms of Reference and scope of work

2.1 General

The scope of work is to **perform the Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment.**

2.1.1 NMRC is an ISO-14001 & OHSAS 18001 certified Organization for Environment, Health & safety. The work is to be carried out as per International Norms/Standards and in such a manner that all premises always look Neat & Clean. Similarly, the waste disposal is also carried out in totally sealed manner without affecting the Environment.

2.2 INTERFACE WORKS:

2.2.1 Co-ordination/co-operation with other contractors:

The contractor shall cooperate with the other contractors appointed by the employer so that the work proceeds smoothly to the satisfaction of engineer. The contractor shall plan & execute the works with proper interfacing with other contractors.

2.3 REFERENCE TO THE STANDARD CODES OF PRACTICE

All Standards, Technical Specifications and Codes of practice referred to shall be latest editions including all applicable official amendments and revisions. The Contractor shall make available at site all relevant Indian Standard Codes of practice and IRSC & IRC Codes as applicable.

2.3.1 Wherever Indian Standards do not cover some particular aspects of design/construction, relevant British/German Standards will be referred to. The Contractor shall make available at site such standard codes of practice.

2.3.2 and In case of discrepancy among Standard codes of practice, Technical Specifications provisions in sub clauses in this NIT, the order of precedence will be as below:

i) Provision in NIT
ii) Technical Specifications,
iii)Standard Codes of Practice.

2.3.3 In case of discrepancy among Standard Codes of Practice, the order of precedence will be IRS, IRC, IS, BS, DIN.

3 Section 3: Instructions to Bidders

3.1 General instructions

a. A tenderer shall submit only one e-bid in the same tendering process, individually as a tenderer. A tenderer who submits or participates in, more than one bid will cause all of the proposals in which the tenderer has participated to be disqualified. No tenderer can be a sub-contractor while submitting a bid in the same bidding process. A tenderer, if acting in the capacity of subcontractor in any bid, may participate in more than one bid, but only in that capacity.

b. The Bidder shall initiate, and actively pursue and involve itself in all investigations and enquiries, Corporation feedbacks, information, convening of and attendance at meetings, and in any other activities as are or may be necessary for producing high quality work as per the requirements.

c. The Bidder shall carry out the services in compliance with the provisions of this Agreement. Any and all changes necessary to ensure that the Bidder's documents conform to the intent and purpose set out in the Agreement, shall be made at the Bidder's own expense. The Bidder represents that it is a professional and experienced company, and hereby agrees to bear full responsibility for the correctness and technical merit of the services performed.

d. Bidders shall be evaluated on the basis of the Evaluation Criteria specified in this document. Bidders shall be deemed to have understood and agreed that no explanation or justification for any aspect of the Selection Process will be given and that NMRC's decisions are without any right of appeal whatsoever.

e. Any entity which has been barred by the Central/State Government in India or by any entity controlled by them, from participating in any project, and the bar subsists as on the date of Bid, would not be eligible to submit an e-Bid.

f. Bidders are encouraged to inform themselves fully about the assignment and the local conditions before submitting the e-Bid by paying a visit to the Corporation and/or by sending written queries to NMRC before the last date for receiving queries/clarifications.

g. NMRC shall not be liable for any omission, mistake or error on the part of the Bidder in respect of any of the above or on account of any matter or thing arising out of or concerning or relating to e-Bid or the Selection Process, including any error or mistake therein or in any information or data given by NMRC.

h. The currency for the purpose of the Proposal shall be the Indian Rupee (INR).

i. Tenderers shall not have a conflict of interest. All Tenderers found to have a conflict of interest shall be disqualified. Tenderers shall be considered to have a conflict of interest with one or more parties in this bidding process, if:

   i. A tenderer has been engaged by the Employer to provide consulting services for the preparation related to procurement or implementation of the project;

   ii. A tenderer is any associates/affiliates (inclusive of parent firms) mentioned in subparagraph above; or

iii. A tenderer lends, or temporarily seconds its personnel to firms or organizations which are engaged in consulting services for the preparation related to procurement for an implementation of the project, if the personnel would be involved in any capacity on the same project.

j. The tenderer shall bear all costs associated with the preparation and submission of e-Bid and Noida Metro Rail Corporation Ltd. ("NMRC" or "the Corporation"), will in no case be responsible or liable for these costs, regardless of the conduct or outcome of the Bid process.

k. This tender document is available on the website **http://etender.up.nic.in** or on NMRC website (www.nmrcnoida.com) to enable the tenderers to view, download the e-Bid document and submit e-Bids online up to the last date and time mentioned in e-Tender notice/tender document against this e-Tender. The tenderers shall have to pay cost of e-bid document/e-Tender processing fee of as mentioned in **Data Sheet** through RTGS/NEFT only payable in favour of Noida Metro Rail Corporation Limited in the A/c No. mentioned in **Data Sheet**. The scanned copy of RTGS/NEFT receipt with transaction Id certified by the same bank must be enclosed along with the e-Bid. This cost of bid document/e-Tender processing fee as mentioned in **Data Sheet** will be non-refundable. Tender without cost of bid document/e-Tender processing fee in the prescribed form, will not be accepted.

3.1.1 Acknowledgement by Bidder

It shall be deemed that by submitting the e-Bids, the Bidder has:

a. Made a complete and careful examination of the e-Bids;

b. Received all relevant information requested from NMRC;

c. Acknowledged and accepted the risk of inadequacy, error or mistake in the information provided in the e-Bids or furnished by or on behalf of NMRC;

d. Satisfied itself about all matters, things and information, necessary and required for submitting an informed Application and performance of all of its obligations there under;

e. Acknowledged that it does not have a Conflict of Interest; and

f. Agreed to be bound by the undertaking provided by it under and in terms hereof.

3.1.2 Availability of Bid Document

This Bid document is available on the web site http://etender.up.nic.in or on Noida Metro website www.nmrcnoida.com to enable the Bidders to view, download the e-Bid document and submit e-Bids online up to the last date and time mentioned in e-Bidder notice/ e-Bid document. The Bidder`s shall have to pay e-Bid document fee and EMD as mentioned in Data sheet through RTGS/ NEFT on addresses given in data sheet. The scanned copy of RTGS/ NEFT with transaction ID certified by the same bank must be enclosed along with the e-Bid. This e-Bid document fee will be non-refundable. E-Bid without Bid fee in the prescribe form will not be accepted.

3.1.3 Clarifications of e-Bid

a. During evaluation of e-Bid, NMRC may, at its discretion, ask the Bidder for a clarification of his/her e-Bid. The request for clarification shall be in writing.

   Any queries or request for additional information concerning this RFP shall be submitted in writing or by fax and e-mail to the DGM/Electrical,NMRC **only before or during Pre-Bid Meeting** held at NMRC. The envelopes/ communication shall clearly bear the following identification/ title: **"Queries/ Request for Additional Information: Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment."**
   The responses will be posted to all such queries on the official Website www.nmrcnoida.com. NMRC reserves the right not to respond to any questions or provide any clarifications, in its sole discretion, and nothing in this Clause shall be taken or read as compelling or requiring NMRC to respond to any question or to provide any clarification.

b. A pre- submission meeting shall be called on the date mentioned in **Data Sheet** at NMRC Office. Any change corresponding to date, if any, shall be communicated to the Bidder vide NMRC/e-Tendering website.

c. In case the Bidder seeks for any queries, he shall send letter or e-mail to the correspondence address given in Data Sheet.

   However, NMRC shall not entertain any correspondence from the Bidders during the period of e-Bid opening to selection of the successful Bidder. Any wrong practice shall be dealt under Fraud and Corrupt Practices.

d. The Tenderer is advised to visit and examine the Site of Works and its surroundings and obtain for himself on his own responsibility all information that may be necessary for preparing the Tender and entering into a contract for the proposed work. The costs of visiting the Site shall be borne by the Tenderer. It shall be deemed that the Contractor has undertaken a visit to the Site of Works and is aware of the site conditions prior to the submission of the tender documents.

e. The Tenderer and any of his personnel will be granted permission by the Employer to enter upon his premises and lands for the purpose of such inspection, but only upon the express condition that the Tenderer, and his personnel, will release and indemnify the Employer and his personnel from and against all liability in respect thereof and will be responsible for death or personal injury, loss of or damage to property and any other loss, damage, costs and expenses incurred as a result of the inspection.

3.1.4 Amendment of e-Bid Document

a. At any time prior to the deadline for submission of e-Bid, NMRC may, for any reason, whether at its own in iterative or in response to a clarification requested by a prospective Bidder, modify the e-Bid document by amendments. Such amendments shall be uploaded on the e-procurement website http://etender.up.nic.in or NMRC's website www.nmrcnoida.com. The relevant clauses of the e-Bid document shall be treated as amended accordingly.

b. It shall be the sole responsibility of the prospective Bidder to check the website http//etender.up.nic.in or NMRC's website www.nmrcnoida.com from time to time for

any amendment in the e-Bid documents. In case of failure to get the amendments, if any, NMRC shall not be responsible for it.

c. In order to allow prospective e-Bids a reasonable time to take the amendment into account in preparing their e-Bids, NMRC, at the discretion, may extend the deadline for the submission of e-Bids. Such extensions shall be uploaded on the e-procurement website http://etender.up.nic.in or NMRC's website www.nmrcnoida.com.

3.2 Preparation and submission of Bids

3.2.1 Language of e-Bid

The e-Bid prepared by the Bidder, as well as all correspondence and documents relating to the e-Bid exchanged by the Bidder and NMRC shall be written in English language. Only English numerals shall be used in the e-Bid. The correspondence and documents in any other language must be accompanied by transcripts verified by the Embassy of Home Country or equivalent.

3.2.2 Documents constituting the e-Bid

The e-Bid prepared by the Bidder shall comprise the following components:

a. Technical e-Bid- Technical e-Bid will comprise of -

i. **Fee details -** Details of Bid processing fee (non refundable) and prescribed EMD

ii. **Eligibility details -** Includes copies of required documents in PDF format justifying that the Bidder is qualified to perform the contract if his/her bid is accepted and the Bidder has financial & technical capability necessary to perform the contract and meets the criteria outlined in the Qualification requirement and technical specification and fulfill all the conditions of the contract.

iii. **Technical evaluation -** Details of all documents needed for Technical evaluation as mentioned in this RFP

b. Financial e-Bid -

i. **Price bid –** Bill of Quantities in XLS format to be filled in after downloading from the e-Procurement website for this e-tender (http://etender.up.nic.in). There shall be a single financial quote for the package for which the e-bid is submitted.

3.2.3 Documents establishing Bidder's Qualification

a. The Bidder shall furnish, as part of its technical e-Bid, documents establishing the Bidder's qualification to perform the contract if its e-Bid is accepted. The documentary evidence should be submitted by the Bidder electronically in the PDF format with signature and stamped.

b. The documentary evidence of Bidder's qualification to perform the contract if its e-Bid is accepted shall be as per qualification requirements specified in e-Bid document.

3.2.4 E-Bid form

The Bidder shall complete the e-Bid form and the appropriate price schedule/BOQ furnished in the e-Bid document.

3.2.5 E-Bid Currency

Prices shall be quoted in Indian Rupees only.

3.2.6 Formats and Signing of e-Bid

a. The Bidder shall prepare one electronic copy of the technical e-Bid and financial e-Bid separately.

b. The e-Bid document shall be digitally signed, at the time of uploading, by the Bidder or a person or persons duly authorized to bind the Bidder to the contract. The later authorization shall be indicated by a scanned copy of written power-of attorney accompanying the e-Bid. All the pages/documents of the e-Bid that are to be uploaded shall be digitally signed by the person authorized to sign the e-Bid.

c. Bidders should provide all the information as per the RFP and in the specified formats. NMRC reserves the rights to reject any proposal that is not in the specified formats.

d. In case the Bidders intends to provide additional information for which specified space in the given format is not sufficient, it can be furnished in duly stamped and signed PDFs.

3.2.7 Deadline for submission of e-Bid

E-Bid (Technical and financial) must be submitted by the Bidder at e-procurement website http://etender.up.nic.in not later than the time specified on the prescribed date (as the server time displayed in the e-procurement website). NMRC may, at its discretion, extend this deadline for submission of e-Bid by amending the e-Bid document, in which case all rights and obligations of NMRC and Bidders previously subject to the deadline will thereafter be subject to the deadline as extended.

3.2.8 Submission of e-Bid

a. The e-bid submission module of e-procurement website http://etender.up.nic.in enables the Bidders to submit the e-Bid online in response to this e-Bid published by NMRC.

b. Bid submission can be done only from the bid submission start date and time till the bid submission end date and time given in the e-Bid. Bidders should start the bid submission process well in advance so that they can submit their e-Bid in time.

c. The Bidder should submit their e-Bid considering the server time displayed in the e-procurement website. This server time is the time by which the e-Bid submission activity will be allowed till the permissible time on the last/end date of submission indicated in the e-Bid schedule.

d. Once the e-Bid submission date and time is over, the Bidders cannot submit their e-Bid. For delay in submission of e-Bid due to any reasons, the Bidders shall only be held responsible.

The Bidders have to follow the following instructions for submission of their e-Bid:

a. For participating in e-Bid through the e-Biding system it is necessary for the Bidders to be the registered users of the e-procurement website http://etender.up.nic.in. The Bidders must obtain a user login Id and password by registering themselves with https://etender.up.nic.in/nicgep/app if they have not done so previously for registration.

b. In addition to the normal registration, the Bidder has to register with his/her digital signature certificate (DSC) in the e-Biding system and subsequently he/she will be allowed to carry out his/her e-Bid submission activities. Registering the digital signature certificate (DSC) is a one-time activity. Before proceeding to register his/her DSC, the Bidder should first log on to the e-Biding system using the user login option on the home page with the login Id and password with which he/she has registered.
For successful registration of DSC on e-procurement website http://etender.up.nic.in the Bidder must ensure that he/she should possess class-2/class-3 DSC issued by any certifying authorities approved by controller of certifying authorities, Government of India, as the e-procurement website http://etender.up.nic.in is presently accepting DSC issued by these authorities only. The Bidder can obtain user login Id and perform DSC registration exercise given above even before the e-Bid submission date starts. NMRC shall not be held responsible if the Bidder tries to submit his/her e-Bid at the moment before end date of submission but could not submit due to DSC registration problem.

c. The Bidder can search for active Bids through "search active tenders" link, select a Bid in which he/she is interested in and then move it to 'My Tenders' folder using the options available in the e-Bid submission menu. After selecting and the Bid, for which the Bidder intends to e-Bid, from "My tenders" folder, the Bidder can place his/her e-Bid by clicking "pay offline" option available at the end of the view Bid details form. Before this, the Bidder should download the e-Bid document and price schedule/bill of quantity (BOQ) and study them carefully. The Bidder should keep all the documents ready as per the requirements of e-Bid document in the PDF format except the price schedule /bill of quantity (BOQ) which should be in the XLS format (excel sheet).

d. After clicking the 'pay offline' option, the Bidder will be redirected to terms and conditions page. The Bidder should read the terms & conditions before proceeding to fill in the Bid fee and EMD offline payment details. After entering and saving the Bid fee and EMD details form so that "bid document preparation and submission" window appears to upload the documents as per technical (fee details, qualification details, e-Bid form and technical specification details) and financial (e-Bid form and price schedule/BOQ) schedules/packets given in the Bid details. The details of the RTGS/NEFT should tally with the details available in the scanned copy and the date entered during e-Bid submission time otherwise the e-Bid submitted will not be accepted.

e. Next the Bidder should upload the technical e-Bid documents for fee details (e-Bid fee and EMD), Qualification details. Before uploading, the Bidder has to select the relevant digital signature certificate. He may be prompted to enter the digital signature certificate password, if necessary. For uploading, the Bidder should click "browse" button against each document label in technical and financial schedules/packets and then upload the relevant PDF/XLS files already prepared and stored in the Bidder's computer. The

required documents for each document label of technical (fee details, qualification details, e-Bid form and technical specification details) and financial (e-Bid form and price schedule/BOQ) schedules/packets can be clubbed together to make single different files for each label.

f. The Bidder should click "Encrypt" next for successfully encrypting and uploading of required documents. during the above process, the e-Bid document are digitally signed using the DSC of the Bidder and then the documents are encrypted/locked electronically with the DSC's of the bid openers to ensure that the e-Bid documents are protected, stored and opened by concerned bid openers only.

g. After successful submission of e-Bid document, a page giving the summary of e-Bid submission will be displayed confirming end of e-Bid submission process. The Bidder can take a printout of the bid summary using the "print" option available in the window as an acknowledgement for future reference.

h. NMRC reserves the right to cancel any or all e-Bids without assigning any reason.

3.2.9 Late e-Bid

a. E-Bids received by NMRC after the specified time on the Bid Due Date shall not be eligible for consideration and shall be summarily rejected and in this case E-Bid fee will not be refundable.

b. The server time indicated in the bid management window on the e- procurement website http://etender.up.nic.in will be the time by which the e-Bid submission activity will be allowed till the permissible date and time scheduled in the e-Bid.

c. Once the e-Bid submission date and time is over, the Bidder cannot submit his/her e-Bid. Bidder has to start the bid submission well in advance so that the submission process passes off smoothly. The Bidder will only be held responsible if his/her e-Bid is not submitted in time due to any of his/her problems/faults, for whatsoever reason, during e-Bid submission process.

3.2.10 Withdrawal and resubmission of e-Bid

a. At any point of time, a Bidder can withdraw his/her e-Bid submitted online before the bid submission end date and time. For withdrawing the Bidder should first log in using his/her login id and password and subsequently by his/her digital signature certificate on the e-procurement website http://etender.up.nic.in. The Bidder should then select "My bids" option in the bid submission menu. The page listing all the bids submitted by the Bidder will be displayed. Click "View" to see the details of the bid to be withdrawn. After selecting the "bid withdrawal" option the Bidder has to click "Yes" to the message "Do you want to withdraw this bid?" displayed in the bid information window for the selected bid. The Bidder also has to enter the bid withdrawing reasons and upload the letter giving the reasons for withdrawing before clicking the "Submit" button. The Bidder has to confirm again by pressing "OK" button before finally withdrawing his/her selected e-Bid.

b. No e-Bid may be withdrawn in the interval between the deadline for submission of e-Bids and the expiration of period of bid validity. Withdrawal of an e-Bid during this interval may result in the forfeiting of Bidder's e-Bid security/EMD.

c. The Bidder can re-submit his/her e-Bid as when required till the e-Bid submission end date and time. The e-Bid submitted earlier will be replaced by the new one. The payment made by the Bidder earlier will be used for revised e-Bid and the new e-Bid submission summary generated after the successful submission of the revised e-Bid will considered for evaluation purposes. For resubmission, the Bidder should first log in using his/her login Id and password and subsequently by his/her digital signature certificate on the e-procurement website http://etender.up.nic.in. The Bidder should then select "My bids" option in the bid submission menu. The page listing all the bids submitted by the Bidder will be displayed. Click "View" to see the detail of the e-Bid to be resubmitted. After selecting the "bid resubmission" option, click "Encrypt & upload" to upload the revised e-Bids documents.

d. The Bidder can submit their revised e-Bids as many times as possible by uploading their e-Bid documents within the scheduled date & time for submission of e-Bids.

e. No e-Bid can be resubmitted subsequently after the deadline for submission of e-Bids.

3.2.11 NMRC's right to accept any e-Bid and to reject any or all e-Bids.

a. Notwithstanding anything contained in this Bid, NMRC reserves the right to accept or reject any Bid and to annul the Selection Process and reject all Bids, at any time without any liability or any obligation for such acceptance, rejection or annulment, and without assigning any reasons thereof.

b. NMRC reserves the right to reject any e-Bid if:

- At any time, a material misrepresentation is made or uncovered, or
- The Bidder does not provide, within the time specified by NMRC, the supplemental information sought by NMRC for evaluation of the e-Bid.

c. Such misrepresentation/ improper response may lead to the disqualification of the Bidder. If such disqualification /rejection occurs after the e-Bid have been opened and the highest ranking Bidder gets disqualified / rejected, then the NMRC reserves the right to consider the next best Bidder, or take any other measure as may be deemed fit in the sole discretion of NMRC, including annulment of the Selection Process.

3.2.12 .Period of validity of e-Bid

a. E-Bid shall remain valid for 180 days after the date of e-Bid opening prescribed by NMRC. An e-Bid valid for a shorter period shall be rejected by NMRC as non-responsive.

b. In exceptional circumstances, NMRC may solicit the Bidder's consent to an extension of the period of e-Bid validity. The request and the response shall be made in writing.

3.2.13 **Correspondence with the Bidder**

a. NMRC shall not entertain any correspondence with any Bidder or its Technical Partners in relation to acceptance or rejection of any e-Bid.

b. Subject to Clause 3.4.4 no Bidders or its Technical Partners shall contact NMRC on any matter relating to his e-Bid from the time of Bid opening to the time contract is awarded.

c. Any effort by the Bidder or by its Technical Partners to influence NMRC in the Bid evaluation, Bid comparison or contract award decisions, may result in the rejection of his Bid.

3.3 Earnest Money Deposit

3.3.1 Earnest money deposit (EMD)

a. The tenderer shall furnish, as part of its e-Bid, an e-Bid security/ EMD as stated in Data Sheet in form of RTGS/NEFT only in favour of Noida Metro Rail Corporation Limited in the A/c No. mentioned in Data Sheet. The scanned copy of RTGS/NEFT receipt of Security/ EMD with transaction Id certified by the same bank must be enclosed along with the e-Bid. Tender without Earnest Money in the prescribed form, will not be accepted.

b. Any e-Bid not secured in accordance with above shall be treated as non-responsive and rejected by NMRC.

c. Unsuccessful Bidder's EMD will be returned within 45 days of opening of the Price Bid in case of Conclusion or discharge of the tender after providing relevant document by tendrer as per RFP.

d. No interest will be paid by the Employer on the Earnest Money Deposit.

e. The successful Bidder's e-Bid EMD will be adjusted with Performance Bank Guarantee, if applicable, to be submitted by the Bidder upon signing the contract.

f. The EMD may be forfeited:

   i. If Bidder (a) withdraws its e-Bid during the period of e-Bid validity specified in RFP on the e- bid form: or (b) does not accept the correction of errors or (c) modifies its e-Bid price during the period of e-Bid validity specified by the Bidder on the form.

   ii. In case of a successful Bidder, if the Bidder fails to sign the contract with the Corporation.

3.4 Opening and Evaluation of e-Bids

3.4.1 Opening of technical e-Bid by NMRC

a. NMRC will open all technical e-Bids, in the presence of Bidder’s representatives who choose to attend on the prescribed date of opening at NMRC Office. The Bidder's representatives who are present shall submit the letter to NMRC on the letter head of the company stating that the representative (name) is authorized to attend the meeting (Please note – The representative is required to carry a copy during pre-Bid and other related meetings as well). He / She shall sign a register evidencing their attendance at NMRC. In the event of the specified date e-Bid opening being declared a holiday for the Corporation, the e –bids shall be opened at the appointed time and place on the next working day.

b. The Bidder who is participating in e-Bid should ensure that the RTGS/NEFT of Bid Processing Fee and EMD must be submitted in the prescribed account of NMRC within

the duration (strictly within opening & closing date and time of individual e-Bid) of the work as mentioned in Bid notice, otherwise, in any case, e-Bid shall be rejected.

c. The Bidders names and the presence or absence of requisite e-Bid security and such other details as NMRC at its discretion may consider appropriate, will be announced at the opening.

a. <u>Opening of financial e-Bid</u>

b. After evaluation of technical e-Bid, through the evaluation committee NMRC shall notify those Bidders whose technical e-Bids were considered non-responsive to the conditions of the contract and not meeting the technical specifications and qualification requirements indicating that their financial e-Bids will not be opened.

c. NMRC will simultaneously notify the Bidders, whose technical e-Bids were considered acceptable to the Corporation. The notification may sent by e-mail provided by Bidder.

d. The financial e-Bids of technically qualified Bidders shall be opened in the presence of technically qualified bidders who choose to attend. The date and time for opening of financial bids will be communicated to the technically qualified Bidders subsequently after completion of technical bids evaluation through e-mail provided by the Bidder.

3.4.2 Correction of Errors

a. Financial Bids determined to be responsive will be checked by NMRC for any arithmetic errors. Where there is a discrepancy between the rate quoted in the Financial Bid, in figures and in words, the amount in words will prevail over the amounts in figures, to the extent of such discrepancy.

b. The amount stated in the Financial Bid will be adjusted by NMRC in accordance with the above procedure for the correction of errors and shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected quoted rate of e-Bid, his e-Bid will be rejected, and his Bid Security shall be liable for forfeiture in accordance with Clause 3.3 1f.

3.4.3 Examination of e-Bid document

a. The NMRC will examine the e-Bid to determine if:

   i. They are complete;

   ii. They meet all the conditions of the contract;

   iii. The required Bid Processing fee, EMD and other required documents have been furnished;

   iv. The documents have been properly duly signed; and

   v. The e-Bids are in order.

b. Any e-Bid or e-Bids not fulfilling these requirements shall be rejected.

3.4.4 Contacting NMRC

a. No Bidder shall contact NMRC on any matter relating to his/her e-Bid, from the time of the e-Bid opening to the time the contract is awarded. If the Bidder wishes to bring additional information to the notice of NMRC, he/she can do so in writing.

b. Any effort by a Bidder to influence NMRC in its decisions on e-Bid evaluation, e-bid comparison or contract award may result in rejection of the Bidder's e-Bid.

c. In the event of any information furnished by the Bidder is found false or fabricated, the minimum punishment shall be debarring /blacklisting from Noida Metro works and legal proceeding can also be initiated. EMD of such bidders will be forfeited.

3.4.5 Confidentiality

a. Information relating to the examination, clarification, evaluation, and recommendation for the Bidders shall not be disclosed to any person who is not officially concerned with the process or is not a retained professional advisor advising NMRC in relation to or matters arising out of, or concerning the Bidding Process. Any effort by a Bidder to exert undue or unfair influence in the process of examination, clarification, evaluation and comparison of Proposal shall result in outright rejection of the offer, made by the said Bidder.

b. NMRC shall treat all information, submitted as part of Bid, in confidence and shall require all those who have access to such material to treat the same in confidence. NMRC may not divulge any such information unless it is directed to do so by any statutory entity that has the power under law to require its disclosure or is to enforce or assert any right or privilege of the statutory entity and/ or NMRC or as may be required by law or in connection with any legal process.

3.5 Award of Contract

3.5.1 Award Criteria

a. NMRC will award the contract as per evaluation criteria stated in the RFP Document.

b. NMRC will award the contract to the successful Bidder whose bid has been determined to be responsive to all the conditions of the contract and meeting the eligibility requirement of the bidding document.

3.5.2 Notice of Award (NOA)

a. Prior to the expiration of the period of e-Bid validity, NMRC will notify the successful Bidder in writing, by letter/e-mail/fax, that its e-Bid has been accepted.

b. The acceptance of NOA will constitute the formation of the contract.

3.5.3 Signing of contract

At the same time as NMRC notifies the successful Bidder that it's e-Bid has been accepted, the successful Bidder shall have to sign the contract agreement with relevant document as mentioned in the RFP. The agreement draft along with other related terms and conditions will be same as furnished in this e-Bid. Any refusal will not be allowed and

EMD may be forfeited at the time of refusal. The Bidder need not download and submit in hard copies of these documents.

3.5.4 NMRC's right to accept any e-Bid and to reject any or all e-Bids

NMRC reserves the right to accept or reject any e-Bid, and to annul the e-Bid process and reject all e-Bids at any time prior to contract award, without thereby incurring any liability to the affected tenderer or tenderers.

4 Section 4: Qualification, Evaluation and Selection Process

4.1 Eligibility Criteria

The Bidder's competence and capability is proposed to be established by the following parameters. The Bidder should meet all the criteria given in this section.

a. Sole proprietorship, registered partnership firm (including LLP) public limited company, private limited company or any of the above can submit the Bid. The firms and the companies should be registered in India. **Joint Ventures or Consortiums are not allowed to participate in the tender**.

b. The overall performance of the tenderer shall be examined for all the ongoing works awarded by NMRC/ any Central / State government department / public sector undertaking / other government entity or local body/private firms of value more than 40% of NIT cost of work and also for all the completed works awarded by NMRC/ any Central / State government department / public sector undertaking / other government entity or local body within last one year (from the last day of the previous month of tender submission), of value more than 40% of cost of work, executed individually. The tenderer shall provide list of all such works in the prescribed Performa given in Form 18 of the Form of Tender. The tenderer may either submit satisfactory performance Certificate issued by the Client/ Employer for the works or give an undertaking regarding satisfactory performance of the work with respect to completion of work/execution of work (for ongoing works) falling which their tender submission shall not be evaluated and the tenderer shall be considered non-responsive and non-compliant to the tender conditions. In case of non-submission of either satisfactory performance Certificate from Client /Employer or undertaking of satisfactory performance of any of the above work, the performance of such work shall be treated as unsatisfactory while evaluating the overall performance of tenderer in terms of Note (b) of Form 18 In case of performance certificate issued by the client, same should not be older than three month (from the last day of the previous month of tender submission) for on-going works. In case the tenderer does not have any work falling in above criteria, his performance will not be judged unsatisfactory.

c. The Bidder should have a minimum experience of having satisfactorily/successfully completed similar works during last 7 (seven) years period ending last day of month previous to the one in any Central Govt./state Govt./PSU"s/NMRC or any private Limited company, which the bids are invited should be either of the following:

i. One similar completed work costing not less than the amount equal to **Rs. 75.78 Lakh approx.** (Rupees Seventy Five Lakh Seventy Eight Thousand only) or

ii. Two similar completed works each costing not less than the amount equal to **Rs. 47.36 Lakh approx.** (Rupees Fourty Seven Lakh Thirty Six Thousand only) or

iii. Three similar completed works each costing not less than the amount equal to **Rs. 37.89 Lakh approx.** (Rupees Thirty Seven Lakh Eighty Nine Thousand only)

"Similar work" for this contract shall be SITC (Supply, Installation, Testing, Commissioning) of 25 kV Over Head Equipments (OHE) in any Railway/Metro organisation.

The Bidder should have minimum **average annual turnover** of **Rs. 94.73 Lakh approx.** in the last 3 (three) Financial Years **(2022-23, 2023-24, 2024-25)** preceding the Bid Due Date.

d. T1 – Liquidity :- Not Applicable.

e. T2 – Profitability: Profit Before Tax (PBT) during any of the financial year should be positive during immediately preceding 03 financial year (2022-23, 23-24, 24-25)

f. T3 – Net Worth:- Not Applicable

Notes:

a) Financial data for latest last three audited financial years has to be submitted by the tenderer in Form-5 along with audited balance sheets. The financial data in the prescribed format shall be certified by Chartered Accountant with his stamp and signature in original with membership number and firm registration number along with UDIN number. In case audited balance sheet of the last financial year is not made available by the bidder, he has to submit an affidavit certifying that 'the balance sheet has actually not been audited so far' certifying by Chartered Account along with membership no. and UDIN no.. In such a case the financial data of previous '2' audited financial years will be taken into consideration for evaluation. If audited balance sheet of any year other than the last year is not submitted, the tender may be considered as non-responsive. Once the audit balance sheet completed, same may be asked by NMRC at any time from selected bidder.

b) Where a work is undertaken by a group, only that portion of the contract which is undertaken by the concerned applicant/member should be indicated and the remaining done by the other members of the group be excluded. This is to be substantiated with documentary evidence.

c) The Bidder should not have been blacklisted/ banned/ declared ineligible for corrupt and fraudulent practices by the Government of India/ any State Government/ Government Agency and Supreme court and contracts have been terminated/ foreclosed by any company / department due to non- fulfillment of Contractual obligation in last 5 (five) financial years.

The Bidder shall also furnish the following documentary proof (as per eligibility criteria):

a. For above criteria 4.1a
   i. Statutory proof of existence as the legal entity
   ii. PAN certificate as per legal entity
   iii. GST certificate

b. For above criteria 4.1c
   i. Work Experience with documentary evidence as mentioned in the Form 4.

c. For above criteria 4.1d
   i. Form 5: Financial Capability Details
   ii. A copy of the Audited balance sheets and positive Profit and Loss Statements for the last 3 (three) financial years
   iii. Self attested copy of the last 3 (three) financial years ITR

d. For above criteria 4.1h
   Form 7: Undertaking

Notes:

a) The tenderer shall submit details of works executed by them in the Performa of Form-4 for the works to be considered for qualification of work experience criteria. Documentary proof of completion certificates from client clearly indicating the nature/scope of work, actual completion cost and actual date of completion for such work should be submitted. The offers submitted without this documentary proof shall not be evaluated**. In case the work is executed for private client, copy of work order, bill of quantities, bill wise details of payment received certified by C.A., T.D.S certificates for all payments received and copy of final/last bill paid by client shall also be submitted.**

b) Value of successfully completed portion of any ongoing work up to last day of the month previous to the month of tender submission will also be considered for qualification of work experience criteria.

d) For completed works, value of work done shall be updated to last day of the month previous to the month of tender submission price level assuming 5% inflation for Indian Rupees every year and 2% for foreign currency portions per year. The exchange rate of foreign currency shall be applicable 28 days before the submission date of tender.

e) If the above work(s) (i.e. “Similar work” comprise other works, then client’s certificate clearly indicating the amount of work done in respect of the “similar work” shall be furnished by the tenderer in support of work experience along-with their tender submissions.

4.2 Bid Capacity Criteria:

Bid Capacity: The tenderers will be qualified only if their available bid capacity is more than the approximate cost of work. Available bid capacity will be calculated based on the following formula:

Bid capacity will be calculated based on the following formula:

Available Bid Capacity = 2*A*N – B

Where,

A = Maximum of the value of work executed in any one year during the last three financial years (updated to the last day of the previous month of tender submission price level

assuming 5% inflation for Indian Rupees every year and 2% for foreign currency portions per year).
N = No. of years prescribed for completion of the work
B = Value of existing commitments (as on the last day of the previous month of tender submission) for on-going works during period of **12** months w.e.f. from the first day of the month of tender submission.

Notes:

a. Financial data for latest last three financial years has to be submitted by the tenderer in Form-5 of FOT along with audited financial statements. The financial data in the prescribed format shall be certified by the Chartered Accountant with his stamp and signature in original with membership number and firm registration number along with UDIN no.

b. Value of existing commitments for on-going construction works during period of **12** months w.e.f from the first day of the month of tender submission has to be submitted by the tenderer in Form-9. These data shall be certified by the Chartered Accountant with his stamp and signature in original with membership number & UDIN number and firm registration number.

c. The tender submission of tenderers, who do not qualify the minimum eligibility criteria & bid capacity criteria stipulated in the clauses 4.1 to 4.2 above, shall not be considered for further evaluation and therefore rejected. The mere fact that the tenderer is qualified as mentioned in sub clause clauses 4.1 to 4.2 above shall not imply that his bid shall automatically be accepted.

4.3 Personnel

The Tenderer shall submit - Form 12: Undertaking pertaining to Personnel a staffing schedule containing the names, employment ID (if any), professional experience of personnels.

4.3.1 RESOURCES PROPOSED FOR THE PROJECT – PERSONNEL

It is to be noted that the performance of project personal deployed will be evaluated periodically by Employer during the contract period. In case the performance of any of the personnel is not satisfactory, the contractor shall replace them with good personnel immediately.

4.4 Compliance with Technical Specifications

The Bidders must comply with the stipulated technical specifications as mentioned in the tender documents

4.5 Information of the Technical and Financial Proposal

a. The Bidder satisfying technical and financial eligibility criteria under Clause 4.1 & 4.2 shall be considered as technically and financially qualified.

b. The financial proposal of only technically qualified Bidders shall be opened for evaluation.
c. The Bidder with the lowest quoted price for the **Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment** work in N-GN corridor (21 stations and depot) in the financial quote **(L1 bidder)** shall be selected for the award of contract.

4.6 Selection of Bidder

After the above evaluation process, the Technically Qualified Bidder, who is declared as L1 (lowest quoted price) may be declared as the selected Bidder ("Selected Bidder") for the Project.

a. In case, two or more technically qualified bidders quote the same rate in the Commercial Bid, and become Lowest (i.e. L-1), then the tender would be awarded to the bidder who has the highest / higher Average Annual Turnover from 'Similar Works' (as per Minimum Eligibility Criteria defined in Section 4 under "Definition of Similar Work") during the last 3 years ending on the last day of the month preceding the month in which the tender has been floated. Experience certificate / work completion certificate on client's letter head is mandatory to ascertain the nature, period and value of work which shall be required to be uploaded by the bidder by the last date of tender submission. Prior to the expiry of the period of bid validity, NMRC will notify the successful bidder in writing, either through Notice of Award (NOA), that his bid has been accepted.
b. Prior to the expiry of the period of bid validity, NMRC will notify the successful bidder in writing, either through Notice of Award (NOA), that his bid has been accepted.
c. The NOA would be sent in duplicate to the successful bidder, who will return one copy to NMRC duly acknowledged, signed and stamped by the authorized signatory of the bidder, as an unconditional acceptance of the NOA, within 10 (ten) days from the date of issue of NOA.
d. No correspondence will be entertained by NMRC from the unsuccessful bidders.

4.7 Notice of Award and Execution of Contract Agreement

a. NMRC will notify the Successful Bidder by a NOA that its bid has been accepted.
b. The Selected **Bidder shall, within 10 (ten) days of the receipt of the NOA, sign and return the duplicate copy of the NOA in acknowledgement thereof along with letter of acceptance of NOA.** In the event, the duplicate copy of the NOA duly signed by the Selected Bidder and letter of acceptance of NOA is not received by the stipulated date, NMRC may, unless it consents to extension of time for submission thereof, appropriate the Bid Security of such Bidder as mutually agreed genuine pre-estimated loss and damage suffered by NMRC on account of failure of the Selected Bidder to acknowledge the NOA
c. The **Successful Bidder shall execute the Contract Agreement within 30 (thirty) days of the letter of acceptance of NOA** or such extended period as may be decided by the Corporation.
d. Failure of the Successful Bidder to comply with the requirement of acknowledgement of NOA shall constitute sufficient grounds for the annulment of the NOA, and forfeiture of the bid security.

e. The Purchaser reserves the right to increase or decrease the quantity up to 25% of the quantity offered by the successful tenderer. The bidder is bound to accept the increase or decrease in the tendered quantity up to 25% under this clause without any change in unit price.

4.8 Performance Bank Guarantee / Security Deposit

a. To fulfill the requirement of performance bank guarantee during the implementation period, the Successful Bidder (herein referred to as the "Contractor") shall deposit **10% of the Contract Price** in form of DD or unconditional and irrevocable Bank Guarantee bond issued by a scheduled bank in favor of NMRC, which may be reduced for balance years on completion of each year, within 30 days from Notice of Award. EMD amount of successful bidder shall be adjusted in the performance bank guarantee, if applicable. For unsuccessful bidder, EMD shall be refunded without any interest. **The PBG shall remain valid for the entire period of the Contract incl. any extension, amendments, or variations thereof, and shall further remain valid for a period of (6) months beyond the date of completion of the contract. The bank guarantee shall also have a claim period not less than (6) months from the date of expiry of the PBG, during which NMRC shall be entitled to invoke the same.**
b. It is to note that if contract value increases by more than 25% of the original contract value, the performance bank guarantee shall be increased accordingly.
c. A Contract agreement will have to be signed by the Contractor at his cost on proper stamp paper. Without performance guarantee by Contractor, Contract agreement shall not be signed.
d. NMRC reserves the right for deduction of NMRC dues from Contractor's Performance Bank Guarantee/ Security Deposit (interest free) for
    i. Any penalty imposed by NMRC for violation of any terms and conditions of agreement committed by the Contractor.
    ii. Any amount which NMRC becomes liable to the Government/Third party due to any default of the Contractor or any of his director/ employees/ representatives/ servant/ agent, etc.
    iii. Any payment/ fine made under the order/judgment of any court/consumer forum or law enforcing Contractor or any person duly empowered in his behalf.
    iv. Any outstanding payment/ claims of NMRC remained due after completion of relevant actions as per agreement.
e. Once the amount under above Clause is debited, the Contractor shall replenish the Security Deposit/ Performance Bank Guarantee to the extent the amount is debited within 15 days period, failing which, it shall be treated as Contractor Event of Default and will entitle NMRC to deal with the matter as per the provisions of RFP and Contract Agreement.
f. Part/whole Performance Bank Guarantee may be forfeited in case of no work/unsatisfactory work or abandon of contractor.

4.9 Contact during Proposal Evaluation

a. Proposals shall be deemed to be under consideration immediately after they are opened and until such time NMRC makes official intimation of award/ rejection to the

Bidders. While the Proposals are under consideration, Bidders and/ or their representatives or other interested parties are advised to refrain from contacting by any means, NMRC and/ or their employees/

representatives on matters related to the Proposals under consideration till the time Contract is awarded.

b. Any effort by a Bidder to influence NMRC in its decisions on Bid evaluation, Bid comparison or contract award may result in rejection of the Bidder's Bid.
c. In the event of any information furnished by the Contractor is found false or fabricated the minimum punishment shall be debarred/ blacklisting and the legal proceeding may also be initiated.
d. If the Bidder wishes to bring additional information to the notice of NMRC, he/she can do so in writing. All correspondence/ enquiry should be submitted to the following in writing by fax/ post/courier:

DGM (Electrical)
Noida Metro Rail Corporation,
Block-III, 3rd Floor, Ganga Shopping Complex,
Sector-29, Noida 201301
Email: dgm_elec@nmrcnoidal.com, am_tr@nmrcnoida.com, nmrcohetender@gmail.com

No interpretation, revision, or other communication from NMRC regarding this solicitation is valid unless in writing and signed by the competent authority from NMRC.

4.10 Other Instruction

a. Canvassing in connection with the tenders is strictly prohibited and the tenders, submitted by Bidder, who resort to canvassing, are liable to be rejected. EMD will be forfeited of those tenders who will be found non-serious and if it is felt by the tender committee that the Bidders submitted their tender only to influence the tendering process.
b. On acceptance of the tender, the name of the accredited representative of the Contractor, who would be responsible for taking instructions from the NMRC or the official deputed by NMRC, shall be communicated to the NMRC or the official deputed by NMRC in writing.

4.11 Project Financial Terms

4.11.1 Payment Terms

a. The payment for items given in Bill of Quantity/Pricing Document shall be made on the basis of actually executed quantities after verification of concerned NMRC representative.
b. The Contractor may raise their 'On Account'' payments generally on monthly basis as per the status of work on the last day of the respective month.
c. Payment will be made after the fulfillment of statutory liabilities & verification by NMRC representative.
d. No payment shall be made in advance.
e. No payment shall be made for the items rejected.
f. TDS will be deducted as per applicable law.

g. GST will be paid only on the production of GST paid challan or its reflection on the GST portal of NMRC.
h. Quote PAN & GST on all correspondence bill, voucher and other documents otherwise TDS at higher of the the prescribed rate will be deducted.

LD- As per GCC clause.

4.12 Public Procurement (Preference to Make in India) to provide for Purchase Preference (linked with local content) in respect of procurement in NMRC

a) Definitions:

I. Local content' means the amount of value added in India which shall be the total value of the item procured (excluding net domestic indirect taxes) minus the value of imported content in the item (including all custom duties) as a proportion of the total value, in percent. Minimum local content shall be 90%(As per prevailing MoHUA guidelines) for the subject tender.

II. Local Supplier means a supplier or service provider whose product or service offered for Procurement meets the minimum local content as prescribed at sr. no. (I) above.

III. L-1 means the lowest tender or lowest bid received in a tender, bidding process or other. Procurement solicitation as adjudged in the evaluation process as per the tender or other procurement solicitation.

IV. Margin of purchase preference' means the maximum extent to which the price quoted by a local supplier may be above the L1 for the purpose of purchase preference. Margin of purchase preference shall be 10% for the subject tender.

b) Procedure for Purchase Preference in procurement of goods or works which are Divisible in nature:

I. Among all qualified bids, the lowest bid will be termed as L1. If L1 is from a local supplier, the contract for full quantity will be awarded to L1.

II. If L1 bid is not from a local supplier, 50% of the order quantity shall be awarded to L1. Thereafter, the lowest bidder among the local suppliers, will be invited to match the L1 price for the remaining 50% quantity subject to the local supplier's quoted price falling within the margin of purchase preference, and contract for that quantity shall be awarded to such local supplier subject to matching the L1 price.

III. In case such lowest eligible local supplier fails to match the L1 price or accepts less than the offered quantity, the next higher local supplier within the margin of purchase preference shall be invited to match the L1 price for remaining quantity and so on, and contract shall be awarded accordingly.

IV. In case some quantity is still left uncovered on local suppliers, then such balance quantity may also be ordered on the L1 bidder.

c) Procedure for Purchase Preference in procurement of goods or works which are not divisible in nature and in procurement of services where the bid is evaluated on price alone:

I. Among all qualified bids, the lowest bid will be termed as L1. If L1 is from a local supplier, the contract will be awarded to L1.

II. If L1 is not from a local supplier, the lowest bidder among the qualified bidder, will be invited to match the L1 price subject to local supplier's quoted price falling within the margin of purchase preference, and the contract shall be awarded to such local supplier subject to matching the L1 price.

III. In case such lowest eligible local supplier fails to match the L1 price, the local supplier with the next higher bid within the margin of purchase preference shall be invited to match the L1 price and so on and contract shall be awarded accordingly.

IV. In case none of the local suppliers within the margin of purchase preference matches the L1 price, then the contract may be awarded to the L1 bidder.

a) Minimum local content and verification of local content:

I. The local supplier at the time of tender shall be required to provide self-certification that the item offered meets the minimum local content and shall give details of the location(s) at which the local value addition is made.

b) Complaints relating to implementation of Purchase Preference

I. Fees for such complaints shall be Rs. 2 Lakh or 1% of the value of the local item being procured (subject to maximum of Rs. 5 Lakh), whichever is higher. In case the complaint is found to be incorrect, the complaint fee shall be forfeited. In case, the complaint is upheld and found to be substantially correct, deposited fee of the complainant would be refunded without any interest

1. Form 19: Undertaking of more then 90% declaration regarding minimum local content.
2. Form 20: Performa of list of goods, works or services tentatively proposed to be offered with local value addition.

Section 5: Special Conditions of Contract (SCC)

SCC Clause	Reference to GCC Sub-Clause No.	Description
1	**Sub Clause 4.2.1**	**PERFOMANCE SECURITY** In addition to the clause 4.2.1 in GCC & PBG clause , the amount of Performance Security for this contract will be 10% of contract value as stipulated in the GCC. If the contract value increases by more than 25% of the original contract value, the Performance Security will be increased accordingly for complete revised value on every increase.
2	**Sub-Clause 4.3**	**REPRESENTATION ON WORKS** The instructions given by the Engineer-In-charge or Engineer-In-charge's representative to contractor shall be complied immediately. The contractor shall not replace any of the deployed staffs for the work without permission of Engineer-In-charge. The contractor either himself or his nominated representative duly authorized by the contractor shall be responsible for the satisfactory execution of the work.
3	**Sub-Clause 4.4**	**Coordination with other Contractors** The contractor for this package shall plan and execute work in coordination and in co-operation with other contractors working for adjacent/other packages.
4	**Sub-Clause 4.5**	**SUB-CONTRACTOR** **Sub-contracting of whole work or any part of work shall not be permitted in the contract.** If it will come to the notice of employer that the work or part of work has been subcontracted, the contract will be terminated and performance bank guarantee shall be forfeited and punitive action shall be initiated against the contractor.
5	**Sub-Clause 4.10**	**SUFFICIENCY OF ACCEPTED CONTRACT AMOUNT** The Contractor shall be deemed to have satisfied himself as to the correctness and sufficiency of the Contract Price. Unless otherwise stated in the Contract, the Contract Price shall cover all his obligations under the Contract and all things necessary for Execution and Completion of the Works

		with High Quality Level. The contractor shall be deemed to have satisfied himself as the sufficiency of contract prices for the payments to employees towards compliance of minimum wages, PF & ESI, etc.
6	**Sub-Clause 4.11**	**Access Route** All operations for the execution of the Works shall be carried out so as not to interfere unnecessarily with the convenience of the public or the access to public or private roads or footpaths or properties owned by the Employer or by any other person. The Contractor shall select routes, choose and use vehicles so that movement of Contractor's Equipment, Plant and Materials from and to the Site is limited so that traffic is not delayed and damage to highways and bridges is prevented. If there is any delay or damage or injury, the cost of rectification or reconstruction of highways or bridges shall be borne by the Contractor. The Contractor shall indemnify the Employer in respect of all claims, demands, proceedings, damages, costs, charges and expenses whatsoever arising out of or in relation to any such matters
7	**Sub Clause 4.15**	**EQUIPMENTS, MACHINERY AND PLANTS** Contractor may note that no tools, spare parts, machinery, plant and equipment shall be supplied by the employer. The contractor has to arrange all tools, equipment machinery, spare parts, etc. and their transportation as required for the work under the contract. **The Engineer-in-charge or his representative shall not, at any time, be liable for the loss or damage to any of the contractor's Plant, Machinery, Temporary Works or materials**.
8	**Sub Clause 4.16**	**SAFETY** **A) SAFETY REQUIRMENTS** The Metro Train Stations and Depot are having High Voltage Over Head Electric Lines, High Voltage Equipments, the movement of Trains in the depot, etc which can cause major injury, electrocution, death to the personnel and thus requirements for safety observance are very high. The contractor shall be responsible for ensuring the fitness and safety of the persons deployed by the contractor. In this regard, the contractor and deputed staff must ensure the observance of safety requirements. It

		shall be the sole responsibility of the contractor to adopt all the safety measures and deploy personnel who are adequately trained in safety. The contractor is responsible to ensure that necessary and adequate personal protective equipments are all the times available for the service to personnel working. Contractor shall ensure to provide the Hi-Visibility/ Reflecting Jackets to all on site staff. **B) SAFETY PRECAUTIONS** After the date of Notice to Proceed, the Contractor shall submit a detailed and comprehensive contract specific Site Safety Plan based on the Employer's Safety, Health and Environmental Manual (SHE Manual). The Contractor is required to make himself aware of all the requirements of the Employer's Safety, Health and Environmental Manual in this regard and comply with them. The Site Safety Plan shall include detailed policies, procedures and regulations which, when implemented, will ensure Compliance with Sub-Clauses 4.16 and 6.7 of General Conditions of Contract. The Contractor shall, from time to time and as necessary or required by the Engineer produce supplements to the site Safety Plan such that it is at all times a detailed, comprehensive and contemporaneous statement by the Contractor of his site safety and Industrial health obligations, responsibilities policies and procedures (under the laws of India) or as stated In the Contract or elsewhere relating to work on Site. If at any time the Site Safely Plan is, in the opinion of the Engineer, Insufficient or requires revision or modification to ensure the security of the Works and the safety of all workmen upon, and visitors to the Site, the Engineer may instruct the Contractor to revise the Site Safety Plan. The contractor shall, within 14 days, submit the revised plan to the Engineer for review. Any omission, Inconsistency or error in the Site Safety Plan or the Engineer concurrence or the rejection of the Site Safety Plan and or supplements thereto shall be without prejudice to the Contractor's obligations with respect to site safety and industrial health and shall not excuse any failure by the contractor to adopt proper and recognised safety practices throughout the execution of the Works. The Contractor shall adhere to the Site Safety Plan and shall ensure that all sub contactors of all tiers have a Copy

		of the Site Safety Plan and comply with its provisions. The Contractor shall notify the Engineer Immediately of any occurrence or incident that results in death or serious Injury as defined In the Indian Penal Code. Such Initial notification may be verbal and confirmed in writing thereafter and shall be followed by a comprehensive written report within 24 hours of the occurrence/Incident. The Contractor shall duly complete standard forms as required by the Engineer and Statutory Authorities. The Contractor shall provide and maintain all necessary temporary, fire protection and fire fighting facilities on the Site during the construction of the Works in accordance with the statutory regulations and as required by the Engineer. The Contractor shall ensure that all gases, fuels and other dangerous materials and goods are stored and handled in a safe manner and in accordance with the statutory regulations and as required by the Engineer. The obligations and requirements for safety and industrial health under this Contract are entirely without prejudice to, and do not derogate from, the Contractor's statutory obligations, with respect to safety and industrial health. **C) ACCIDENTS** If any accident occurs due to execution of work or due to negligence on the part of the contractor's personnel it shall be the full responsibility of the Contractor. If any damage occurs to the structures/ material & equipment as well as rolling stock, the cost of damage will be recovered from the contractor's bill. The firm must maintain a "Zero Accident Record". In case of any major accident /fatality a penalty of not exceeding 15% of total contract value will be levied.
9	**Sub-Clauses 4.16 and 6.7**	**Safety Precautions** The Contractor is required to make himself aware of all the requirements of the Employer's Safety, Health and Environmental Manual in this regard and comply with them. The Site Safety Plan shall include detailed policies, procedures and regulations which, when implemented, will ensure compliance with Sub-Clauses 4.16 and 6.7 of General Conditions of Contract. The Contractor shall, from time to time and as necessary or required by the Engineer, produce supplements to the Site Safety Plan such that it is at all times a detailed, comprehensive and contemporaneous statement by the Contractor of his site safety and industrial health obligations, responsibilities, policies and procedures (under the laws of

		India) or as stated in the Contract or elsewhere relating to work on Site If at any time the Site Safety Plan is, in the opinion of the Engineer, insufficient or requires revision or modification to ensure the security of the Works and the safety of all workmen upon, and visitors to the Site, the Engineer may instruct the Contractor to revise the Site Safety Plan. The Contractor shall, within 14 days, submit the revised plan to the Engineer for review.
10	**Sub-Clause 4.17**	**Protection of the Environment** The Contractor shall maintain ecological balance by preventing deforestation, water pollution and defacing of natural landscape. The Contractor shall, so conduct his cleaning operations, as to prevent any avoidable destruction, scarring or defacing of natural surroundings in the vicinity of work. In respect of ecological balance, the Contractor shall observe the following instructions (a) Where destruction, scarring, damage or defacing may occur , the same shall be repaired, replanted or otherwise corrected at Contractor's expense. All work areas shall be smoothened and graded in a manner to confirm to natural appearance of the landscape as directed by the Engineer. (b) All trees and shrubbery, which are not specifically required to be cleared or removed for cleaning purposes, shall be preserved and shall be protected from any damage that may be caused by Contractor's cleaning operations and equipment. The removal of trees or shrubs will be permitted only after prior approval by the Engineer. Trees shall not be used for anchorage. The Contractor shall be responsible for injuries to trees and shrubs caused by his operations. The term "injury" shall include, without limitation, bruising, scarring, tearing and breaking of roots, trunks or branches. All injured trees and shrubs shall be restored as nearly as practicable, without delay, to their original condition at Contractor's expenses. (c) The Contractor shall provide all necessary access, assistance and facilities to enable the Engineer and the Employer to monitor and conduct tests to verify that the Site Environmental Plan is being properly and fully implemented
11	**Sub-Clause 4.18**	**Electricity and Water** Electricity and water shall be arranged by the contractor on his own and at his cost. If available, the Employer may provide Water supply and Electricity on chargeable basis. The contractor shall make his own arrangements to tap the Electricity from the nominated and existing sockets/ points. The contractor shall

		tap the Electricity as per IE Rules & IE Act (Latest) duly complying all safety precautions and under following conditions: (a) The contractor shall submit full scheme for the requirement of Electricity & water. If scheme mentions Electricity requirement which is beyond the capacity of the Employer, in that case the contractor shall make his own arrangements/ alternative arrangements. (b) The Contractor should make his own arrangements to draw the water from the available water point to the working place without affecting the premises
12	**Sub Clause 4.27**	**Security of the Site** The Contractor shall take all measures necessary to ensure such security, including exercising control over all persons and vehicles which are employed or engaged on the Site or in connection with the Works or the other works comprising the Project and with the security arrangements applicable to any other site within the Project. The Contractor shall arrange the issue of passes for the admission of all persons and vehicles to the Site or to any part thereof and may refuse admission to or remove from the Site any person or vehicle failing to show an appropriate pass on demand to any duly authorised person. If required by the Engineer, the Contractor shall submit a list identifying all persons to whom passes have been issued together with two photographs of each person and all entities to which a pass has been issued in respect of any vehicle and shall satisfy the Engineer of the bonafides of any such person or entity. The Contractor shall not, without the written permission of the Engineer or otherwise in accordance with the Contract, allow access to the Site to any person unless the presence on Site of such person is necessary in connection with the execution of the Works or with the discharge of the duties of any relevant authority. For the purposes of this Clause only, "Site" shall include off-Site places of manufacture or storage and the Contractor's Work Areas and shall include, areas provided to the Contractor by others.
13	**Sub-Clause 4.28**	**CONTRACTOR'S OPERATIONS ON SITE** All of the contractor’s staff shall follow the rules and regulations, procedures in the depot premises. The contractor shall make aware all of his staff for the same.
14	**Sub-Clause 6.0**	**Training of Contractor’s Employees / Staff / Workers** Contractor shall provide a training / workshop on Safety,

		Health & Environment (SHE) to all its workers/ employees/ sub-contractors at the time of induction as per required of condition of contract on Safety, Health and Environment. Before posting any of his workers/ staff/ employees/ sub-contractors, the contractor shall give a certificate that the said person had undergone the requisite SHE training.
15	**Sub-Clause 6.4 & 4.1**	**LABOUR LAW & OBLIGATION OF CONTRACTOR** In dealing with labour and employees, the Contractor shall comply fully with all laws and statutory regulations pertaining to engagement, payment and upkeep of the labour in India. Some of the obligation of contractor is as below for the guidance of contractor to follow: i Display notices showing rates of wages, hours of work, wage period, date of payment, Name, Address & contact no. of the inspectors/labour officer having the jurisdiction and date of payment of unpaid wages shall be displayed in English and in Hindi. A copy of notice shall be sent to the inspector and wherever any changes occur the same shall be communicated. ii License for employing contract labour. iii Contractor has to pay Minimum Rates of wages in respect of that category of worker during the entire period of contract applicable time to time by 7th of every month. **The minimum rates of wages which is notified by Government. Any change in rate shall be considered and the payment shall be made accordingly.** iv Compliance of Minimum wages Act by Payment of wages to all staff through Bank Payment. Cash payment to new staff up to 2 month only may be allowed, and it will be made only in the presence of nominated representative of employer. Submit proof of minimum wages payment (Bank statement) on monthly basis to the employer. For initial 2 months of contract period relaxation of bank payment may be given on the above clause to full fill the obligation of opening of bank accounts of new contract labour, but after this initial period, wage payment to maximum staff must be through bank account only. v Fix periods in respect of which such wages shall be payment. However Wages payment period should not exceed one month. vi Wages to be paid without deduction of any kind

		except those specified in labour law. vii Provide First Aid facilities to contract workers at worksites, viii The contractor must issue employment card to contract workers. ix .To ensure treatment in case of accident/injuries suffered in performance of work including wages and compensation under WC Act. x Send Accident report to Regional Labour Commissioner (RLC). In case of death of staff, the agency is required to pay ₹2,00,000/- for heir apparent as immediate relief to his/her dependent. Subsequently agency should facilitate compensation on priority. Violation of these basic provisions shall attract a penalty of 5% of contract value and repeated violations shall lead to termination of contract.
16	**Sub-Clause 6.6**	**Housing Facilities** The Contractor shall have to make his own arrangements for housing facilities for his staff.
17	**Sub-Clause 6.7**	**Health and Safety** Contractors are required to have tie-up with well-equipped reputed hospitals having facilities of MRI, CT Scan, Ultrasound, Blood Bank, specialist Doctors like neurosurgeon, orthopaedic as mandatory requirement and fire station located in the neighbourhood for attending to the casualties promptly and emergency vehicle kept on standby duty during the working hours for the purpose.
18	**Sub-Clause 6.9**	**PROVISION OF EFFICIENT AND COMPETENT STAFF** The personnel deployed for the BDV Driving must possess heavy vehicle driving license and should be qualified, trained, efficient, competent enough in the relevant work.
19	**Sub-Clause 6.10**	**PRESERVATION OF PEACE AND ORDERLY CONDUCT** The contractor shall be fully responsible to ensure the discipline, and orderly conduct among the staff deployed for work. Smoking & Consumption of Tobacco in any form is not allowed. The carrying and consumption of intoxicating liquor, drugs or other substances that may affect the proper performance is strictly prohibited in the depots**.** The Engineer-In-charge may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Contractor's Representative who in the opinion of the Engineer-In charge, persists in any misconduct, is incompetent or negligent in the performance of his duties,

		fails to conform with any provisions of the Contract or persists in any conduct which is prejudicial to safety, health, or the protection of the environment. Any claim or dispute arises due to removal of such person shall have to be dealt only by the contractor and employer shall not be the party to such action in any case.
20	**Sub-Clause 6.11**	**LABOUR TO BE CONTRACTOR'S EMPLOYEE** Labour deployed shall only be the contractor's employee. Deployment of labour hired through sub-contractor is not permitted. If any case of hiring of labour through sub-contractor comes to the notice of employer, then it shall be considered as the sub contracting of contract and action shall be initiated accordingly which may even lead to termination of contract.
21	**Sub Clause 7.0**	**Quality Control** The Contractor shall appoint a suitably qualified and experienced person, not otherwise engaged in the performance of the Contract, to act as manager of the quality assurance system and shall provide such other personnel and resources as required to ensure effective operation of the quality assurance system. The said manager shall carry out audits of the application of the quality assurance system, and ensure effective quality control and delivery of quality assurance. The Contractor shall provide all necessary access, assistance and facilities to enable the Engineer to carry out surveillance visits both on and off the Site to verify that the quality assurance system is being properly and fully implemented. No extra payment shall be made in this regard and the cost of the Work under this element shall be deemed to be included in the Contract Price.
22	**Clause 8 & Sub Clause8.2**	**COMPLETION PERIOD** **NOA will be given for one year**. However, performance of contractor will be evaluated for continuation of the contract each year.
23	**Sub Clause 8.7**	**SUSPENSION OF WORK** The work is of essential service required for the passenger. The suspension of work by the contractor or contractor's staff even for a single day may lead to heavy penalties on the contractor up to termination of contract and forfeiture of bank guarantee.

24	**Sub Clause 11.1**	**THE CONTRACT PRICE** The contract price, subject to any adjustment thereto in accordance with contract conditions shall be inclusive of all taxes like GST, duties, levies, royalties Service Tax etc. or any tax in replacement of such taxes. Contractor will show the breakup of taxes in the invoices as quoted in BOQ while claiming payment as per tender conditions. He will have to maintain all records related to payment of taxes at his end for verification any time during the contract. The Contractor shall ensure full compliance with tax laws of India with regard to this contract and shall be solely responsible for the same. He shall keep the Employer fully indemnified against liability of all types of taxes, duties, levies etc
25	**Sub-Clause 11.1** **Sub-Clause 11.1.1** **Sub-Clause 11.1.4**	**Contract Price & Payment** **In respect of All Inclusive Contract** The Contract Price, subject to any adjustment thereto in accordance with the contract conditions, shall be all inclusive (including all taxes, duties, royalties etc.) **Change in Taxes Duty** (a) "Change in Taxes/Duties/Levies" means the occurrence or coming into force of the following, at any time after the date of submission of tender. (i) Any new tax which is imposed on Composite Works Contractors applicable on Metro Project. (ii) Change in the rate of GST on Composite Works Contractors applicable on Metro Project as Per GST Act. (b) The Contract Price shall be adjusted due to any of the above two conditions. Adjustment in contract price will be applicable up to the stipulated date of completion of work including the extended period of completion where such extension has been granted under sub clause 8.4.1 of GCC or it is specifically mentioned that extension is with adjustment for changes as stated above. (c) If the extension of contract period is on account of contractor's fault under Sub-clause 8.4.3 of GCC, no compensation shall be made towards upward revision towards "change in Taxes/Duty (taking place during the said extended contract period)" as mentioned at Sl. No. (a) (i) & (ii) above, during the original contract period or extended contract period shall be on employer's account. (d) Any other changes (except on account of clause (a)

		(i) & (ii) above) in existing taxes/new taxes on supply of materials/services/works etc. will not be considered and its impact shall be considered covered in the price variation clause provided in the Contract and in Contract where Price Variation clause s not provided, the impact on any other change (except on account of clause (a) (i) & (ii) above in existing taxes/new taxes on supply of materials/services/works etc. will be deemed to be included in the quoted contract price. (e) Also, the contract price shall not be adjusted on account of fluctuations in the rates of exchange between the foreign currencies of the contract and Indian rupees from the last date of submission of tender.
26	**Additional**	**Price Variation** This is a fixed price contract and no Price Variation is admissible in this contract without approval from competent authority.
27	**Sub-Clause 11.2**	**Advance** No Advance is admissible in this contract.
28	**Sub Clause 11.6**	**ON ACCOUNT PAYMENT APPLICATION FOR INTERIM PAYMENT CERTIFICATES** **Payment shall be made on quarterly basis upon submission of Bills with requisite documents by contractor separately and bill will be verified by nominated Engineer In-charge.** The value of all work done in accordance with the Contract, and the amount which is finally due, and For the purpose of On-account payment, the contractor shall submit detailed activities carried out as per the sheets, Abstract sheets along with recorded bill for the item actually executed for checking and payment.
29	**Sub Clause 12.6**	**PAYMENT IN APPLICABLE CURRENCIES** Payment shall be done in INR only.
30	**Sub Clause 14.1**	**INDEMNITY** Contractor shall submit the indemnity bond such that the contractor's staff shall not claim any type of payment, employment etc. with employer. After completion of contract and the contractor shall withdraw all of his staff from the site without any claim.
31	**Sub Clause 14.2**	**USE AND CARE OF SITE** The Contractor shall not demolish, remove or alter structures or other facilities on the site without prior approval of the Engineer-In-charge. All surface and sub-soil drains shall be maintained in a clean, sound and satisfactory state of performance.
32	**Sub-Clause 15.0**	**Insurance** (a) All of the contractor's employees drawing monthly

		wages up to ₹21,000/-or as applicable as per the enhanced limit, shall have to be covered under ESI. The Contractor shall take insurance policy as specified in the Employee's Compensation Act only for those employees who are not covered by ESI. (b) The contractor shall insure against liability to third parties in the joint name of the Employer and the contractor for any loss, damage, death or injury which may occur to any physical property (except things insured otherwise) or any person (except person insured by employer, staff of other contractor working in the premises, contractor's staff under sub clause above which may arise out of the performance of the contract. The insurance shall be at least for the amount of ₹7,50,000/- for each incident. (c) Insurance cover for Contractor's All Risk shall be full value of Contract price.
33	**Sub Clause 15.4**	**INSURANCE (IN PLACE OF GCC CLAUSE 15)** **INSURANCE FOR WORKERS** All of the contractor staff shall have to be covered under ESI. The contractor shall take insurance policy as specified in the workmen's compensation act for the contractor's staffs those are not covered by the ESI.
34	**Sub-Clause 18.1**	**Notices and Instructions** The Contractor shall furnish to the Employer/Engineer the postal address of his office at Delhi NCR. Any notice or instructions to be given to the Contractor under the terms of the contract shall be deemed to have been served on him if it has been delivered to his authorized agent or representative at site or if it has been sent by registered post to the office, or to the address of the firm last furnished by the Contractor. The Contractor shall establish an office in the Delhi NCR in consultation with the in charge for planning, co-ordination and monitoring the progress of the Work and intimate the same in writing to in charge. In addition, the Contractor may set up field offices at convenient and approved locations for co-ordination and for monitoring the progress of fieldwork at his own cost.
35	**Additional**	**PHOTO IDENTITY CARDS** A photo Identification card signed by contractor must be provided to heavy vehicle drivers working in any shift.
36	**Additional**	**ENTRY EXIT PASS** The Engineer-In-charge shall provide the photo entry exit pass to the staff deputed after submittal of antecedent check, police verification, contractor's photo identity card

<table>
<tr><td></td><td></td><td>and indemnity bond by the contractor.
Centralised cell of NMRC shall provide the photo entry/exit pass to the outsourced/contractor staff deputed for contract work in NMRC premises.</td></tr>
<tr><td>37</td><td>Additional</td><td>COMMUNICATION FACILITIES TO STAFF
The contractor shall provide the mobile phone communication facilities to staff deputed at site, The mobile number shall be provided to Engineer-In-charge.</td></tr>
<tr><td>38</td><td>Additional</td><td>Plan for execution of work
The successful bidder will submit the plan for the execution of work (tentative) and supply of materials in the NMRC depot/ETU/traction store within 02 weeks of receiving of LOA.</td></tr>
<tr><td>39</td><td>Additional</td><td>Activity specific Man power requirements:
The successful bidder shall ensure the man power requirement as per the below mentioned activity.
<table>
<tr><th>Sr. No.</th><th>Name of activity</th><th>Required man power (min.)</th></tr>
<tr><td>1</td><td>Lightening arrestor related work</td><td>01 supervisor + 05 semi-skilled worker</td></tr>
<tr><td>2</td><td>Earth pit restoration work</td><td>01 supervisor + 02 semi-skilled worker</td></tr>
<tr><td>3</td><td>Feeding jumper/ catenary wire strengthening work</td><td>01 supervisor + 04 semi-skilled worker</td></tr>
<tr><td>4</td><td>Painting of Mast</td><td>01 supervisor + 02 semi-skilled worker</td></tr>
<tr><td>5</td><td>Painting of ATD weight</td><td>01 supervisor + 08 semi-skilled worker</td></tr>
<tr><td>6</td><td>CAD weld related work</td><td>01 supervisor + 02 semi-skilled worker</td></tr>
</table></td></tr>
<tr><td>40</td><td>Additional</td><td>Work timings :
a. For mainline work execution: All the work will be carried in the power block timings. The timings will be approved by the engineer-in-charge on weekly basis as per the availability of block. The successful bidder have to plan accordingly.
In emergency conditions, approved block timings may be cancelled as per the system requirements. No extra payment shall be made to contractor in this regard.
b. For Depot work execution: In depot, the work may be executed in morning and evening shift only. The bidder has to confirm the timings at least 1 days before the execution of work by concerned incharge.
In emergency conditions, approved work timings may be cancelled as per the system requirements. No extra payment shall be made to contractor in this regard.</td></tr>
</table>

41	**Additional**	**Penalty and Recoveries** **a. Penalty due to non compliance of safety :** All the manpower involve in the contract should be equipped with all PPE items. In case of non-compliance , Rs. 2000 per incidence will be charged. **b. Penalty due to non compliance of requisite man power for mentioned activities:** The successful bidder will ensure to work with requisite man power as per SCC clause 39, failing which Rs. 2000 per incidence will be imposed on the contractor.
42	**Additional**	**Test Approval Compliance:** a. **Type Test:** Type test of OHE equipment shall be submitted by the contractor along with the technical documents of equipment for approval of work. Additional compliance needeas mentioned under clause 4 , Type test section in section 06. b. **Factory Acceptance Test (FAT):** The contractor shall submit FAT of all equipment. Factory inspection call will be raised for all equipment associated with tender before delivery of materials. c. **Approval of CAD welding work:** The contractor will take prior approval of required materials, personal involved, method statement for CAD welding work
43	**Additional**	**Material and warranty compliance:** a. **GTP submission:** GTP of all the materials should be submitted for approval by NMRC before supply. b. All the material used should either from RDSO approved vendor or having satisfactory performance certificate from any metro/Railway. **c. The warranty of all requirements/material (supplied or installed on site goods/desired value in case of earthing) should be considered upto DLP period. DLP will be 01 year after the completion of time period of contract (i.e, 01 year).**
44	**Additional**	**GENERAL CONDITIONS OF CONTRACT** **a.** This contract will be governed by NMRC's General Conditions of Contract and Special Conditions of Contract. The later will have priority over the earlier one in case of any ambiguity in any of the clause. **b.** All conditions mentioned in the General Conditions of Contract (GCC) will be applicable in addition to above.

6. Section 6: Technical Specifications

A. Lightning Arrester:

- The contractor shall execute the work i.e**. "Supply, installation, Testing and commissioning of 42 kV Metal Oxide Gapless type Lightning Arresters along with disconnector assembly, surge counter, support channel, composite Pedestal insulator/out trigger and associated fittings and accessories required for proper connections such as back angle, copper jumper wire, ACSR Conductor nut bolts etc. for NMRC operational network."** The work shall be carried out as per attached specifications, approved drawings and as per the direction of Engineer in charge.

- This Scope covers the supply, Installation, testing and commissioning of Metal Oxide Gapless type Lightning Arresters along with surge counter, composite Pedestal insulator/out trigger, ACSR Earth wire, Annealed copper jumper wire, suitable clamps, SPS and support channel for protection with fitting accessories in complete intended for outdoor installation to protect the 25kV Overhead Equipment's against operating over-voltage and Lightning impulses on existing Traction Network of NMRC.

- Lightning arrestors shall be of heavy duty, class 3 and gapless zinc Oxide type. Arrestors shall be hermetically sealed units suitable for outdoor installation on self-supporting base or structures to be supplied by the contractor.

- All the installations will be done on the existing structure of NMRC. All the clamping, structure shall be under the scope of the contractor. All support channels shall be part of the contractor if any shortfall arises in the existing structure.

- The necessary tools, tackles, material and labour required for all the works mentioned here under to complete the works up to the satisfaction of NMRC engineer is in the scope of the contractor. No additional payment will be made for the same.

- Installation, Testing and Commissioning work of Lightning Arrestor work shall be carried out on NMRC operational lines in night during non-revenue hour in Traffic cum power block condition (Tentatively from 00:00Hrs to 04:00Hrs). Under direction of engineer-in-charge, The time for actual work may be less than power block/permit to work duration.

1. CLIMATE & ENVIRONMENT CONDITIONS:

Atmospheric temperature	Minimum temperature (ambient):0.6^{0}c Mean temperature (ambient):35^{0}C Maximum temperature (ambient): 55^{0}C
Humidity	Maximum relative humidity : 100% Minimum relative humidity : 10%
Rain fall	Rains occur generally during, monsoon from June to September and. Occasional showers in December and January are also experienced.

Thunder storm	The region is subject to thunder during April to June isoceraunic level of average 80 thunderstorms per year as per IS 2309 may be considered.
Wind speed	Maximum wind pressure reaching 150 kg/m^2
Pollution level	Heavily polluted zone
Earthquake	Zone-5

2. GENERAL SPECIFICATIONS:

a) The Lightning Arresters shall, unless otherwise specified herein, conform to the latest revision as per RDSO Specifications.

b) Lightning arrestors are made to protect the 25kV Overhead Equipment's against operating over- voltage and Lightning impulses.

c) Lightning arrestors shall be procured from RDSO approved sources only.

d) Lightning arrestors shall be metal- zinc oxide types and they shall contain a string of resistor, whose active part shall be composed of perfectly homogenous resistors.

e) Lightning arrestors shall correspond to the discharge class 3 of the IEC 60099-4.

f) The Lightning Arrester shall comprise of number of non-linear Resistor Blocks, housed inside the Composite Housing. Suitable provisions to arrest the relative movement of Blocks shall be provided inside Composite Housing. Lightning Arrester shall be of hermetically sealed construction to prevent moisture ingress inside the Composite Housing.

g) The Arrestor shall have means for relieving internal pressure to prevent explosive shattering of the housing. The Pressure Relief Device shall be Class-A as per IS: 3070 (Part- III)-1993 (Reaffirmed in 2004).

h) The Arrestor shall have base support and accessories according to RDSO specification.

i) All ferrous parts used in manufacture of Lightning arrester, its assembly and the insulating base shall be hot-dip galvanized. All fasteners of diameter upto 12 mm shall be of stainless steel conforming to grade 04 Cr17 Ni12 Mo2 of IS : 1570 Pt. V and those above 12 mm shall preferably be of stainless steel or of mild steel hot dip galvanized to RDSO's specification No. ETI/OHE/18 (4/84) or latest updation.

j) All the material used should as per RDSO/IS standard or as approved by the Engineer in charge.

k) One number Insulating Base shall be supplied by the manufacturer with each Arrestor. The Insulating Base shall have same mounting dimension as that of Lightning Arrestor.

l) A **surge counter shall be installed** on each Lightning arrester to indicate the number of functioning of each device. **They shall also indicate the value of the leakage current.**

m) Surge Monitor shall be designed to record directly the number of surges handled by the Lightning Arrester on a cyclometric counter, and also indicate the leakage current passing through the Lightning Arrester, **on an ammeter**, continuously.

n) Tenderer shall provide for each Arrester, insulated connecting lead from Ground Terminal of Lightning Arrester to the Surge Monitor/Earth connection and this shall be of 35 mm2 , 1100 volts grade, unarmored PVC Insulated copper cable to enable the on line measurement by clip-on type Portable Equipment to measure third harmonic resistive leakage currents.

o) All type tests, Routine tests and site tests to be carried as specified in the latest revision of RDSO Specification No. ETI/PSI/71 (1/87) and shall be jointly witnessed by NMRC Engineer.

p) The Earthing connection of LA to be connected to Buried earth conductor (BEC of 93.3 sq.mm) on below parapet. Earth wire shall be of 93.3 sq.mm ACSR conductor, consisting of 7 steel wires each of 2.5 mm diameter and 12 aluminium wires also of 2.5 mm diameter each, with a nominal cross section of 93.3 sq.mm. The overall diameter of the conductor is 12.5 mm. The ACSR conductor shall generally confirm to Bureau of Indian Standard specification IS:398 (Part II)-Latest Revision.

q) The jumper connection shall be of 105 sq mm of annealed copper, consisting of 19 strands each strand containing 7 wires each of 1.016 mm diameter, with a nominal cross section of 105 sq mm. All Jumpers shall be connected with bimetallic strip, wherever required.

r) **Name plate**

Each Lightning Arrester shall be provided with Name-Plate legibly and indelibly marked with the following information or as per clause No. 3.1 of IS:3070 (Part-III)-1993.

i) Continuous Operating Voltage,
ii) Rated Voltage,
iii) Rated Frequency,
iv) Nominal Discharge Current,
v) Long Duration Discharge Current,
vi) Pressure Relief Class,
vii) Manufacturer's Name or Trade-mark, Type and Identification,
viii) Month & Year of Manufacture,
ix) Purchase Order Number and
x) Manufacturer's Serial Number.

The Lightning Arrestor shall be suitable for outdoor installation, where the maximum temperature attainable by an object exposed to sun is 75°C. No. Plate of each LA must be installed by the contractor at suitable location agreed by NMRC site supervisor.

3. TECHNICAL SPECIFICATIONS:

Offered Equipment shall conform to the following Guaranteed Technical Parameters:

a. LA Parameter:

INDICATIONS	UNIT	VALUES REQUIRED
Manufacturer		
Place of Manufacture		
Manufacturer Drawing reference		
Standard		IEC 60099-4 and RDSO Specification No. ETI/PSI/71 (1/87) with A&C slip no. 1 to 7 or Latest Version
Type of Substation		Outdoor
Lightning Arrester type		Non-linear Metal Oxide Resistor type, gapless
Nominal System Voltage	Phase-to-Earth	25 kV
Possible variation in the Traction Supply Voltage	kV	19 kV to 27.5 kV
Rated Voltage for Lightning Arrester	kV	42
Rated Frequency	Hz	50
MCOV	kV	34
Nominal discharge current (8/20 micro sec wave)	kAp	10
Peak value of switching impulse current (30/60 micro sec wave))	kAp	1
Max. discharge Voltage at nominal discharge current	kVp	125
Max. residual voltage at switching impulse current	kVp	90
Pressure Relief Class		A
Rated Impulse withstand of arrester insulation	**KV peak**	**170**
Power frequency voltage withstand for arrester insulation	kV RMS	105
Peak value of High current impulse (4/10 micro sec wave)	kA	100 kA
Line discharge class	Cl	3
External housing of arrester and creepage		Silicone rubber with minimum 1300 mm creepage distance.

B. ACSR Earth wire and Annealed Copper Jumper wire :

ITEM	Earth Wire	Jumper Wire
Material	ACSR Earth Wire	Annealed copper Jumper Wire
Cross Section (sq mm)	93.3	105
Diameter (mm)	12.5	
Made of	Aluminium 12 wires of 2.5 mm. Steel 7 wires of 2.5 mm	19 strands each strand containing 7 wires each of1.01 mm diameter
Linear Weight (Kg/m)	0.437	0.982
Expansion Factor	18x10-6	17x10-6
Equivalent Copper Conductivity (%)	61%(Alu.)	
Resistivity (Ωm)	2.8264	
Specification	Generally IS 398(Part II)	Generally latest RDSO jumper specifications ETI/OHE/3(2/94)

I. Composite Pedestal Insulator :

The creepage distance of insulators should be of minimum 1600mm.

II. PG clamps and other associated fittings :

Suitable size of PG clamps, BEC connectors, channels, nut bolts and other associated fittings should be as per RDSO/IS standards or as approved by Engineer in charge.

4.2 Technical Data and Drawings

The Tenderer shall furnish Guaranteed Performance data, Technical and other Particulars for the Lightning Arrester of latest revision of RDSO Specification No. ETI/PSI/71 (1/87).

4.3 Supply and Installation:

1. Tenderers are advised to visit the site, with proper permission from NMRC, where LAs to be installed before offering their rates. It is the soul responsibility of successful bidder to procure the material ,all accessories and fasting items which is suitable for the existing installations.

2. Supply of nut, Bolts, washers, lock nuts etc. shall be in the scope of contractor. The bolts should be of GI of appropriate size. Lock nuts shall be provided on each bolt. No T&P shall be issued to contractor. The contractor shall bring all T&P's

instruments, Machines, materials etc.

3. The cost of these items shall be borne by the contractor. Power supply and Illumination/ Lighting of working site shall be in the scope of contractor. Nothing shall be paid extra.

4. Drawings given in the tender are tentative. Contractor shall install a sample at one of the location. The same shall be approved by NMRC before start of further work.

5. The Contractor shall execute the work in NMRC operational network and contractor should be familiar with the working procedure during power block hours.

6. While executing work, if any minor modification/alteration is to be done by the contractor as advised by site engineer, nothing shall be paid extra.

7. The contractor during the execution of work shall follow the Indian Electricity act & all other statutory rules, regulations Acts as available& applicable on date during the period of contract.

The contractor during the execution of work shall maintain required Electrical clearance between any live and earth parts and jointly check the clearance with NMRC Engineer after completion of the work.

8. The contractor shall not sub-contract/Transfer or assigns the contract to the third party.

9. The contractor will have to submit the list of authorized/competent staff along with a set of photo identity cards to whom permission will be required to be issued by the NMRC.

10. Contractor's staff shall obey all the safety rules applicable for such works in NMRC. They shall also fill an indemnity bond before entering into the track.

11. Contractor shall deploy multiple teams per line (but not less than two teams per line) on each day for which power block shall be arranged by NMRC.

12. The work shall be carried out in night during non-revenue hours in power block conditions. The time for actual work may be less than the power block/permit to work duration. This is due to the fact that work site may be away from the location from where PTW is issued. No compensation/extra payment shall be made in this account.

13. In case, if work is not completed in one night, Part of work shall be properly secured before leaving site. Nothing should infringe train operations.

14. Since the work is to be performed on line which is used for passengers services, it will be responsibility of contractor to ensure that the site is made fit and operational at least 30 minutes before scheduled time of cancellation of PTW & power block. Any delay in train services due to contractor's negligence shall lead to penalty to contractor. Penalty in such cases shall be assessed separately but will be limited to 10% of contract value.

15. If on any day work gets cancelled due to bad weather condition or power Block constraint, contractor has to negotiate with the prevailing conditions. Nothing

will be paid extra for the same.

16. The contractor team shall be equipped with necessary communication facility at site of work. There should be at least one supervisor who will control his man-power & obtain necessary instruction form NMRC's representative/supervisor at site of work.

17. Any damage/breakage to the NMRC property during the execution of work will be at the risk & cost of the contractor.

18. Contractor shall ensure the safety of its own personnel and equipment's and any other persons involved in installation and commissioning activities.

19. NMRC is an ISO-14001 & OHSAS 18001 certified Organization for Environment, Health & safety. The work is to be carried out as per International Norms/Standards and in such a manner that all premises always look Neat & Clean. Similarly, the waste disposal is also carried out in totally sealed manner without affecting the Environment.

20. As LA shall be installed on OHE mast, All safety precautions along with PPE for working on height to be taken care by the contractor.

21. NMRC's engineer in-charge / representative shall verify the installation during & after completion of work each day, and prepare joint report in duplicate duly signed by him and contractor's representative. A copy of report shall be handed over to contractor which will be produced along with the bill.

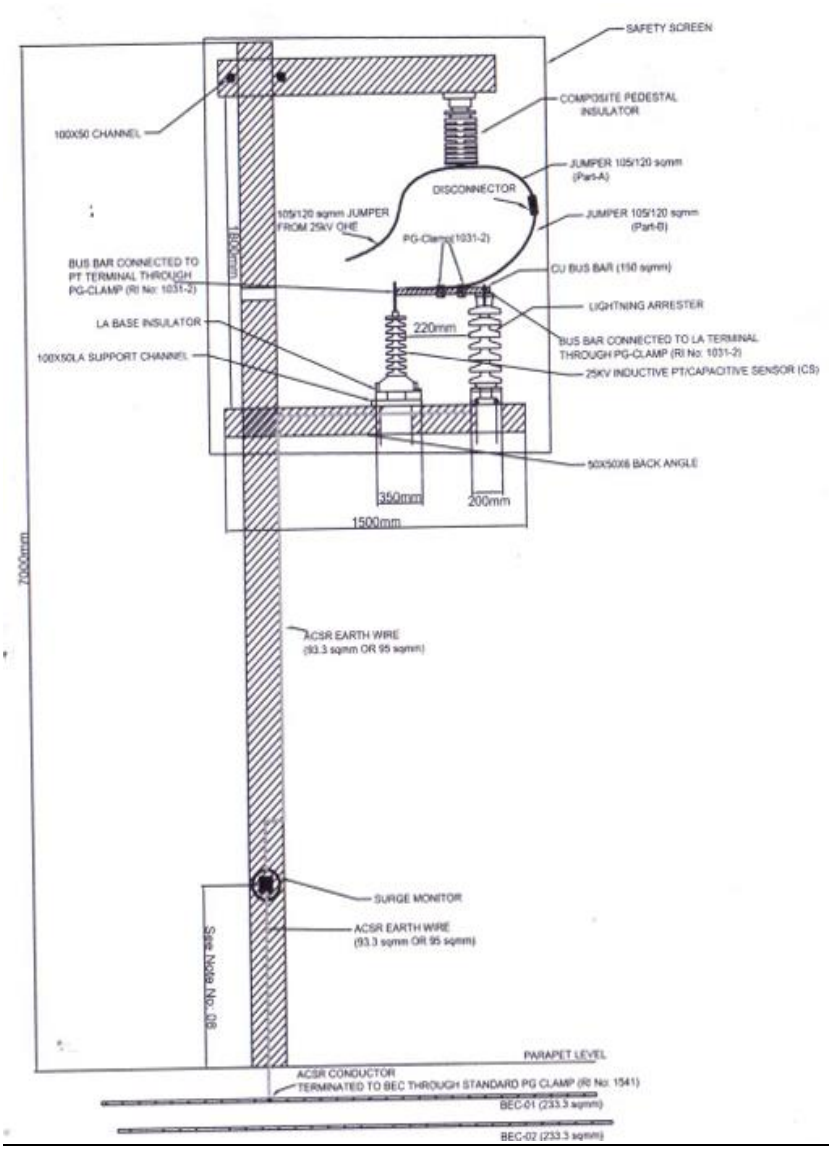
4.4 Warranty:

All Lightning Arrestors along with fittings and accessories supplied against this contract, irrespective of origin (imported/indigenous), shall be guaranteed for trouble free and fully satisfactory performance for a period **mentioned in Special condition of contract. (Please refer SCC clause)**
The Supplier shall make necessary arrangements for close monitoring of performance of Lightning Arresters, thorough periodical visits to Traction Sub-stations/Switching Stations for observations.
Technical guidance and assistance for proper operation and maintenance, trouble-shooting investigation and generally all aspects of technical liaison that may be required, shall also be organized by the supplier.

4.5 Drawings:

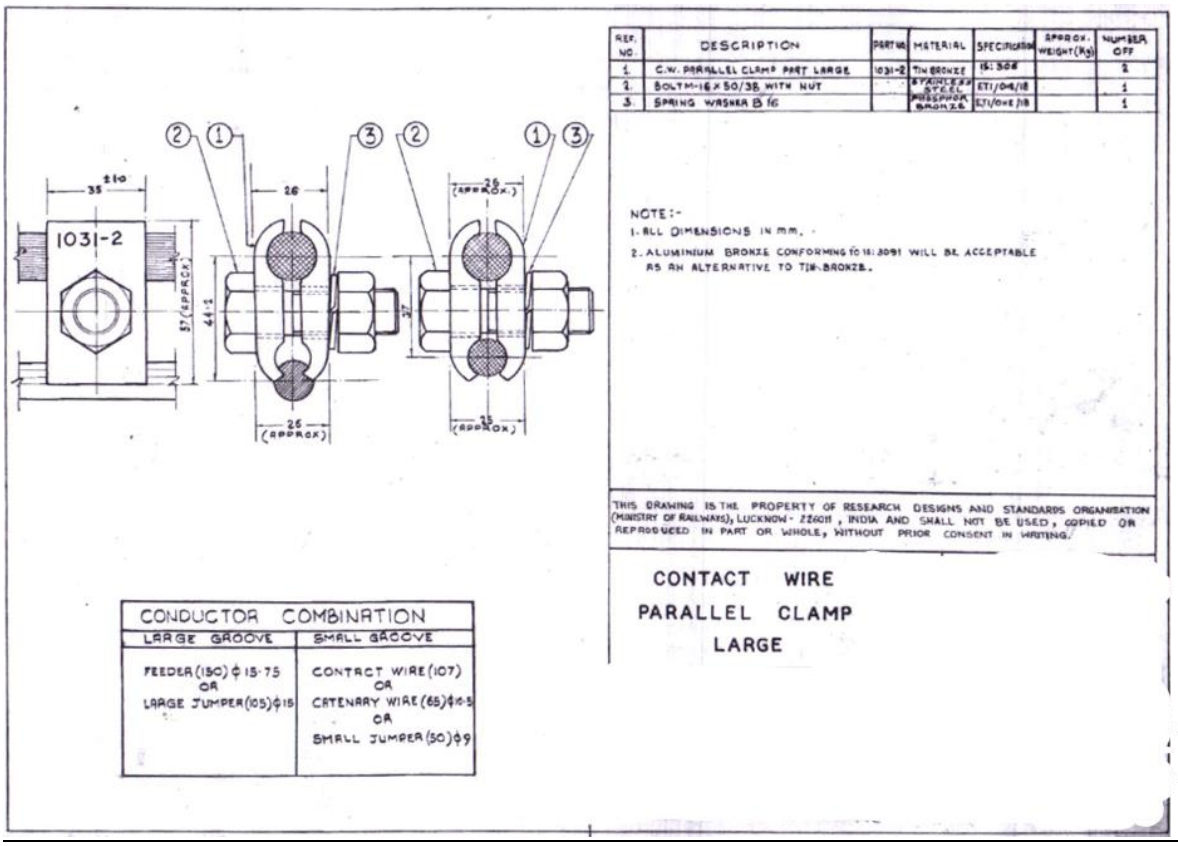
The drawings are attached for reference purpose, and the work will be executed as per the drawing standards, however, if the site does not permits the installation as per the reference drawing, then after approval of engineer-in-charge slight variation may be permitted.

ANNEXURE-A



Note:

1. All dimensions are shown in mm unless otherwise specified.
2. Position of dis-connector shall be such that in any case Part-A shall not come in contact with equipment installed on OHE mast in case of bursting of dis-connector i.e. sufficient electrical and mechanical clearances shall be maintained as per site conditions.
3. All insulators are of 1600mm creepage distance.
4. Minimum electrical clearance from non-live/earthed part (such as OHE Mast, Supporting channel, Safety Screen etc) shall be minimum 500mm as far as possible.
5. Measurements shown are tentative and may change based on site conditions and design of equipment. Prior approval of Engineer-In-Charge shall be taken in any case.
6. PG clamp used for connecting Bus-Bar to terminal connectors of LA and PT is PG: RI No: 1031-2 (ETI/OHE/P/1030-2)
7. PG-Clamp used for termination of ACSR conductor to BEC is RI No: 1541 (ETI/OHE/P/1540)
8. In case there is no infringement surge counter to be installed at eye sight level from the rail level.

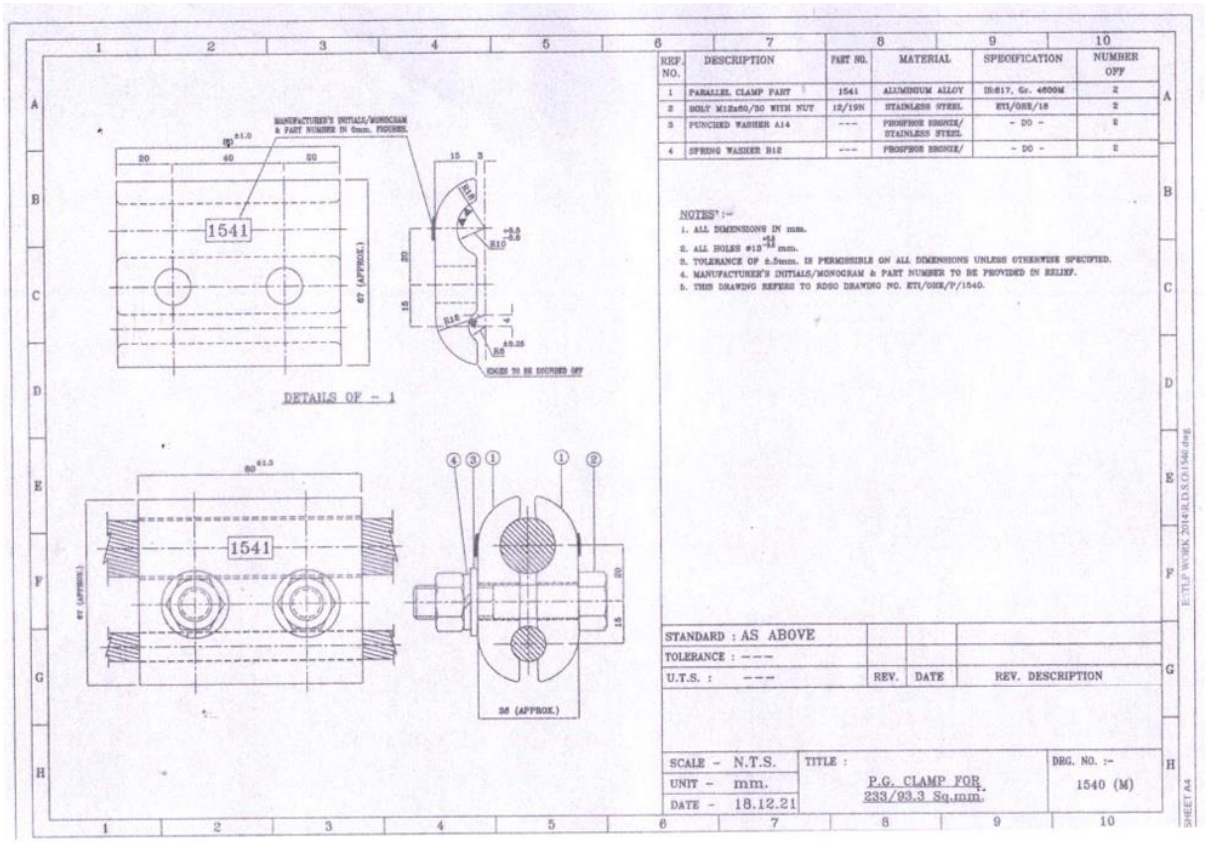


REF. NO.	DESCRIPTION	PART NO.	MATERIAL	SPECIFICATION	APPROX. WEIGHT (Kg)	NUMBER OFF
1.	C.W. PARALLEL CLAMP PART LARGE	1031-2	TIN BRONZE	IS: 304		2
2.	BOLT M-16 X 50/38 WITH NUT		STAINLESS STEEL	ETI/OHE/18		1
3.	SPRING WASHER B 16		PHOSPHOR BRONZE	ETI/OHE /18		1

NOTE :-
1. ALL DIMENSIONS IN mm.
2. ALUMINIUM BRONZE CONFORMING TO IS: 3091 WILL BE ACCEPTABLE AS AN ALTERNATIVE TO TIN BRONZE.

CONTACT WIRE
PARALLEL CLAMP
LARGE

CONDUCTOR COMBINATION	
LARGE GROOVE	SMALL GROOVE
FEEDER (150) ϕ 15·75 OR LARGE JUMPER (105) ϕ 13	CONTACT WIRE (107) OR CATENARY WIRE (65) ϕ 10·5 OR SMALL JUMPER (50) ϕ 9



REF. NO.	DESCRIPTION	PART NO.	MATERIAL	SPECIFICATION	NUMBER OFF
1	PARALLEL CLAMP PART	1541	ALUMINIUM ALLOY	IS:617, Gr. 4600M	2
2	BOLT M12x60/30 WITH NUT	12/19N	STAINLESS STEEL	ETI/OHE/18	2
3	PUNCHED WASHER A14	---	PHOSPHOR BRONZE/ STAINLESS STEEL	- DO -	2
4	SPRING WASHER B12	---	PHOSPHOR BRONZE/	- DO -	2

NOTES :-
1. ALL DIMENSIONS IN mm.
2. ALL HOLES ϕ13 +0.5 -0.0 mm.
3. TOLERANCE OF 0.5mm. IS PERMISSIBLE ON ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED.
4. MANUFACTURER'S INITIALS/MONOGRAM & PART NUMBER TO BE PROVIDED IN RELIEF.
5. THIS DRAWING REFERS TO RDSO DRAWING NO. ETI/OHE/P/1540.

STANDARD : AS ABOVE			
TOLERANCE : ---			
U.T.S. : ---	REV.	DATE	REV. DESCRIPTION

SCALE - N.T.S.	TITLE :	DRG. NO. :-
UNIT - mm.	P.G. CLAMP FOR 233/93.3 Sq.mm.	1540 (M)
DATE - 18.12.21		

E:\TLP WORK 2014\R.D.S.O\1540.dwg
SHEET A4

TECHNICAL SPECIFICATION FOR SILICONE COMPOSITE INSULATORS FOR 25 kV A.C. 50 Hz SINGLE PHASE OVERHEAD TRACTION EQUIPMENT.

1.0 SCOPE

1.1 This Specification covers Design, manufacturing requirements and tests methods for Silicone Composite Insulators used on single phase Overhead Electric Traction Equipment having a nominal voltage of 25 kV (line-earth) A.C. at 50 Hz. The system voltage may, however, go up to 30 kV.

1.2 REFERENCE SPECIFICATIONS:

IS, IEC, ASTM and other Standard Specifications listed out in this Specification shall be referred, while assessing conformity of Insulators with these Specifications. These are as under and shall mean latest revision with Amendments, issued unless specifically stated otherwise in the Specification.

Table-1

Sl. No.	Relevant IS/IEC/ASTM/Specs.	Item
(i)	IEC: 61109-2008	Insulators for Overhead lines- Composite Suspension & Tension Insulators for A.C. systems with a nominal voltage greater than 1,000V- Definitions, Test methods and Acceptance criteria.
(ii)	IEC 62217-2012	Polymeric HV Insulators for indoor and outdoor use-General Definition, Test methods & Acceptance criteria.
(iii)	IEC/ TS: 60815-1 (Edition 1.0)-2008-10 and IEC/ TS: 60815-3 (Edition 1.0)-2008-10	Selection and dimension of High-Voltage Insulators intended for use in polluted conditions – Part 1: Definitions, Information and General principles. Part 3: Polymer Insulators for A.C. Systems.
(iv)	IEC 62231 2006	Composite Station Post Insulators for substations with a.c. voltage greater than 1000 V upto 245kV- Definintion, test method and Accepting Criteria.

(iv)	IEC: 60060-2010 & IS:2071	High-voltage test techniques
(v)	IS: 1865-1991	Iron Casting with spheroidal or Nodular Graphite.
(vi)	BS: 970	Specification for Wrought Steels in the form of Blooms, Billets, Bars and Forgings. Direct hardening Alloy Steels, including Alloy Steels capable of surface hardening by nitriding.
(vii)	ETI/OHE/13(4/84)-latest issued by RDSO	Specification for Hot Dip Zinc galvanisation of Steel Masts (Rolled and Fabricated), Tubes and Fittings used in 25 kV A.C. OHE.
(viii)	ASTM: D 2863-2012	Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index).
(ix)	IEC: 60587-2007	Electrical Insulating Materialsused under severe ambient conditions-Test methods for evaluating resistance to Tracking and Erosion.
(x)	IEC: 61467-2008	Insulators for Overhead lines; Insulator string and sets for lines with a nominal voltage greater than 1,000 V – A.C. Power Arc tests.
(xi)	IEC: 60093-1980	Method of test for Volume Resistivity and Surface Resistivity of solid Electrical Insulating materials.
(xii)	ASTM: D 624-2012	Standard Test Methods for tear strength of Rubber and Thermoplastic Elastomers.
(xiii)	ASTM: D 149-2009 IEC: 60243	-Standard test method for Dielectric Breakdown voltage and Dielectric Strength of Solid Electrical Insulating materials at Commercial Power Frequencies. -Methods of test for Electric strength of Solid Insulating Materials Part I: Tests at Power frequencies.
(xiv)	ASTM: D 495–1973	Method for high – Voltage, low – Current, Dry Arc Resistance of solid Electrical Insulation.
(xv)	ASTM: D 578 –2005	Standard Specification for Glass Fiber Strands.

(xvi)	IEC: 61952-2008	Insulators for Overhead Lines – Composite Line Post Insulators for A.C. systems with a nominal voltage greater than 1000V – Definitions, Test methods and Acceptance criteria.
(xvii)	ASTM: D 2240-2010	Standard test method for Rubber property—Durometer Hardness.
(xviii)	ASTM: D 412-2006	Standard test methods for vulcanised Thermoplast Rubber And ic Elastomers—Tension.
(xix)	ASTM: D792-2008	Standard test methods for density and Specific Gravity (Relative Density) of Plastics by displacement.
(xx)	ASTM: D 2583-2007	Standard test method for indentation Hardness of Rigid Plastics by means of a Barcol Impressor.
(xxi)	ASTM: D 2584-2011	Standard test method for Ignition loss of Cured Reinforced Resins.
(xxii)	IEC 62231:2006	Composite station post insulators for substations with A.C voltages greater than 1 000 V up to 245 kV - Definitions, test methods and acceptance criteria

2.0 TERMINOLOGY:

For the purpose of this Specification, the following definitions shall apply:

1050 mm Creepage Distance Insulators i.e. 20 mm/kV

These Insulators shall be used in the areas, where Equivalent Salt Deposit Density (ESDD) is ≤ 0.3 mg/sq.cm.

1600 mm Creepage Distance Insulators i.e. 31 mm/kV

These Insulators shall be used in heavily /very heavily polluted zones, where Equivalent Salt Deposit Density (ESDD) is more than 0.3 mg/sq.cm.

NMRC Network, NOIDA and NCR lies in Very High Polluted zones and ESDD is more than 0.3mg/Sq.Cm.

Stay Arm Insulator

The Insulator which forms part of the horizontal member, of the Cantilever Assembly (from which the Overhead Traction Conductors are suspended) and which insulates Stay Tube from the mast or structure to which the Cantilever is attached, is known as Stay Arm Insulator.

Bracket insulator:

The Insulator which forms, part of the inclined member, of the Cantilever Assembly, (from which the Overhead Traction Conductors are suspended) and which insulates Bracket from the mast or structure to which the Cantilever is attached, is known as Bracket Insulator.

9-Tonne Insulator

The Insulator is normally, though not exclusively, used as a Strain Insulator for anchoring of conductors, is known as 9-Tonne Insulator. It is also used in a vertical position to support 25 kV Feeder Wire.

Operating Rod Insulator

The Insulator used in the Operating Rod of a 25 kV Isolator for opening and closing of the Isolators.

Post Insulator

A Post Insulator is used for supporting rigid live contacts of 25 kV Isolator Switches, the 25 kV Bus Bars at Sub-station/Switching Stations, the 25 kV Bus Bars over Portals and at such other locations.

Sectioning Insulator

The Insulating element of a piece of Equipment (called Section Insulator Assembly) which is used for separating adjacent sections of the overhead traction lines, belonging to different Elementary Electrical Sections, in the normal condition is known as Section Insulator. It provides a continuous smooth (mechanical and electrical) path for passage of the Pantograph of Electric Rolling Stock.

Creepage Distance

It is the shortest distance along the contours of the external surfaces of the insulating part of the Insulator i.e. distance between those parts which normally have the operating voltage between them.

Note: The Creepage distance for the insulators shall be Minimum 1600mm.

Lot of Insulators

All the Insulators, of the same type and design manufactured under identical conditions of production, shall be offered for Acceptance test.

Batch of Insulators

A Batch of Insulators shall be the complete number of Insulators, manufactured from one type of Silicone Rubber/FRP Rod, during the month, which shall be marked on the Insulator offered for testing.

3.0 BASIC COMPONENTS AND MANUFACTURING PROCESS

Silicone Composite Insulator shall have following basic components and shall be manufactured according to process given in following paras :

3.1 SHED AND SHEATH MATERIAL

3.1.1 Composite Insulator's Shed & Sheath shall be made of High Temperature Vulcanising (HTV) type Silicone Rubber, having Silicone Polymer content by weight 30% minimum. Alumina Tri Hydrate (ATH) shall be used as filler. The filler shall be properly mixed with silicone compound to ensure the uniform distribution. Thickness of sheath shall be minimum 4 mm & shall have excellent Hydrophobic and anti- tracking properties.

3.1.2 The material shall conform to the tests specified in this Specification. The material preferably shall be such that it should not attract Rats/Birds/Squirrels/Monkeys and other rodents at storage location or on the line. The thickness of Shed at edge should not be less then 3 mm to minimise the external damage. The strength of shed to sheath interface shall be greater that the tearing strength of the polymer.Manufacturer shall indicate the solvent etc. to be used for cleaning Silicone Rubber Sheds along with method of cleaning.

3.2 **CORE/ROD**

Core of the Composite Insulator shall be manufactured from Boron free, Electrically Corrosion Resistant (ECR) grade Fiber Glass Reinforced Plastic (FRP) Rod having at least 70% fibres by weight. The FRP Rod diameter shall be 32 mm minimum for Stay Arm, Bracket, 9-Tonne & Operating Rod insulators, 45mm minimum for Post insulator and 55 mm minimum for Post & Sectioning Insulators. The Core shall be sound and free of cracks, impurities, and voids that may adversely affect the insulator. It shall have high resistance to acid corrosion

3.3 **END FITTINGS**

3.3.1 The end fitting shall be made up of EN8 / EN8D material as per BS- 970.The End Fittings shall be made of Spheroidal Graphite Cast Iron to Grade: 400/15 of IS: 1865-1991 or Forged/Extruded Steel Fittings to BS-970 (Part-II). Approval of the Type test of the Insulator implies employment of metal fitting of the particular make, material & design used during Type test and the same shall be approved. In the event of Insulator manufacturer resort to change in make, material or design of Metal Fitting, in house Prototype tests (Mechanical tests) shall be required to be repeated.

3.3.2 The end fittings shall be free from cracks,seams,shrinks, air holes or rough edges. The surface of metal parts shall be perfectly smooth with the projecting points or iregularities which may cause corona.

NOTE: The threads of the tapped holes in the Metal Fittings of Stay Arm, Operating Rod & Post Insulator shall be cut after galvanisation and protected against corrosion by application of suitable grease or zinc spray. The threads of Hook for Stay Arm Insulator shall be cut before galvanisation. All the tapped holes shall be suitable for fixing galvanised Bolts and shall conform to IS: 4218 (Part I to VI)-latest

3.4 **MANUFACTURING PROCESS OF COMPOSITE INSULATORS**

3.4.1 Pultrusion process should preferably be adopted to manufacture the FRP Rod/Core. The temperature of Die and speed of individual Fiber movement shall be so controlled that, there are no cracks on the FRP rod. The rod shall be resistant to hydrolysis. Glass Fibre and rsin shall be optimised.The core shall conform to the tests specified in this Specification.

Cleaning of FRP Rod Should be done in such a way so as to remove polar and non polar impurites stuck on the surface of the Rod.
Special Care shall be taken by manufacturer while handling the rods so that there is no dust deposition takes place on the surface of FRP rods.Application of primer over FRP rod plays a vital role in the quality of the final product. The manufacturer should ensure that proper heating cycle is followed after application of primer, as per the instruction given by the primer manufacturer.

3.4.2The jointing of the Metal Fittings with the FRP Core shall be as per RDSO's approved reference Drawings attached as Annexure to this Specification. The Rod shall neither react chemically with the Metal Fittings nor cause their fracture/looseness on account of expansion or contraction. During the jointing process, care shall be taken to ensure that the FRP Core and the Metal Fittings are properly aligned. Only coloured Bonding Agent shall be used for manufacturing the Insulator as per this Specification. The strength of Bond between FRP Rod & Sheath shall be more than the tearing strength of the polymer.

3.4.3Metal End Fittings shall be fitted on the Rod by crimping process, prior to moulding of Sheds to ensure better sealing & avoiding water ingress. They shall be connected to the rod by means of controlled compression techniques. The manufacturer shall have in progress Acoustic emission arrangement or some other arrangement to ensure that there is no damage to the Core (FRP) during crimping. This verification shall be in progress and done on each insulators. The strength of bond between Metal Fitting & Sheath shall be more than the tearing strength of the polymer material.

In order to have adequate griping between FRP Rod and Metal Fittings, the manufacturer should properly define parameters for the inner surface roughness of the metal fittings.

3.4.4Insulator shall be manufactured by injection moulding process. The injection moulding techniques rely on the processing parameters of

the material, such as flow-ability, cure speed and de-moulding capability of the materials. It is important to verify properties and consistent quality of Rubber Compound with reference to the process parameters selected prior to bulk manufacturing on Injection Moulding Machine. This shall be achieved by using Rheological methods, such as Capillary Rheometer or any other suitable method. Insulator manufacturer shall verify the process parameters for each lot of the raw material. Record of the same shall be kept and produced to the inspecting official at the time of Design/Prototype/Acceptance tests/Quality Audit visits. The joint, formed due to the mould parting line of moulding vessel shall be smooth.

3.4.5The interface between the housing and the core must be uniform and without voids. The strength of the bond shall be greated than the tearing strength of the polymer.The manufacturer shall follow non destructive techniques (N.D.T) e.g.Ultrasonic/Radiography etc. to check the quality of jointing of the housing interface with the Core(FRP). The techniques to be follwed with detailed procedure and sampling shall be included in QAP.

3.4.6 The Insulator manufacturer shall furnish, the detailed work instructions of all the processes like crimping, bonding, moulding, cleaning, finishing, testing and packing & storage related to manufacturing of Composite Insulators along with the Quality Assurance Plan (QAP) at the time of Vendor approval by the purchaser.

4.0 TESTS

4.1 TYPE TESTS

4.1.1 **Suitability for long-term use of Silicone Composite Insulators shall be assessed by Type tests**. Vendors should keep the sufficient Raw materials & Metal Fittings ready for preparation of Specimens/ Insulators required for Type tests.

4.1.2 The Manufacturer shall furnish all the **data sheets pertaining to the Electrical and Mechanical properties of Rubber Compound, Bonding Agent** or any other chemicals required during manufacturing process at the time of product design approval.

4.1.3 In no case, Insulator Manufacturer shall change the make, grade, type or composition of the Rubber Compound without repeating the Type tests related to Electrical and Material properties.

4.1.4 Type tests shall be repeated, whenever the design or manufacturing process or the Insulating material/Bonding material of the Insulator is changed/modified or at the time of Vendor approval although type wise vendor status

4.1.5 In case the type tests reports are older than 5 years the following type tests shall be carried out on the Insulators /test Specimens at the works of the manufacturer or at any Government/NABL/NABCB accredited laboratory in the presence of the representative of the purchaser in accordance with the relevant procedures laid down in this Specifications as tabulated below:

Sr. No.	Description	Sample size
1.0	Visual Examination	100 %
2.0	Verification of Dimensions	02 Nos.
3.0	Mechanical failing Load Test	
3.1	Tensile Load Test (Eccentric Tensile Load Test in case of Sectioning Insulator)	01 No.
3.2	Bending Test	01 No.
3.3	Mechanical Performance Test	01 No.
4.0	Damage Limit Proof Test and Test of Tightness of the interface between Metal Fittings & Insulator Housing (Clause 11.2 IEC 61109)	01 No.
5.0	Assembled Core Load Time Test	
5.1	Determination of the average Failing Load of the Core of the assembled Insulator	01 No.
5.2	Control of the slope of the strength time curve of the Insulator	01 No.
5.3	Verification of Maximum cantilever load(MDCL) for post insulator as per IEC 62231	01 No.
5.4	Verification of Maximum Design Torsion Load (MDToL) for post insulator as per IEC 62231	01 No.
5.5	Verification of specified tension load for Post Insulator as per IEC 62231	01 No.
6.0	Galvanisation test	01 No.
7.0	Tests on interfaces and connections of Metal End Fittings	
7.1	Test specimens and Preliminary Tests	01 No.
7.2	Dry Power Frequency Voltage Test	
7.3	Pre Stressing	
7.3.1	Sudden Mechanical Load Release Test	
7.3.2	Thermal Mechanical Test	
7.3.3	Water Immersion Test	
7.4	Verification Tests	
7.4.1	Visual Examination Test	
7.4.2	Steep Front Impulse Voltage Test	
7.4.3	Dry Power Frequency Voltage Test	
7.4.4	Peel Off Test	01 No.
7.4.5	Non Distructive Techniques N.D.T	01 No.
8.0	Analysis of material properties	
8.1	Housing material (Silicone compound)	
8.1.1	Resistance to Tracking & Erosion Test	01 No.
8.1.2	Silicone content by weight	01 No.
8.1.3	Ultimate Elongation (%)	01 No.
8.1.4	Tensile Strength	01 No.
8.1.5	Tear Strength	01 No.
8.1.6	Hardness (Shore A)	01 No.

8.1.7	DC Volume Resistivity	03 Nos.
8.1.8	Resistance to weathering & UV	01 No..
8.1.9	Limiting Oxygen Index Test	As per relevant Standard
8.1.10	Arc Resistance	As per relevant Standard
8.1.11	Specific Gravity	01 No.
8.1.12	Dielectric Strength (kV/mm)	03 Nos.
8.1.13	Flamability Test as per IEC 61952 on Post and operating Rod Insulator	
8.2	Core Material	
8.2.1	Verification of Dimensions	01 No.
8.2.2	Dye Penetration Test	03 Nos.
8.2.3	Percentage of Glass Content	01 No.
8.2.4	Hardness	01 No.
8.2.5	Flexural strength	As per relevant Standard
8.2.6	Water Absorption	01 No.
8.2.7	Water Diffusion Test	01 No.
8.2.8	Brittle Fracture Resistance Test	01 No.
8.2.9	Specific Gravity	01 No.
9.0	Visible Discharge Test	01 No.
10.0	Dry Lightning Impulse Withstand Voltage Test	01 No.
11.0	Wet Power Frequency Test	01 No.
12.0	Wet Power Frequency Maximum Withstand Voltage Test	01 No.
13.0	Power Arc Test	01 No.
14.0	Accelerated Weathering Test	01 No.
15.0	Tracking & Erosion Test	01 No.
16.0	Cantilever Failing Load Test For Post Insulator as per IEC 62231	01 No.
17.0	Speicified Tension Load test for Post Insulator as per IEC 62231	01 No.
18.0	Compression and Buckling withstand test (As per IEC 61952 on Post and operating Rod Insulator	01 No.

I. Test at Sl. No. 8.1 shall be carried out on samples as mentioned above or as specified in their relevant standards (whichever is higher shall be taken). These tests need not be repeated, if the material of the Sleeve/Housing are of the same batch for other types of Insulator offered for Prototype tests.

II. Test at Sl. No. 8.2 shall be carried out on samples as mentioned above or as specified in their relevant standards (whichever is higher shall be taken). These tests need not be repeated, if the material of the Core (Glass Fiber) are of the same batch for other types of Insulator offered for Prototype tests.

III. The Electrical tests, listed out at Sl. No. 9.0 to 12.0 above, shall be carried out on one type of Insulator only, in case the design of Insulator (excluding End Fittings) is same for all the types offered for Prototype Testing. They shall be repeated with a time gap of every 5 years or till any change in design of housing of the Insulators offered for Prototype tests whichever is earlier.

IV. The Tests, mentioned at Sl. No. 13 above, shall be carried out on any one type of Insulator (preferably on 9- Tonne Insulators) in case the design of Insulator (excluding End Fittings) is same for all the types offered. Also, the Power Arc test shall be carried out on any one type of Insulator, preferably on Sectioning Insulator out of Post, Operating & Sectioning Insulators. They shall be repeated with a time gap of every 5 years or till any change in design of the Insulators offered for prototype tests whichever is earlier.

V. The Tests mentioned at Sl. No. 14 & 15 above, shall be conducted on any one type of Insulator only. They shall be repeated with a time gap of every 5 years or till any change in design/material/grade (Polymer compound) of the Insulators offered for Prototype tests whichever is earlier.

VI. The Galvanisation test shall be conducted on three samples of each type of Metal Fittings of the Insulators, broken during Mechanical load and Performance test. This test shall also be conducted on Hooks, in case of Stay Arm Insulator.

VII. The test on interface & connections of Metal Fittings shall be carried out on any one type of Insulators (preferably on 9-Tonne insulator) at the time of renewal of Vendor approval only (if offered at a time), in case the design of Insulator (excluding End Fittings) is same.

VIII. The tests mentioned at Sl. No. 1.0, 2.0 3.1, 3.3, 4.0,5.0 & 6.0 above shall be repeated only in case of Insulators manufacturers change the material of Metal Fitting /manufacturer of Metal Fitting.

4.2 ACCEPTANCE CRITERIA FOR TYPE TESTS

4.2.1 A single Batch of Insulators offered for type tests, shall pass all the tests as stipulated above. In case any Insulator/Test Specimen sample fails in the Type Test, manufacturer shall brought out in black & white, the reason of such failure & corrective action taken by them. Only after Purchaser's satisfaction, the firm can offer fresh Batch of Insulators, for all Type tests referred above. The bulk manufacturing of the Insulator shall be taken up, only after approval of the original Drawings, incorporating changes, if any, necessitated during the Type tests.

At the time of Type tests, the Insulator manufacturer shall have to furnish Test Certificates (as received from the OEM's) for all Raw materials including Rubber Compound, any additives, Fillers to Rubber Compound, Chemical Agents, FRP Rod, Metal parts etc.

4.2.2 The manufacturer shall stick with the same materials properties and process of manufacture as adopted for the Prototype. In no circumstances, shall materials with other than those adopted in the Design/Drawings and/or during the manufacture of Prototype be used for bulk manufacture on the plea that they had been obtained prior to the approval of the Prototype.

4.2.3 Notwithstanding approval having been accorded to manufacture for supply of the Insulators, on the basis of the results of the Type tests, purchaser can conduct tests including destructive tests at any time during the process of bulk manufacture- without prior advice to the manufacturer. All facilities shall be made available to conduct such test- without any charges.

4.2.4 Prior to giving a call to the purchaser for testing of the insulators (at least 15 days in advance), manufacturer shall submit a Detailed Test schedule, consisting of Schematic Circuit Diagrams for each of the tests and the number of days required to complete all the tests. Prior to that, it should be ensured that, sufficient Raw materials & Metal Fitting for Prototype sample is ready in all respect. Once the schedule is approved, the Tests shall invariably be done accordingly. However, during the process of type test or even later, ~~RDSO~~ purchaser reserves the right to conduct any additional test (s), besides those specified herein, on any Insulator so as to test the Insulator to their satisfaction or for gaining additional information and knowledge.

4.2.5 In case any dispute or disagreement arises between the manufacturer and representative of the purchaser during the process of testing as regards the procedure for Type tests and/or the interpretation and acceptability of the results of type test, it shall be brought to the notice of the purchaser as the case may be, whose decision shall be final and binding.

4.2.6 The Insulator shall be visually examined to see that it is free from physical distortion of shape, chalking (flouring), crazing and that the sleeve/housing shall be free from cracks or any other defect likely to be prejudicial to satisfactory performance in service.

4.2.7 The Metal Fittings shall be smooth without any excrescence. Before accepting the lot, the Purchaser shall check the Insulators for the defects (100% for Type test and 10% of the lot, in case of Acceptance test).

4.2.8 The following Documents shall be furnished by the manufacturer at the time of type/acceptance test for Silicone compound & FRP Rod.

i) Name and Trade mark of manufacturer.
ii) Product Data Sheet/Test Certificate.
iii) Any other information required by the Purchaser.

4.3 **ROUTINE TESTS**

These tests are for the purpose of eliminating Insulators with manufacturing defects. They are conducted by manufacturer on every Insulator offered for Acceptance Test, which shall pass the tests. The Purchaser shall have the right to witness Routine tests. The manufacturer shall maintain the detailed record of the number of

Insulators tested, rejected and other essential data, for the purpose of examination during Tests, Assessment & Audit visits.

4.3.1 **ROUTINE VISUAL EXAMINATION**

The visual examination shall be conducted as per IEC 61109- 2008 & IEC 62231.

4.3.2 **ROUTINE MECHANICAL LOAD TEST**

All Insulators except for Sectioning Insulator shall be subjected to Axial Tensile load of 70% of the value specified in Table-5 for one minute. In case of Sectioning Insulator, the Tensile load shall be applied 80 mm eccentric. If any Insulator cracks or its Metal Fittings loosen or deform or crack or any abnormal sound observed, it shall be rejected. Every Insulator passing the routine mechanical load test shall be affixed with a clear label or stamp on the End Fitting indicating that it has passed routine Mechanical Load test.

4.3.3 The manufacturer shall follow non destrucive techniques (N.D.T) i.e ultrasonic /radiography etc to check the quality of jointing of the housing interface with the core (FRP). This test shall be carried our on every insulator.

4.4 ACCEPTANCE TESTS

4.4.1 These tests are for the purpose of verifying the Mechanical characteristics as well as the required properties of the FRP Rod, housing material of Insulator and other characteristics as considered necessary, to ensure quality of manufacturing and the material used.

4.4.2 The sample size shall be 1.5% of the quantity offered subject to a minimum of 6 picked up at random. All the tested samples shall be signed with date by Inspector & Firms representative on the Shed with permanent marker. The tested samples (except sample used for percentage of Silicone Polymer content by weight) after cutting of two Shed shall be supplied to consignee alongwith inspected Insulators.

Note-

If the order of a particular type of Insulator is in small quantity i.e.less than 200 Nos., the manufacturer can club different orders (maximum 5 orders) & total insulator quantity clubbed will be treated as offered quantity.

4.4.3 The following tests shall constitute part of acceptance test, to be conducted on the insulators selected in random from the lot offered for acceptance: (See Table-03 on next page).

4.4.4 Only after passing the visual examination, other Acceptance tests shall be conducted on the offered Insulators. No failure should take place in the tests listed in Sr .No 1 to 8 of Table-3, otherwise, retesting shall be performed as per new sampling size equal to twice the quantity listed in quantity column of Table-3. If any Insulator fails in the retest, or in the first testing of tests at Se.No. 9 & 10 of Table-3, the entire lot shall be rejected & each Insulator of the lot shall be destroyed.

Table -3

Sr. No.	Name of Test	Clause No. of the specification	Quantity
1.	Visual Examination	A-1	100 %
2.	Verification of dimensions	A-2	02 Nos.
3	Verification of the tightness of the interface between End Fitting and Insulator Housing	Para 12.4 of IEC 61109-2008	01 No.
4	Verification of the specified Mechanical Load		
5	Bending load test	A-3.2	01 No.
6	Mechanical Performance Test	A-3.3	01 No.
7.	Dry Power Frequency withstand Voltage Test	IS-2071 [at 100kV (rms) for one minute].	01 No.
8.	Galvanisation Test	ETI/OHE/13 (4/84)	01 No.
9.0	Analysis of material properties (Housing material)		
9.1	Hardness (Shore A) (on Test Slabs only)	ASTM D 2240	01 No.
9.2	Specific Gravity (on Test Slabs & Insulators Shed)	ASTM D 792	01 No.
9.3	Tear Strength (on Test Slabs only)	ASTM D 624-2012 (DIE-C)	01 No.
9.4	Tensile strength (on Test Slabs only)	ASTM D 412	01 No.
9.5	Ultimate Elongation % (on Test Slabs only)	ASTM D 412	01 No.
9.6	Silicone Polymer content (By Weight)	Clause No.A-16 of the specification	01 No.
10	Analysis of material properties (Core material)		
10.1	Dye Penetration Test	IEC 61109	01 No.
10.2	Percentage of Glass content	ASTM D 2584	01 No.
10.3	Hardness	ASTM D 2583	01 No.
10.4	Specific Gravity	ASTM D 792	01 No.

4.4.5 The Specific Gravity test shall be carried out on specimen taken out from the Insulator offered for Acceptance test and minimum three test slabs from same Rubber compound shall be prepared for conducting tests at the manufacturer's premises during inspection by the Inspecting Authority. For the purpose of conforming / co-relating the composition of the test slabs with that at the Insulators material, the acceptance test results of both (insulator shed & test slab) shall be within specified limit and shall not have variation more than the limit given below:

a) Specific Gravity: Test results shall be within ± 0.04.

4.4.6 The following shall form part of the Acceptance Test Report:-

(a) Co-relation Test Report of Housing material signed by Inspecting Official for checking the limits as given in Clause No. 4.4.5.

(b) A Certificate by the Inspecting Official stating that he has checked the records of the Routine Tests, conducted by the manufacturer and found in line with the test results submitted to Inspecting Officials.

(c) A statement from the manufacturer, countersigned by the Inspecting Official, showing the rejection rate of Insulators in the Routine Tests, conducted by the manufacturer, for each lot offered.

(d) Thermo Gravimetric Analysis (TGA) & FTIR test reports for percentage of Silicone Polymer content by weight.

Note:-The Inspecting Authority can issue the Inspection Certificate/Dispatch clearance, based on the Acceptance tests mentioned above, except for percentage of Silicone Polymer content by weight. It shall be the responsibility of the manufacturer to submit the Test Report of TGA & FTIR tests to the Inspector & Consignee/Purchaser within a month from the date of Inspection. In case sample fails, the entire lot shall be rejected & each Insulator of the lot shall be destroyed at consignee premises in presence of Inspector. Fresh supply of Insulators against failed lot shall be made within two months.

5.0 DRAWINGS AND THEIR APPROVAL

5.1 For the purpose of vendor approval, the supplier shall submit the following Drawings in 1:1/1:2 scale, separately for each type of Insulator, in sizes of 210mm x 297mm or any integral multiple thereof for approval.

(i) Assembly Drawing of the Insulator.
(ii) FRP Core Drawing.
(iii) Metal Fittings Drawings.

6.0 **ESSENTIAL REQUIREMENTS**

6.1 The Insulators shall conform to essential dimensions shown in Figure 1 to 6 for interchangeability. In case of 1600 mm Creepage Distance Insulators maximum 550 mm, 593 mm & 578 mm length of Insulators have been permitted for Stay Arm, Bracket & 9-Tonne Insulator respectively.

6.2 It shall cover the entire dimensional parameters characterizing the Insulator profile, clearly indicating the values of individual parameters i.e s,c,p1,p2,ld1,ld2 etc. used for calculating profile parameter on the Drawing & shall generally conform to IEC/TS 60815-3 Edition 1.0, 2008-10.

7.0 **MARKING**

7.1 Each Insulator shall be legibly and indelibly marked during molding. The marking on Sheds (10mm) / Sheath (4/5mm) shall have engraved/relief figures the name of manufacturer, month & year of production. It shall not get wiped out during the life of the Insulator.

7.2 The each Metal Fittings shall have markings indicating the name of both manufacturers i.e. Metal Fitting and Insulator manufacturers and year of manufacturing in size of 6 mm Relief figures. Also, Batch Number (Month & Year of manufacturing) of Insulator shall be marked in size of 6 mm figures on top side Metal Fitting of Insulator by Punching.

7.3 Each Insulator Should have laser marking/alternative permanent marking method, on top and bottom shed towards outer periphery in the following format:-

Make-XXXX-MM-YYYY
Where XXXX indicates the serial number of the insulators manufactured in the particular month.
MM- month of manufacturing
YYYY- Year of manufacturing
Manufacturer should ensure unique serial number with trace ablility to determine the raw material batch used.

8.0 **PACKING**

8.1 The Insulators shall be securely packed first with thick Polythene Bag. It shall be kept inside 7 Ply (140-120-120-120-120-120-140) Cardboard Box having 75 mm thickness Thermocol at both the ends of Box. Appropriate hole to support the Metal Fitting shall be made in the Thermocol.

8.2 Care shall be taken to ensure that Sheds of the Insulators shall not touch each other and the walls of the Box. It shall be ensured that there is no damage to Sheds during loading & transportation. Not more than four Insulators shall be packed in a Box, so as to facilitate manual loading and unloading. The manufacturer shall provide instruction leaflet regarding handling & storage of the Insulators to individual consignees in English and Hindi language along with the supplies.

9.0 STANDARD ATMOSPHERIC CONDITIONS

Electrical tests shall, however, be carried out under conditions prevailing at the time of the tests. The barometric pressure, air temperature and humidity at the time of tests shall be recorded for the purpose of calculating the corrections to test voltage in accordance with Appendix B.

10.0 REQUIREMENTS OF ELECTRICAL & MECHANICAL PARAMETERS

Voltages for High Voltage Tests

The values of voltages at Standard Atmospheric Conditions for the various high voltage tests on the insulators shall be as given in Table-4.

Table-4

VALUES OF VOLTAGES FOR HIGH VOLTAGE TESTS

Type of Insulator	Visible Discharge Test KV (rms)	Wet Power Frequency withstand Voltage Test		Dry Lightning Impulse withstand Voltage Test	
		Insulator Vertical kV (rms)	Insulator Horizontal kV (rms)	Positive Wave kV (peak)	Negative Wave kV (peak)
1	2	3	4	5	6
Stay Arm	35	100	125	240	260
Bracket Tube	35	100	125	240	260
9-Tonne	35	100	125	240	260
Operating Rod	35	100	125	240	260
Post	35	100	-	240	260
Sectioning	35	-	125	240	260

Note: These values apply to all polluted and heavily polluted zone Insulators.

10.1 Minimum Mechanical Failing Load and Bending Moment and Torsional Moment

The minimum mechanical failing load, bending moment and torsional moment shall be in accordance with Table-5.

Table-5

MINIMUM MECHANICAL FAILING LOADS, BENDING AND TORSIONAL MOMENTS.

Type of Insulator	Tension (kgf)	Tension with 80mm Eccentric Load (kgf)	Bending Moment (kgf.m)	Torsional Moment (kgf.m)
Stay Arm	7000	-	200	-
Bracket Tube	7000	-	200	-
9-Tonne	11000	-	210	-
Operating Rod	2200	-	70	-
Post	6000	-	370	100
Sectioning	-	5000	-	-

11.0 AFTER SALES SERVICE

11.1 The manufacturer shall make necessary arrangements for closely monitoring the performance of the Insulators, through periodical visits to the offices of the Consignees to whom, the Insulators have been dispatched for interaction with the Operating and Maintenance personnel of the **NOIDA Metro Rail Corporation Limited**

11.2 The manufacturer shall respond promptly and in a workman-like manner to any call given by **NOIDA Metro Rail Corporation Limited** for any assistance by way of attending to failures, investigating the cause of the failures including tests, to be done and such other items with a view to seeing that the insulator serves the purpose for which it is intended.

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DETAIL DESCRIPTION OF TESTS

A-1 VISUAL EXAMINATION

A-1.1 The insulator shall be visually examined to see that it is free from physical distortion of shape and the surface is free from cracks, chalking, crazing or any other likely defect. The visual defects shall not exceed the limits permissible for the appropriate class of Insulator as specified in IEC: 61109-2008, to be prejudicial to satisfactory performance in service. The Metal Fittings shall be smooth without any excrescence. The Insulator shall be checked for the following defects:-

A-1.2 Tilt, Mis-alignment and Threads of metal fittings: Generally no tilt of metal fitting is acceptable for all types of Insulators. However a maximum tolerance of 2mm for the tilt of metal fitting shall be permitted if the tilt could not be avoided totally. Wherever thread cutting is required in the metal fittings, each insulator shall be checked for the diameter of thread and depth of threaded portion as per the specification / approved drawing using suitable gauges. The mis- alignment shall be checked for each insulator separately, generally no mis-alignment is acceptable. The following checks shall also be carried on the Insulators.

A-1.2.1 Stay Arm Insulator

i) Tube side Metal Fitting: Each insulator shall be checked for the diameter of transverse holes, and the distance between the transverse holes as well as from the end of metal fitting using suitable gauges.

ii) Stay arm Insulator Hook: Each hook shall be checked for the diameter of thread and length of the threaded portion as per specification using suitable "Go and No Go gauges".

A-1.2.2 Bracket Insulator

i) Tube side metal fitting: Each insulator shall be checked for the machining of the hole as per the specification using suitable gauge and "U" bolts.

A-1.2.3 Sectioning Insulator

Each metal fitting shall be checked for the critical dimensions of the metal fitting using suitable gauges.

A-2 VERIFICATION OF DIMENSIONS

The dimensions of the Insulator shall be verified to see that they are in accordance with the approved Drawings. Unless otherwise specified, a tolerance of +/- (0.03 d+0.3) mm shall be permissible on any dimension of the housing only, 'd' being the dimension in mm.

A-3 MECHANICAL FAILING LOAD TESTS

These tests shall comprise Tensile, Bending, Mechanical Performance Test, Eccentric Loading and Torsion Tests.

A-3.1 TENSILE LOAD TEST

This test shall be carried out on all type of Insulators except the Sectioning Insulator. The load shall be applied to the Insulator in line with its axis. It shall be increased at a rate given in Note-2 of Para A-3.3 to 70% of the specified minimum Tensile Failing Load.

It shall be maintained at this value for one minute and then raised at the same rate until separation or breakage of Metal Fittings or total breakage of the Insulator occurs. The separation or any permanent deformation in the Insulator and its components shall not occur before the load reaches the minimum Tensile Failing Load specified in Table-5.

A-3.2 BENDING TESTS

This test shall be carried out on all type of Insulators except the Sectioning Insulator. One end of the Insulator shall be rigidly fixed in a suitable fixture so as not to cause the failure of the Metal Fitting during the test. The load shall be applied to the other end of the Insulator in line with the diameter and in a direction perpendicular to the axis of the Insulator and shall be increased at a rate given in Note-2 of Para A-3.3 to 70% of the specified minimum failing Bending Moment, taking into account the distance between the top of the fixture and the point at which the load is applied.

It shall be maintained at this value for one minute and then raised at the same rate until the crackling sound or fracture of FRP Rod or permanent deformation or momentary stability of load (on indictor) or total breakage of the Insulator Metal Fittings or separation occurs. The failing bending moment shall be calculated by multiplying the value of the load in 'kgf' and the distance from the point of application of load to the point of breakage/failure in 'metre' and this value shall be not less than the minimum bending moment specified in Table-5.

A-3.3 MECHANICAL PERFORMANCE TEST

The Insulators shall be subjected to a tensile load (Eccentric Tensile Load in the case of Sectioning Insulator) equal to 70% of the specified minimum failing load and immediately removed. This shall be done 4 times in quick succession. Thereafter the Insulator shall be subjected to the Tensile Test (Eccentric Tensile Tests in the case of Sectioning Insulator) in accordance with Clause A-3.1. The separation or breakage of the Metal Fittings or the total breakage of the Insulator or any permanent deformation in the Insulator and its components shall not occur below the specified minimum failing load specified in Table-5.

In case of the Sectioning Insulator, the line of application of the load shall be 80mm away from and parallel to the longitudinal axis of the insulator.

Note:

(1) The choice of the End to be fixed rigidly shall be left to the manufacturer.

(2) The recommended rates of increase of load in the Tensile and Bending tests are as under:

Tensile Test:	200 to 300 kgf/s
Bending Test:	15 to 30 kfg/s

A-3.4 ECCENTRIC LOADING TEST

This test shall be carried out only on the Sectioning Insulator. The load shall be applied by means of suitable jigs such that the line of application of the load is 80 mm away from and parallel to the longitudinal axis of the Insulator. Care shall be taken to ensure that during the test, the jigs do not move and the distance of the load from the centerline of the Insulator does not become less than 80 mm. The load shall be increased at a rate given in Note-2 above to 70% of the specified minimum eccentric tensile failing load. It shall be maintained at this value for one minute and then raised at the same rate until separation or breakage of metal fittings or total breakage of the Insulator or any failure occurs. The separation of Metal Fittings or total breakage of the Insulator or any permanent deformation in the Insulator and its components shall not occur before the load reaches the minimum Eccentric Tensile Failing Load specified in Table-5. It may be noted that no sag/bend/deflection shall be there till 1000kgf Eccentric Tensile Load and a maximum 10 mm sag/ bend/deflection is permitted at a Eccentric Tensile Failing Load specified in Table-5. The maximum sag/bend/deflection shall be measured at 1000 kgf, 3500 kgf & 5000 kgf during Eccentric Tensile Load test and shall be mentioned in the Test report.

A-3.5 TORSION TEST

This test shall be done only on the Post Insulator. The Insulator shall be subjected to a Torsional Load without causing any Bending whatsoever. Depending upon the length of the lever arm used for imparting the torsion, the load corresponding to the minimum Torsional failing moment shall be calculated and 70% of the value of Load so calculated shall be gradually applied at the end of the lever arm and maintained at that value for one minute. The load shall then be raised at the same rate till failure of crimping/fracture of FRP Rod/Permanent deformation in FRP Rod shall takes place. The Torsional moment shall be calculated with the load at which the failure of crimping/fracture of FRP Rod/Permanent deformation in FRP Rod shall takes place by multiplying the load and the lever arm length and that failure shall occur at a torsional moment shall not be less than the minimum specified value in Table-5

A maximum 5 twist is permitted at torsional moment specified in Table-5.

A-3.6 **FLAMIBILITY TEST** on Housing Material and Compression and Buckling withstand test as per IEC 61952 Shall also be conducted on Post Insulator and Operating Rod Insulator.

A-4 DAMAGE LIMIT PROOF TEST AND TEST OF TIGHTNESS OF THE INTERFACE BETWEEN METAL FITTINGS & INSULATOR HOUSING

This test shall be carried out on four Insulators, in accordance with clause 11.2 of IEC 61109-2008.

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A-5 ASSEMBLED CORE LOAD TIME TEST

Test Specimens

Six Insulators made on the production line shall be tested. These Insulators shall be examined visually and checked to confirm the major/critical dimensions confirm with the relevant drawing.

Mechanical Load Test

This test is to be performed in two parts at ambient temperature.

A-5.1 DETERMINATION OF THE AVERAGE FAILING LOAD OF THE CORE OF THE ASSEMBLED INSULATOR

Three of the Specimens shall be subjected to Tensile Load. The Tensile Load shall be increased rapidly but smoothly from zero to 75% of the expected Mechanical Failing Load and then gradually to be increased in a time between 30 seconds to 90 seconds until breakage of the Core or Complete pull out occurs. Any test leading eventually to a failure of the couplings shall be ignored. The average of the three failing load shall be calculated.

A-5.2 CONTROL OF THE SLOPE OF THE STRENGTH TIME CURVE OF THE INSULATOR

The remaining three Specimen, shall be subjected to a Tensile load, which shall be increased rapidly but smoothly from zero to 70% of the average failing load, as calculated in clause A-5.1 and then maintained at this value for 96 hours without failure. If for any reason the load application is interrupted, then the test shall be restarted on a new specimen.

A-6 GALVANISATION TEST

The uniformity, adherence and mass of zinc coating shall be tested in accordance with Specification No.ETI/OHE/13 (4/84)-latest and the results of the tests shall meet the requirements specified. The mass of zinc coating shall be, as specified in clause 3.3.2 of the Specification.

A-7 TESTS ON INTERFACES & CONNECTIONS OF METAL FITTINGS

A-7.1 TEST SPECIMEN AND PRELIMINARY TESTS

The tests shall be performed on the full Insulator as the length of the insulator is less than 800 mm. Three Insulator assembled on the production line, shall be tested. Both Metal Fittings shall be the same, as on the standard production Insulators. The Insulators shall be examined visually and dimensions conform to the RDSO approved Drawings andthen subjected to the Mechanical RoutineTest according to Para 13.1 of IEC 61109-2008.

A-7.2 DRY POWER FREQUENCY VOLTAGE TEST

On the three Specimen, Dry Power Frequency Flashover Voltage shall be determined, by averaging five flashover voltages on each specimen. The average flashover voltage shall be corrected to normal standard atmospheric conditions as per Appendix 'B'. The Flashover Voltage shall be obtained by increasing the voltage linearly from zero within 1 minute.

A-7.3 PRE STRESSING

The tests shall be carried out on the three specimen in the sequence as indicated below.

A-7.3.1 SUDDEN LOAD RELEASE TEST

The Three Insulators shall be mounted in the Testing Equipment. The temperature inside the chamber shall be set to - 20^{o} C to - 25^{o}C. Every test Specimen shall be subjected to five sudden load releases; from a Tensile Load, amounting to 30% of the Specified Mechanical Load.

A-7.3.2 THERMO MECHANICAL TEST

This test shall be carried out on three Insulators, in accordance with Clause 10.3.2 of IEC 61109-2008.

A-7.3.3 WATER IMMERSION TEST

The three Insulator subjected to Thermal Mechanical test as per clause A-7.3.2 shall be kept immersed in a vessel; in boiling deionised water with 0.1% by weight of NaCl for 42 hours. After completion of 42 hours, the samples should be left in the vessel until the water cools down to about 50^{o} C and maintained at this temperature in the equipment till verification test start in the following sequence:-

A-7.4 VERIFICATION TESTS

The time interval between the following tests i.e. Visual Examination, Steep Front Impulse Voltage Test and Dry Power Frequency Voltage Test shall be such that the verification tests are completed within 48 hours.

A-7.4.1 VISUAL EXAMINATION

The housing of each specimen is inspected visually. No cracks/damage are permissible.

A-7.4.2 STEEP FRONT IMPULSE VOLTAGE TEST

The voltage shall be applied to the original Metal Fittings of the Insulator as the insulation length of the insulator is smaller than 500 mm.

An impulse voltage with a steepness of at least 1000 kV/µs shall be applied between the Metal Fitting. Each Insulator is to be stressed with 25 impulses of positive and 25 impulses of negative polarity. Each impulse shall cause external flashover between the electrodes & no puncture shall occur. This test shall be carried at CPRI, Bangalore/ ERDA or any other Government Laboratory having NABL accreditation.

A-7.4.3 DRY POWER FREQUENCY VOLTAGE TEST

The Dry Power Frequency Flashover Voltage shall be determined once more for each specimen as per clause A-7.2. The average value of the flashover voltage shall be greater than or equal to 90 % of the values determined in Clause A-7.2 for each specimen. Each test specimen shall be individually subjected for 30 minutes to 80 % of its average Flashover Voltage as determined above. No puncture shall occur and the temperature rise of the shank measured immediately after the test shall be not more than 20^0 C.

A-7.4.4 PEEL OFF TEST

The bonding between FRP rod and housing material to be verified through peel of test in each shift (The meaning of shift is defined as the duration starting from the starting of injection moulding process of Insulator till the stopping of the moulding process). This test shall be carried out on assembled insulator after injection moulding. Samples of silicone composite insulators as detailed in table 2 shall be taken from the insulators subjected to mechanical failing load test. 'U' shape cut on the sheath portion shall be made so that rubber can be pulled using plier from bottom portion of 'U' shape cut. While pulling the rubber, it should not be peeled off from the FRP surface instead it should break leaving residue on the FRP surface. In case the rubber peels off without leaving any residue on FRP Rod, the sample should be treated as failed.

A-8 ANALYSIS OF MATERIAL PROPERTIES

The following test as per specified standard shall be carried out on the Insulators/Specimens. The tests results for material properties shall conform to the values specified.

A-8.1 HOUSING MATERIAL & CORE MATERIAL

S.No.	Test	Reference Specification	Specified Value.
(a)	Resistance to tracking & erosion	IEC: 60587	Min. 4.5 kV
(b)	Percentage of Silicone Polymer content by Weight	As per clause No. A-16 of Specification	30 % minimum
(c)	Tensile strength	ASTM D 412	Min. 40 kg/sqcm

(d)	Ultimate elongation	ASTM D 412	Min 125 %
(e)	Tear strength (KN/m)	ASTM D 624-2012 (DIE-C)	Min. 13
(f)	DC Volume resistivity	IEC 60093	Min. $1x10^{13}\Omega cm$
(g)	Verification of Dimensions	As per approved Drawing.	As per approved drawing.
(h)	Dye Penetration Test	IEC 62217 (Clause 9.4.1)	No dye penetration till15 minutes.
(i)	Percentage of Glass Content	ASTM D2584	70% (min.)
(j)	Hardness Test (Barcol)	ASTM D2583	50 min
(k)	Flexural Strength	ASTM D 790	10,000 kg/cm^2
(l)	Water Absorption	IEC 61109-2008, ASTM D 570	0.1 % max.
(m)	Water Diffusion	IEC 62217-2012 (Clause 9.4.2)	Shall withstand 12 kV.
(n)	Brittle Fracture Resistance Test	As per procedure given in Para A-15	Shall withstand
(o)	Specific Gravity	ASTM D 792	1.9 to 2.1

A-9 VISIBLE DISCHARGE TEST

The room in which the test shall be carried out needs to be darkened completely and a period of at least five minutes shall be allowed for the observer to become accustomed to the darkness. A Power Frequency Voltage of the value specified in Table-4 shall be applied in accordance with the procedure laid down in Appendix 'C' and maintained at that value for five minutes. During this period, there shall be no signs of Visible Corona. The Voltage shall then be raised gradually and the value at which corona first appears, shall be recorded. Thereafter, Voltage shall be reduced gradually, and the value at which the Corona just disappears shall be recorded.

A-10 DRY LIGHTNING IMPULSE WITHSTAND VOLTAGE TEST

The Insulator shall be tested dry under the conditions described in Appendix "C". The Impulse Generator shall be adjusted to a standard 1.2/50 impulse at the specified impulse withstand voltage adjusted for the atmospheric conditions at the time of test. Fifteen such voltage waves shall be applied to the Insulator. If there is no flashover or puncture, the insulator shall be deemed to have passed the test. However, two flashovers on the external insulation are permissible. The Insulator shall pass the Impulse Withstand Voltage Test with Voltages of both Positive and Negative polarity. The Insulators shall not be damaged by these tests, but slight marks on the surface of the Metal Fitting shall be permissible. The original oscillograms recorded during the test shall form part of the Type Test Report.

A-11 WET POWER FREQUENCY WITHSTAND VOLTAGE TEST AND WET POWER FREQUENCY MAXIMUM VOLTAGE TEST

The Insulator shall be arranged as described in Appendix "C" and exposed for at least 1 minute before application of Voltage and throughout the test the Artificial Rain produced in accordance with Clause 3.3 of IS:2071 (Part-I) or . The Test Voltage to be applied to the Insulator shall be the specified wet power conditions at the time of test. A Voltage of about 75% of the test voltage so determined, shall be applied and then increased gradually to reach the test voltage, it shall be maintained at this value for 1 minute. The Insulator shall not flashover or punctures while the Test Voltage is applied.The test shall then be repeated at successively higher voltage in step of 2.5 kV or 5 kV until the Insulator is unable to withstand the applied voltage for a period of 1 minute. The voltage, corrected as described in Appendix "B", of the test immediately preceding the last test shall be taken as the maximum Wet Power Frequency Withstand Voltage.

A-12 POWER ARC TEST

The Power Arc test comprises flashing over at the maximum arc current of 6 kA for 0.2 sec. followed by 2 kA for 0.2 sec. followed by 6 kA for 0.2 sec. and the Core of Insulator shall not exposed & punctured.

It is understood that at present the facilities available in the country do not have the arrangement to conduct the test in the sequence required and therefore the Power Arc test shall be done at 6 kA for 0.2 sec. followed with a pause of maximum 180 sec. by 2 kA for 0.2 sec. followed with a pause of maximum 180 sec. by 6 kA for 0.2 sec. (till such time as this sequence is modified) with the no load voltage of the power source i.e. 7 to 10 kV. The insulator shall not be punctured/ flash under polymer housing and core/FRP rod of insulator shall not be exposed at the end of the test. After completion of the test the insulator shall be subjected to mechanical load test in accordance with Clause: A-3.1 of this specification and no failure should occurr before the load reached the minimum tensile failing load specified in Table-5. The original oscillographs recorded during the test shall form part of the type test report. This test shall be carried at CPRI, Bangalore/ ERDA or any other Govt. Lab having NABL accreditation.

A-13 ACCELERATED WEATHERING TEST

This test shall be carried out as per Clause No.9.3.2 of IEC 62217-2012.

A-14 TRACKING & EROSION TEST

This shall be carried out as per Clause No. 9.3.3 of IEC 62217-2012. The test sample shall be prepared in the presence of inspecting official & will be sealed/signed by him for sending the sample to tracking & erosion test. The sealing should be such that it is intact even after the completion of the test. The sealed sample shall be submitted to **purchaser** along with the original test reports after the test.

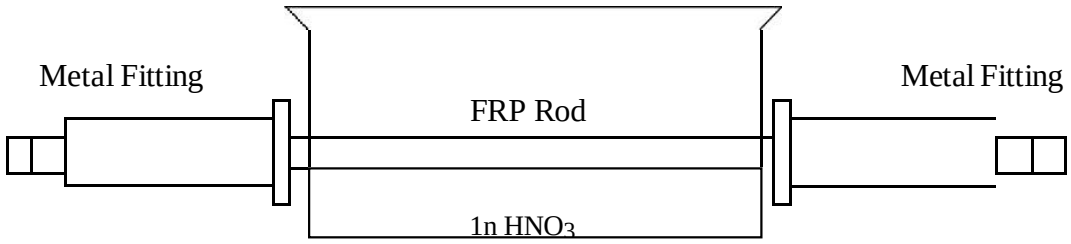
The test once carried out on the sample sealed by **purchaser** inspecting official, need not be repeated, if the material of the sleeve

is same for other types of insulator offered. However, every 5/6 years from the date of the completion of the test, this test shall be repeated irrespective of material change or not, to ensure the quality of the material.

A-15 <u>BRITTLE FRACTURE</u>

A-15.1 Brittle fracture results due to exposure of mechanically stressed Glass fiber in the rod, to an acidic medium & thereby leads to stress corrosion cracking. Factors that plays a role in brittle fracture failure are, the quality of bonding between Glass fibers and the resin matrix, poor quality of glass resin interface i.e. containing voids or an uneven resin distribution etc. Protection of glass fibers is key to improved brittle fracture resistance at the microscopic level.

A-15.2 This test should be conducted on bare FRP Rod. The Rod should be crimped with Metal Fitting & load to the tune of 80% of SML should be applied for 96 hours. To check the influence of stress in the End Fittings & FRP Rod and evaluation of brittleness of FRP Rods, FRP Rod at the middle is fully dipped in 1N HNO_3 and under 80% SML Tensile Load for 96 hours as shown in figure below



A-15.3 The sample is considered as pass, if the rod does not indicate any sign of crack on its surface during & after 96-hour duration.

A-16 DETERMINATION OF PERCENTAGE OF SILICONE POLYMER CONTENT BY WEIGHT

The inspecting official shall seal four pieces of Silicone Rubber of Insulators and send the sample to CPRI, Bangalore/CIPET or any other Government Lab NABL accredited for determination of percentage of Silicone Polymer content by weight by Thermo Gravimetric Analysis (TGA) as per ASTM E 1131-2008 & Fourier Transform Infrared Spectroscopy (FTIR) as per ISO-4650-2005 or any other suitable method.

Insulator from which these pieces have been cut should also be sealed & clearly signed by inspecting official for verification during Quality Audit & Assessment by purchaser representatives. It should be the responsibility of the manufacturer to keep such Insulator stacked separately at his works.

The reports of percentage of Silicone content should be available in separate file at manufacturer's works. These shall have to be produced by the manufacturer to inspecting officials during acceptance test visits along with their supply details while submitting the case for renewal of approval or fresh Prototype approval.

The acceptance criteria for the test shall be the 30% minimum of Silicone Polymer content by weight. The % values of other elements obtained from this test like fillers and other chemicals shall be used

by purchaser to verify the consistency of quality of the raw material. A copy of this Test Report indicating name of the vendor, date of test and quantity of lot shall be sent to purchaser / inspecting agency for record.

CORRECTION OF TEST VOLTAGES FOR ATMOSPHERIC CONDITIONS

B - 1. GENERAL

Variation in barometric pressure and humidity of the atmosphere cause variation in the electric strength of the air and hence in the Flashover Voltage of an Insulator exposed to atmosphere.

B-2. CORRECTION FACTORS

When the atmospheric conditions around an Insulator during test differ from the reference conditions, adjustment are required to be made to certain of the test voltages by the application of the following correction factors in accordance with Table- B-1 at the end of this Appendix.

a) Correction Factor (d) for Air Density

$$d = \frac{0.289\ p}{273 + t}$$ (d lies between 0.95 and 1.05)

When P= atmospheric pressure in mbar, and t= temperature in ^{o}C

For a wider range of density and for higher accuracy, the factor 'k' shall be used instead of factor 'd'. The values of factor 'k' corresponding to various values of factor 'd' are given below:

D	K
0.70	0.72
0.75	0.77
0.80	0.82
0.85	0.86
0.90	0.91
0.95	0.95
1.0	1.00
1.5	1.05
1.10	1.09
1.15	1.13

b) Correction Factor (h) for Humidity:

Figure. A-1 attached gives the values of absolute humidity value for wet and dry bulb temperatures (when the velocity of air over the wet bulb exceeds 3 m/s) for the standard atmospheric pressure of 1013 mbar. For better accuracy, a correction should be applied to the absolute humidity value obtained from Figure: A-1 for any deviation of ambient atmospheric pressure from the standard value of 1013 mbar. This correction is obtained from figure: A-2 as follows:-

Locate the point corresponding to the deviation of ambient atmospheric pressure from 1013 mbar on the left hand side of Figure: A-2B and join it with the right hand side top corner by a straight line. Then locate the point on the curve in Figure: A-2A corresponding to the observed value of the difference of dry and wet bulb temperatures.

Drawn a vertical line through this point to intersect the straight line drawn in Figure: A-2B. Read the correction to be applied to humidity from the right hand side of Figure: A-2B corresponding to the point of intersection. The correction is positive for a positive deviation and negative for negative deviation from the standard atmospheric pressure.
For the corrected value of absolute humidity thus obtained, the correction factor (h) of Table B-1 shall be determined from Figure:A-3.

Table B-1

CORRECTION OF VOLTAGES FOR ATMOSPHERIC CONDITIONS

TYPE OF TEST	ADJUSTMENT REQUIRED.
Dry Lightning Impulse Withstand Voltage	Voltage applied shall be the appropriate value specified in Table- 4 multiplied by k and divided by h.
Wet Power Frequency Withstand Voltage	Voltage applied shall be the appropriate value specified in Table- 4 multiplied by k.
Wet Power Frequency maximum Withstand Voltage	Measured Voltage shall be divided by k.

--:o:--

APPENDIX "C"

HIGH VOLTAGE TESTS

GENERAL

The Insulator shall be clean and dry and in thermal equilibrium with its surroundings.

C-1.1 INSULATORS TESTED IN VERTICAL POSITION

C-1.1.1 The Insulators shall be hung vertically from an earthed support by means of a wire rope or metal rod. The distance between the top of the Insulator Metal Fittings and the point of support shall be not less than 1 metre. At the lower end of the Insulator shall be attached, if required, a metallic rod of weight adequate to ensure that the Insulator remains in vertical position during test.

C-1.1.2 No object shall be nearer to the axis of the Insulator less than 1 metre or 1.5 times the length of the Insulator whichever is the greater.

C-1.1.3 The test Voltage shall be applied between the metal rod at the bottom of the Insulator and the earthed point of suspension.

C-1.2 INSULATORS TESTED IN HORIZONTAL POSITION

C-1.2.1 The Insulator shall be anchored by means of a cable or metal rod connected to earth. The distance between the top of the Insulator Metal Fitting and the point of anchorage shall be not less than 1 metre.

C-1.2.2 The other end of the Insulator shall be provided with a metal rod of about 1 metre long and the whole arrangement maintained in an approximately horizontal position by any convenient means.

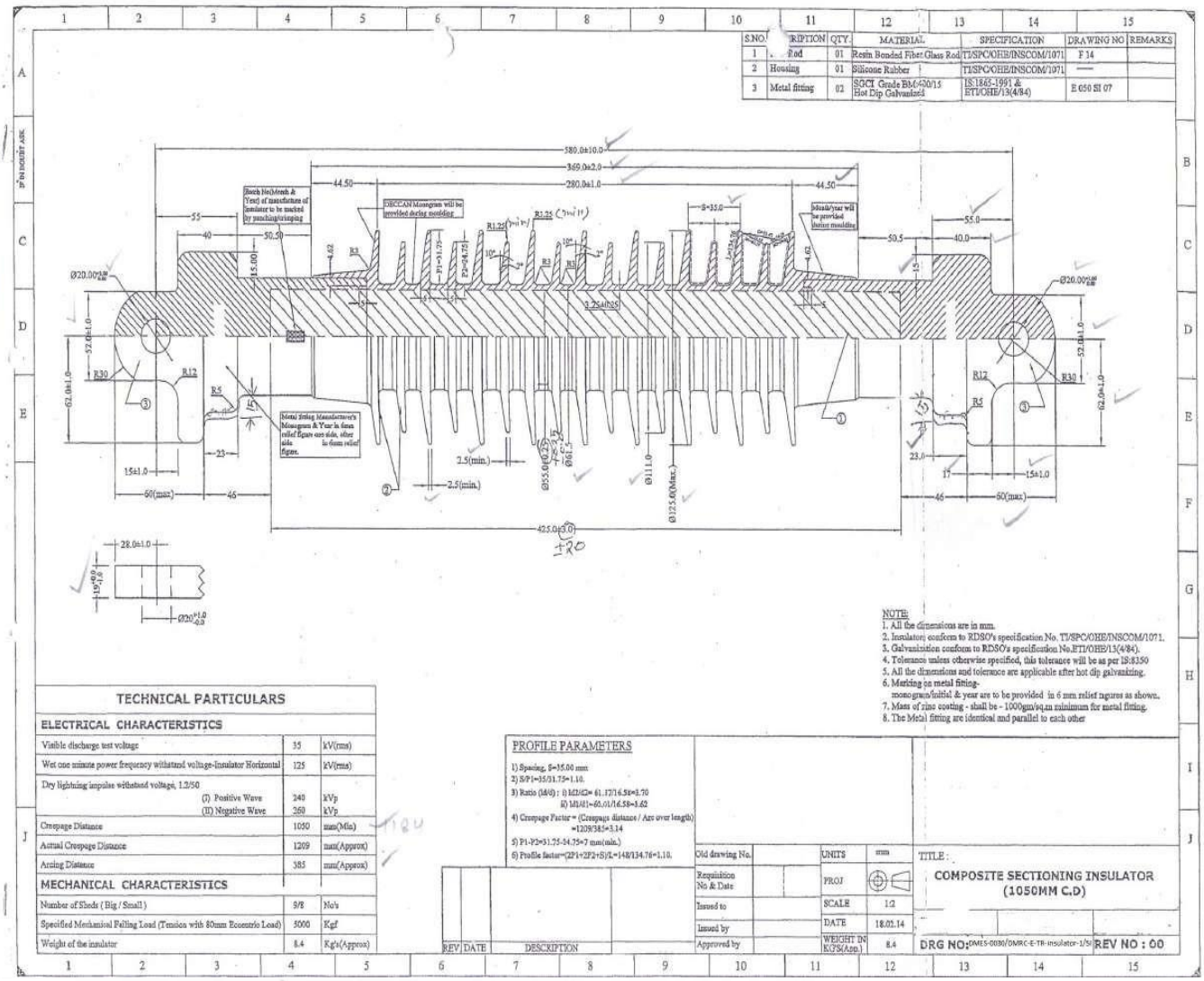
C-1.2.3 No object shall be nearer to the axis of the insulator less than 1 metre or 1.5 times the length of the Insulator whichever is the greater.
C- 1.2.4 The test Voltage shall be applied between the end of the metal rod and the earthed point of anchorage.

C-2 HIGH VOLTAGE TEST

C-2.1 The High Voltage test shall be conducted in accordance with IS: 2071 (Part I to III).

C-3 PRECAUTIONS AGAINST EXCESSIVE HUMIDITY

C-3.1 Special precautions shall be taken to avoid condensation on the surface of the Insulator when the relative humidity is high. For example, the Insulator shall be maintained at the ambient temperature at the test location for a sufficient period to attain thermal equilibrium before commencing the test. Except by agreement between the manufacturer and the purchaser, the test shall not be carried out if the relative humidity exceeds 85%.



S.NO.	DESCRIPTION	QTY.	MATERIAL	SPECIFICATION	DRAWING NO	REMARKS
1	Rod	01	Resin Bonded Fiber Glass Rod	TI/SPC/OHE/INSCOM/1071	F 14	
2	Housing	01	Silicone Rubber	TI/SPC/OHE/INSCOM/1071	—	
3	Metal fitting	02	SGCI Grade Bb0/420/15 Hot Dip Galvanized	IS:1865-1991 & ETI/OHE/13(4/84)	E 050 SI 07	

TECHNICAL PARTICULARS

ELECTRICAL CHARACTERISTICS		
Visible discharge test voltage	35	kV(rms)
Wet one minute power frequency withstand voltage-Insulator Horizontal	125	kV(rms)
Dry lightning impulse withstand voltage, 1.2/50 (I) Positive Wave / (II) Negative Wave	240 / 260	kVp / kVp
Creepage Distance	1050	mm(Min)
Actual Creepage Distance	1209	mm(Approx)
Arcing Distance	385	mm(Approx)
MECHANICAL CHARACTERISTICS		
Number of Sheds (Big / Small)	9/8	No's
Specified Mechanical Failing Load (Tension with 80mm Eccentric Load)	5000	Kgf
Weight of the insulator	8.4	Kg's(Approx)

PROFILE PARAMETERS

1) Spacing, S=35.00 mm
2) S/P1=35/31.75=1.10.
3) Ratio (Id/d) : i) Id2/d2= 61.12/16.58=3.70
ii) Id1/d1=60.01/16.58=3.62
4) Creepage Factor = (Creepage distance / Arc over length)
=1209/385=3.14
5) P1-P2=31.75-34.75=7 mm(min.)
6) Profile factor=(2P1+2P2+S)/L=148/134.76=1.10.

NOTE

1. All the dimensions are in mm.
2. Insulator conform to RDSO's specification No. TI/SPC/OHE/INSCOM/1071.
3. Galvanisation conform to RDSO's specification No.ETI/OHE/13(4/84).
4. Tolerance unless otherwise specified, this tolerance will be as per IS:8350
5. All the dimensions and tolerance are applicable after hot dip galvanizing.
6. Marking on metal fitting-
monogram/initial & year are to be provided in 6 mm relief figures as shown.
7. Mass of zinc coating - shall be - 1000gm/sq.m minimum for metal fitting.
8. The Metal fitting are identical and parallel to each other

REV	DATE	DESCRIPTION

Old drawing No.		UNITS	mm
Requisition No & Date		PROJ	
Issued to		SCALE	1:2
Issued by		DATE	18.03.14
Approved by		WEIGHT IN KG(Appx.)	8.4

TITLE : **COMPOSITE SECTIONING INSULATOR (1050MM C.D)**

DRG NO: DMES-0080/DMRC-E-TR-insulator-1/SI REV NO : 00

B. EARTHING PITS

1.1 **SCOPE OF WORK**:

Restoration work includes restoration by suitable mixture/chemical analysis/bentonite/ macronite etc. on existing pit. In NMRC**, 03 individual earth pit is combined parallelly to achieve desired value of less than 1ohm. Max. permissible limit for resistance of individual earth pit is less than 10 ohm.**

Excavation Work:

- Installation, Commissioning of Earthing pit (Pipe type Earthing). For Pipe type earthing GI pipe of 49 mm outer diameter or greater, minimum 03 meter inserted in ground.

These types of earth pit are generally filled with alternate layer of charcoal & salt or earth reactivation compound. Successful tenderer shall follow following ,method/ procedure for Construction of Earthing Pit.

Procedure for Excavation of Earthing Pit:

- Excavation on earth for a normal earth Pit size minimum 40*40 cm (internal measurement excluding the concrete area).
- Use minimum 40*6mm GI Plate or bigger Size for more Contact of Earth and reduce Earth Resistance.
- Make a mixture of Wood Coal Powder Salt & Sand all in equal part.
- Wood Coal Powder use as good conductor of electricity, anti corrosive, rust proves for GI Plate for long life.
- The purpose of coal and salt is to keep wet the soil permanently.
- The salt percolates and coal absorbs water keeping the soil wet.
- Care should always be taken by watering the earth pits in summer so that the pit soil will be wet.
- Coal is made of carbon which is good conductor minimizing the earth resistant.
- Salt use as electrolyte to form conductivity between GI Plate Coal and Earth with humidity.
- Sand has used to form porosity to cycle water & humidity around the mixture.
- Put GI rod (EARTH rod) of minimum outer diameter in the mid of mixture.
- Use Double GI Strip size 40 mm X 6 mm or bigger area to connect GI Plate to System Earthling.
- Cover Top of GI rod with a T joint to avoid jamming of pipe with dust & mud and also use water time to time through this pipe to bottom of earth plate.
- **In NMRC, 03 individual earth pit is combined parallelly to achieve desired value less than 1ohm. Max. permissible limit for resistance of individual earth pit is less than 10 ohm**
- Check Voltage between Earth Pit conductors to Neutral of Mains Supply 220V AC 50 Hz it should be less than 2.0 Volts.
- Above job includes :-Earth excavation, providing earthing and refilling of earthing pits.

C. Strengthening of catenary wire at FP IOL locations

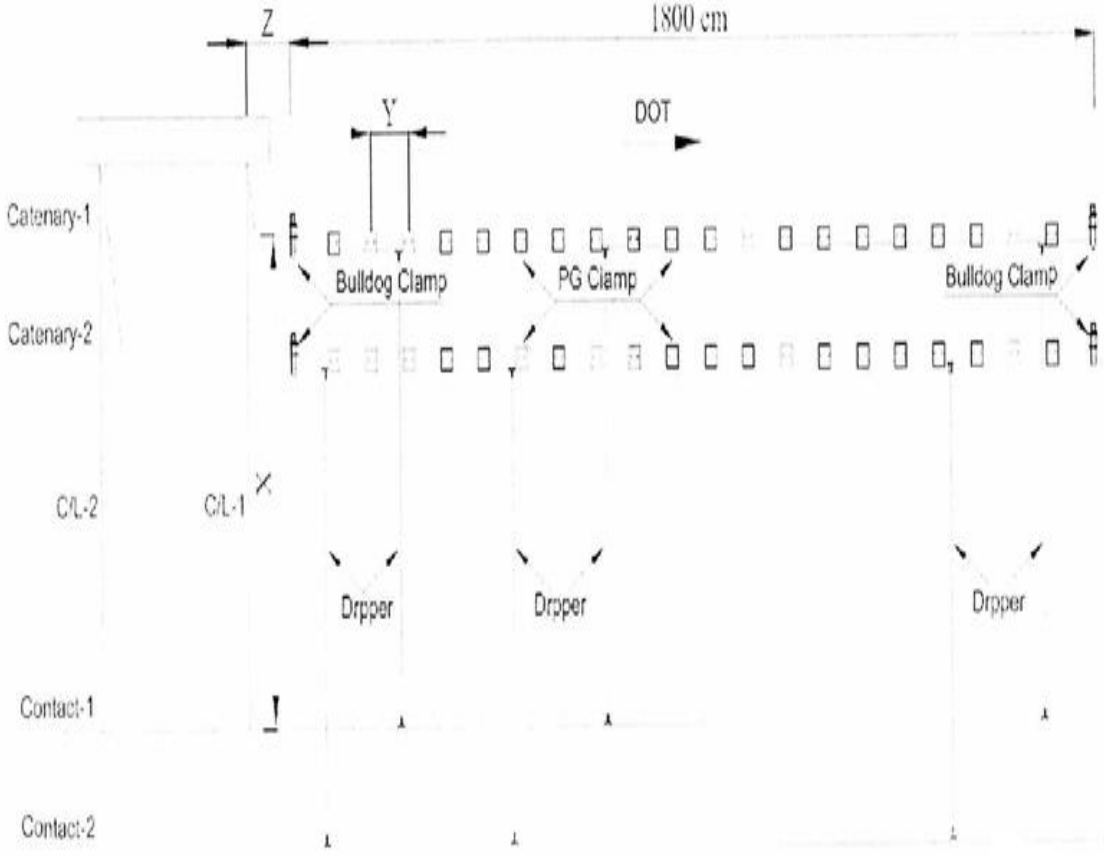
Material required

S.No.	Material Name	Detailed specification of material	Quantity
1	Bulldog clamp	Stainless Steel (Grade 304) 'U' Clamp size 12 mm (inner dia 13mm) along with 10 mm nut & M10 SS Spring Washer	04
2	Bolted type PG clamp	Suitable for 35/300 sqmm (M/s Pfisterer make PG clamp)	As per requirement (Here it should be PG 1031/1041
3	Dropper wire with dropper eye	12 sq mm Copper Bronze 5 sqmm Dia	As per requirement
4	Contact wire	107 sq mm round bottom 12.24 mm Dia hard drawn copper	02 piece (Each of length 1800cm)
5	Dropper Clip	Dropper clip suitable for Contact Wire	As per requirement

Precautions to be taken during strengthening of catenary wire of IOL at FP:

1. Contact wire piece of 1800 cm length placed below both the catenary wire in the direction of train (DOT) at FP/IOL locations. Contact wire piece should be straightened before installation.
2. At both end, Contact wire piece should be tighten with catenary wire using Bulldog clamps and at other places it is supported through Pfisterer make PG clamp (35/300sqmm)
3. All bulldog clamps should be tightened by torque wrench with the torque value 40NM.
4. Main line catenary will always be keep inside of bulldog clamp and contact wire for strengthening work shall always be kept on grip side to avoid any damage in main line catenary. Distance between adjacent PG clamps should be 10cm less than the encumbrance
5. Place the contact wire piece 20cm away from nearest suspension clamp
6. Place the Droppers between existing contact wire and new contact wire piece.

Drawing Of Strengthening of Catenary Wire at FP/IOL Locations



Note

1. Contact wire piece of 1800 cm length placed below both the catenary wire in the direction of train (DOT) at FP/IOL locations.
2. At both end Contact wire piece should be tighten with catenary wire using Bulldog clamps and at other places it is supported through Pfisterer PG clamp.
3. Distance between adjacent PG clamps should be 10cm less than the encumbrance.
4. Place the contact wire piece 20cm away from nearest suspension clamp.
5. Place the Droppers between existing contact wire and new contact wire piece.

X= Encumbrance
Y= Distance Between PG Clamps = (X-10) cm
Z= Distance between C/L-1 and Bulldog Clamp = 20 cm

STRENGTHENING OF CATENARY WIRE AT FP/IOL LOCATIONS

data sheet

LAMIFIL

Contact wire BC 107 mm² - CuAg0,1 - High strength

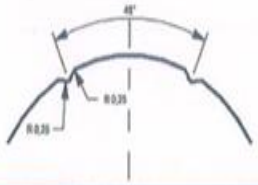
Confidential

Version	1
Date	15/09/2015

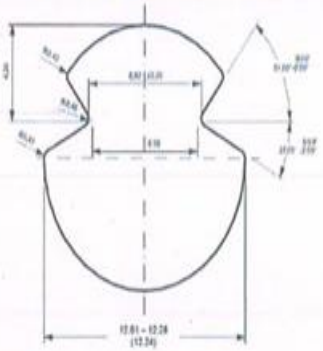
Name	Contact wire BC 107 mm² - CuAg0,1 - High strength

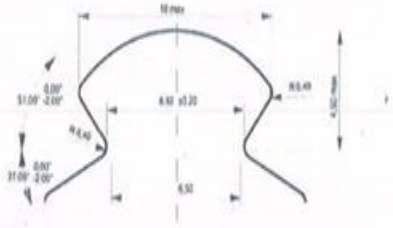
General information

Specification	EN 50149
Configuration	BC 107
Material	Cu-Ag0,1
Identification grooves	2 identification grooves



Mechanical specifications





Nominal section	107 (+/- 3%)	mm²	
Linear weight	923 - 980	kg / km	
Minimum tensile strength	360	MPa	
Minimum breaking load	37,4	kN	Calculated on minimum cross sectional area
Percentage elongation (after fracture A200)	3 - 8	%	

Electrical specifications

Resistivity	< 17,77	nΩm	at 20°C
Maximum resistance / km	0,171	Ω / km	at 20°C, Calculated on minimum cross sectional area
Coefficient of temperature	$3,8 \times 10^{-3}$	/K	

Chemical specifications

Cu	Rest	%
Bi	Max. 0,0005	%
O	Max. 0,040	%
Ag	Min.0,08-Max.0,12	%
Other elements total (excluding Ag,O)	Max. 0,03	%

Painting work:

Painting of counter weight:

1. Painting of each Counter Weight of ATD set (07 No. of weights per ATD and 06 sides per weight) with 2 coats of aluminium paint (ISI mark) and single primer coating after removing the Old paint by scrubbing to the satisfaction of EPIC.
2. Painting of the counter weights will be done at all sides of the weight after removing the tension on counter weight. The contractor shall made all the arrangements required for lifting the weight and taking the load of contact and catenary wire.
3. The paint and other consumables shall be arranged by Contractor. Each ATD weight set contains 06 weight of 60 kg with dimension of 490*330*53 mm and one weight of 40 Kg with the dimension of 490*330*33 mm.

Temperature marking on the ATD mast:

1. Marking of "Y" Value for 0.65°C , 5°C, 10°C, 15°C, 20°C, 25°C, 30°C, 35°C, 40°C , 45°C,50°C,55°C,60°C,65°C on mast along with implantation, height and Half Tension Length of span.
2. The temperature marking shall be provided with black letters on yellow back ground after removing the Old paint by scrubbing to the satisfaction of EPIC. Area of painting will be 8000 sq. cm per mast and total such mast will be 81.

Marking of implantation & height of mast :

1. The bidder will provide height and implantation of the mast at the designated area on the mast with black letters. The markings with black color will be provided on yellow back ground after removing the residues of painting done earlier with emery paper or any suitable means.
2. Area of painting will be 1000 Sq. cm (50*20 cm) per mast and total such mast will be 1650.

CAD Welding :

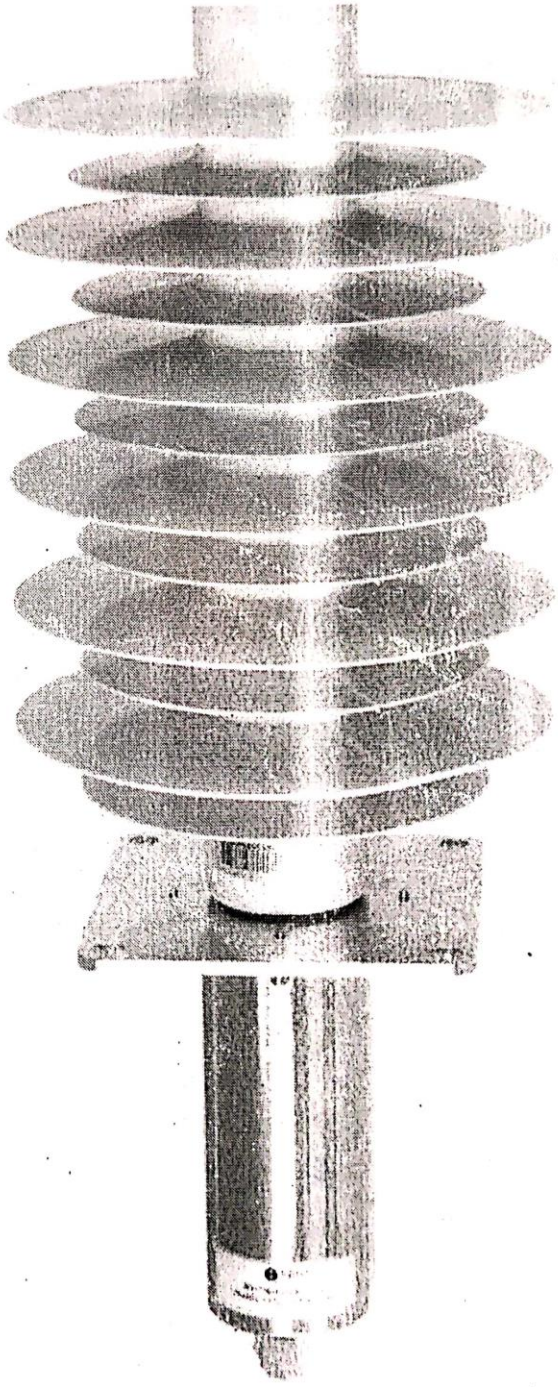
1. Work will be executed as per BOQ and satisfaction of engineer in charge.
2. Copper cable of 70 sq. mm will be cad welded (exothermic) on the rail by suitable arrangement of length depicted as per site requirement.

SUPPLY OF MATERIALS:

Sr.No.	Item Name	Item Description	Unit	Quantity
1	Counter weight	Each set contains 06 weights of 60 kg each with the dimension of 490*330*53 mm and 1 no. weight of 40 kg with the dimension of 490*330*33 mm with groove for suspension of weight. The weight should meet the criteria of RDSO.	Set	2
2	Digital Earth Resistance meter	Product description: Auto ranging,2 pole, 3.5 digit,Accuracy ±2%,, resolution= 0.1,measurable range upto 1999,memory upto 800 record, warranty minimum 01 year, OR **simlar to kyoritsu make model no. KEW4106.**	No.	1
3	Non-Contact type high voltage tester	For volatege measurement range 230-33kV	No.	1
4	Digital Multimeter	Product Description: 3.5 digit display,safety rating category iii under IEC 61010,AC/DC coltage accuracy 0.1%, AC/DC voltage resolution 0.1 milivolt, AC/DC current range 10 ampere, Resistance accuracy 1%,Resistance resolution 0.1 ohm,waaranty 03 years OR **similar to Fluke make, model no. Fluke 179**.	No.	2
5	Clamp meter	Product Description: Auto ranging,Jaw size 51 milimeter, Resistance 1000kΩ±.5 %, Frequency range 100khz±.5%, AC current 1000Amp.±1.5 %, AC/dc voltage range 1000±1% OR **similar to Motwane make, Model No. DCM39A**.	No.	2
6	Digital Vernier caliper	Least count 0.1mm, range 0-450 mm, accuracy 0.01mm,warranty 01 year, metal part Hardened steel OR similar to MITOYO Make, Model No. Mitoyo500-500-10. Product should be supplied with protective case.	No.	2
7	Digital Spirit level	Horizontal vial with length 600 mm, measurement accuracy 0.2 degree, ingress protection IP 54, OR **similar to insize make, model no. 4910-600**	No.	2
8	BM	25kV, Type: PMTB, Make: Megawin, Insulation level : 95/250kV, Rated voltage and current : 27.5kV/1250A)	No.	1
9	VCS	25kV VCS, Type : CCS25+ CBI21, UN: 27K5V AC	No.	4
10	Aluminium cable	Supply of 3.3kV , 400 sq.mm	Meter	100

PROAT	Operation & Maintenance Manual CCS25 + CBI21_MF	June, 23 2015 Rev. 1.02

Capacitive Sensor for Catenaries Lines AT with output 4-20 mA.



1.0 Description of device

The CCS25+CBI21/MF assembly device consists of two elements: a silicon capacitive sensor CCS25 and a current loop converter CBI21.

The sensor contains the primary high voltage capacitors. These, together with the secondary condenser located in the converter, they form a capacitive divider for obtaining a low voltage level proportional to the high line voltage.

The sensor CCS25 detects the proportional voltage of the high AC voltage based on taking a sample of this voltage to levels not dangerous using a capacitive divider.

The converter CBI21 adapts the voltage sample for the current loop transmission system (4-20 mA).

The assembly is adapted for outdoor use and is mainly used for the measurement and detection of AC high voltage overhead line. (catenaries lines)

2.0 Electrical features

- Operation: continuous operation
- Rated frequency: 50 ó 60Hz
- Nominal network voltage: 27,5 kVAC/50Hz
- Max. Service voltage: 50 kVAC/50Hz
- Test voltage: 95kVAC/50Hz/ 1 min.
- Test voltage of shock wave: 170kV peak, 1,2us/50us.
- Sensor capacity: 40 pF±20%
- Temperature Range Supported: -35 to +75 ºC
- Operating Temperature Range: -35 to +75 ºC
- Relative humidity: 20 to 100%
- Response time, detection of presence or absence of tension: Less than 0,2 sec.
- Type of measurement: RMS precision of 10%
- Creepage path: 1591,8 mm.

3.0 Sensor Architecture.

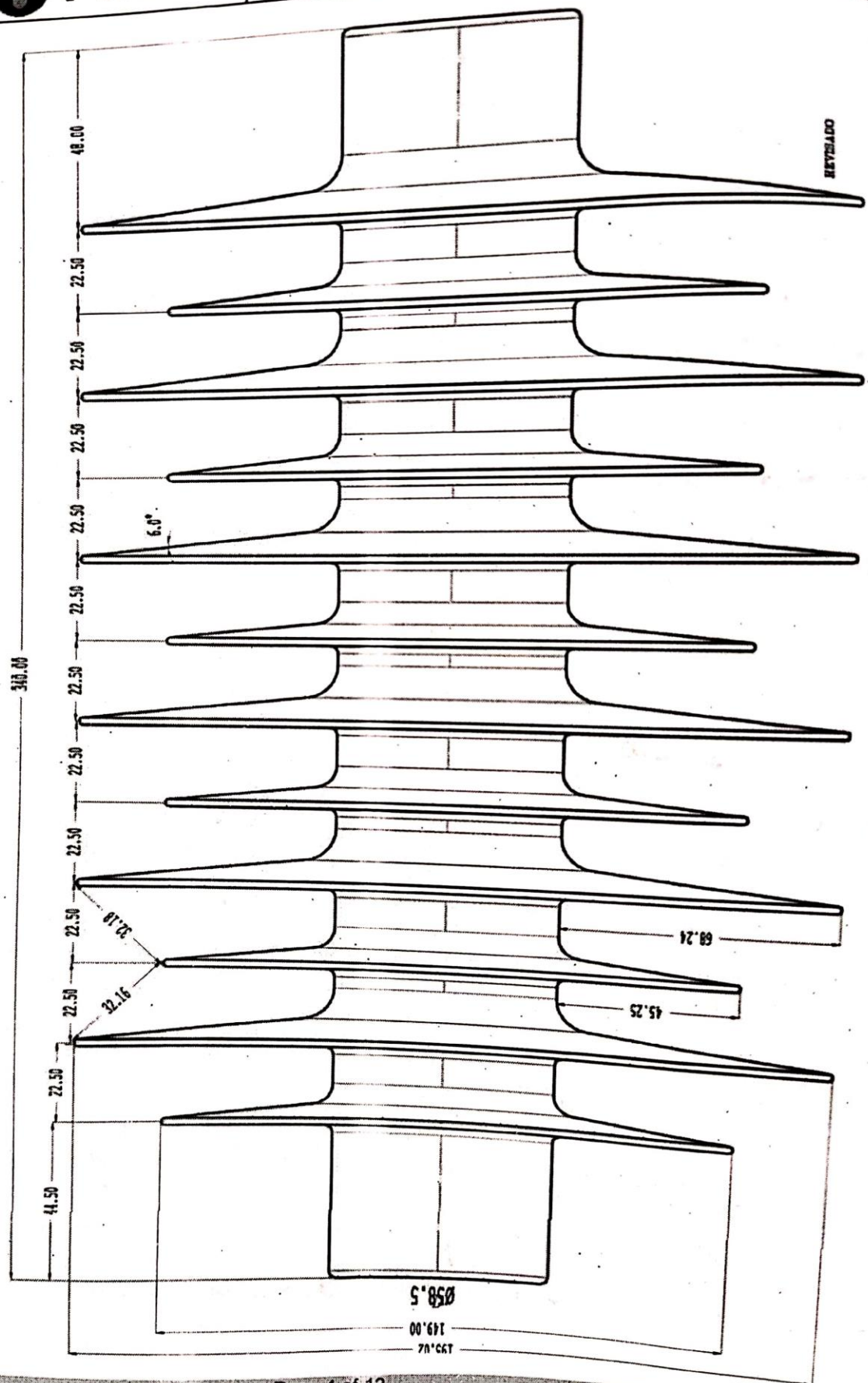
As mentioned, the sensor consists of two distinct elements, the capacitive sensor and current loop converter.

3.1 Capacitive sensor

3.1.1 Construction features

Capacitive sensors are completely passive elements providing a sample of the line voltage. Inside have five capacitors (C1, C2, C3, C4 and C5).

The sensor has an outer silicone coating which gives less weight and improved shock resistance


48.00
22.50
22.50
22.50
22.50
6.0°
22.50
22.50
22.50
22.50
22.50
22.50
22.50
44.50
340.00
32.18
32.16
68.24
45.25
Ø58.5
149.00
195.02

The core cylinder is made of fiberglass; it gives adequate levels of electrical insulation, mechanic resistance, humidity absorption, etc...

The main dimensions are:

Height.....:	340 mm
Diameter long sheds :	195 mm
Diameter short sheds:	149 mm
Central diameter .....:	58 mm
Number of long sheds:	6
Number of short shed:	6

3.1.2 Electrical Characteristics

The characteristics of the capacitors of the sensor are:

- Capacitors C1=C2=C3=C4=C5: 200 pF±20%
- Rated voltage of each capacitor. 25kVAC
- Capacitor Cs (in CBI21): 22 nF
- Secondary voltage: 49.9 VAC±20%

The impedance of the sensor is,

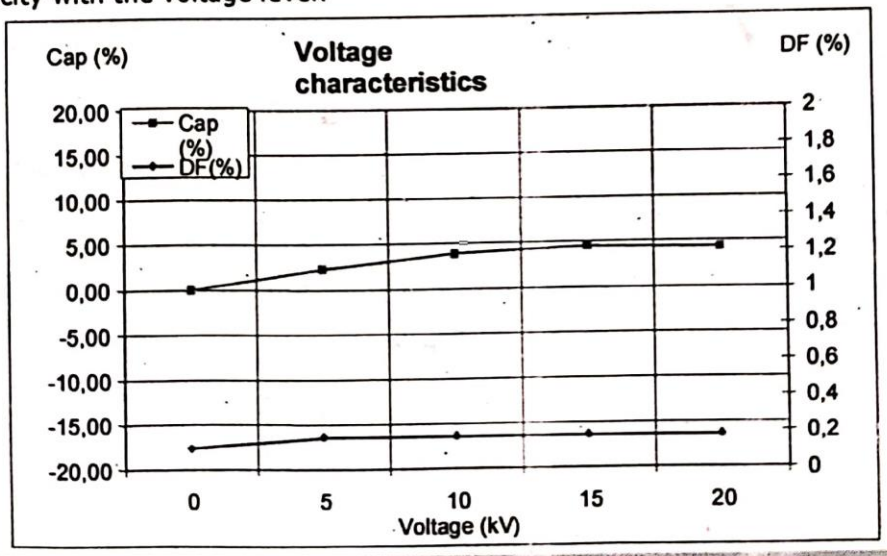
$Z_i = 80{,}0M\Omega$ This means that for a current rating of 27,500 VAC/50Hz., the current flowing through the capacitor is:

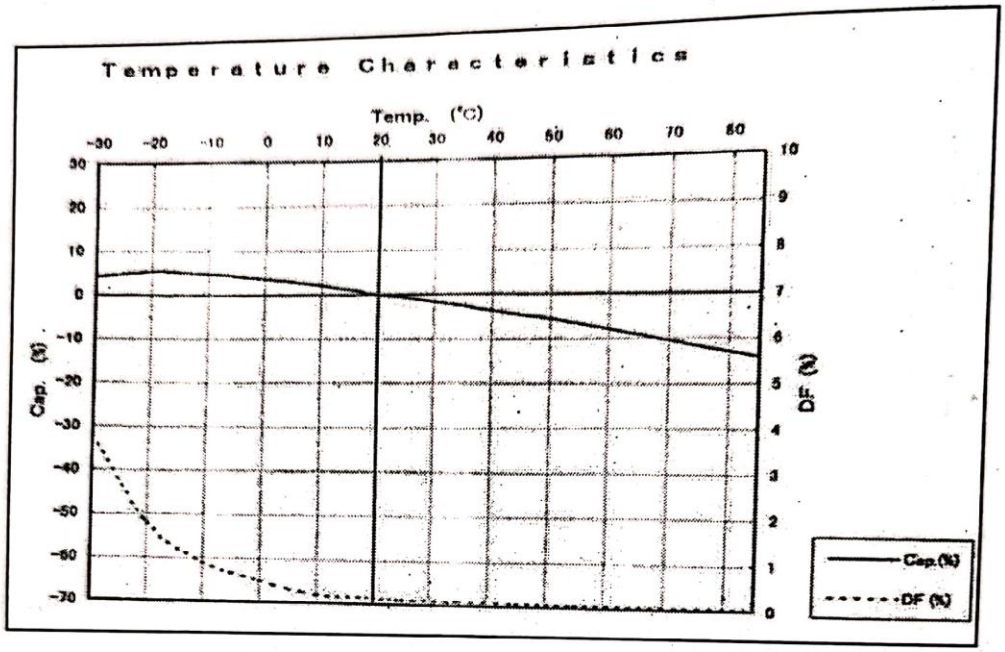
$$i = \frac{V}{Z_i} = \frac{27.500V}{80{,}0M\Omega} = 344\mu A$$

the maximum current that can flow is

$$i_{max} = \frac{V_{max}}{Z_i} = \frac{50.000}{80{,}0M\Omega} = 625\mu A$$

Corresponding to a current is not dangerous to people. Shown below the graphics of the variation of the capacity of capacitors with the temperature and variation of capacity with the voltage level:





C1, C2, C3, C4 y C5 have the same type of dielectric and then is not necessary to do temperature compensation.

3.2 Current converter

This converter transforms the secondary voltage of the sensor to a current loop 4-20 mA.

3.2.1 Constructive features of Current Loop Converter CBI-21

It is located next to the sensor, in a **sealed box adapted to the sensor support** (Fig. 2). CBI-21 converter incorporates a secondary capacitor and transforms the voltage from the sensor to the corresponding current of current loop converter 4-20 mA

This is an electronic circuit that connects to the sensor to sample the voltage reading and has a power strip with four terminals (two inputs of auxiliary voltage and two that send level output 4-20 mA).

All the printed circuit board is coated with silicone which makes it completely waterproof

Outdoor box dimensions:

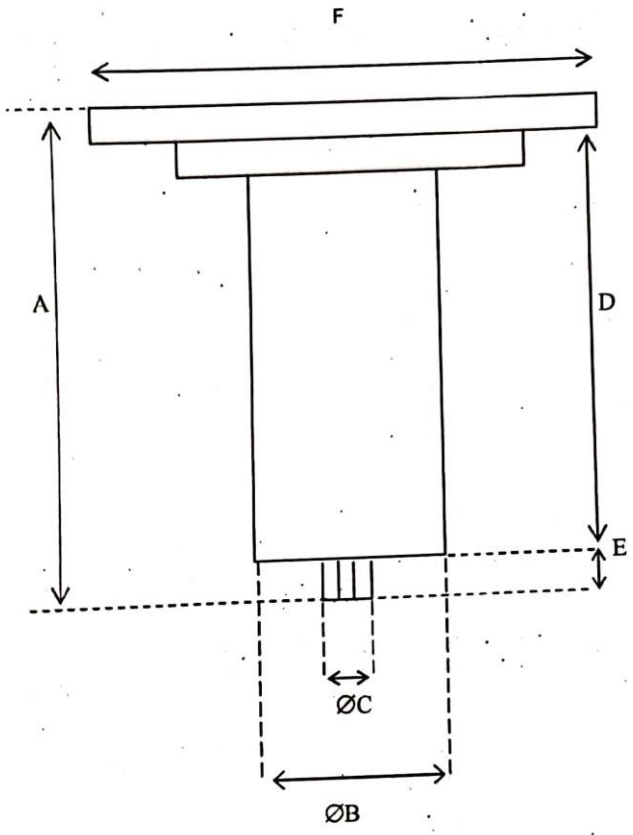


Fig. 2 External dimensions

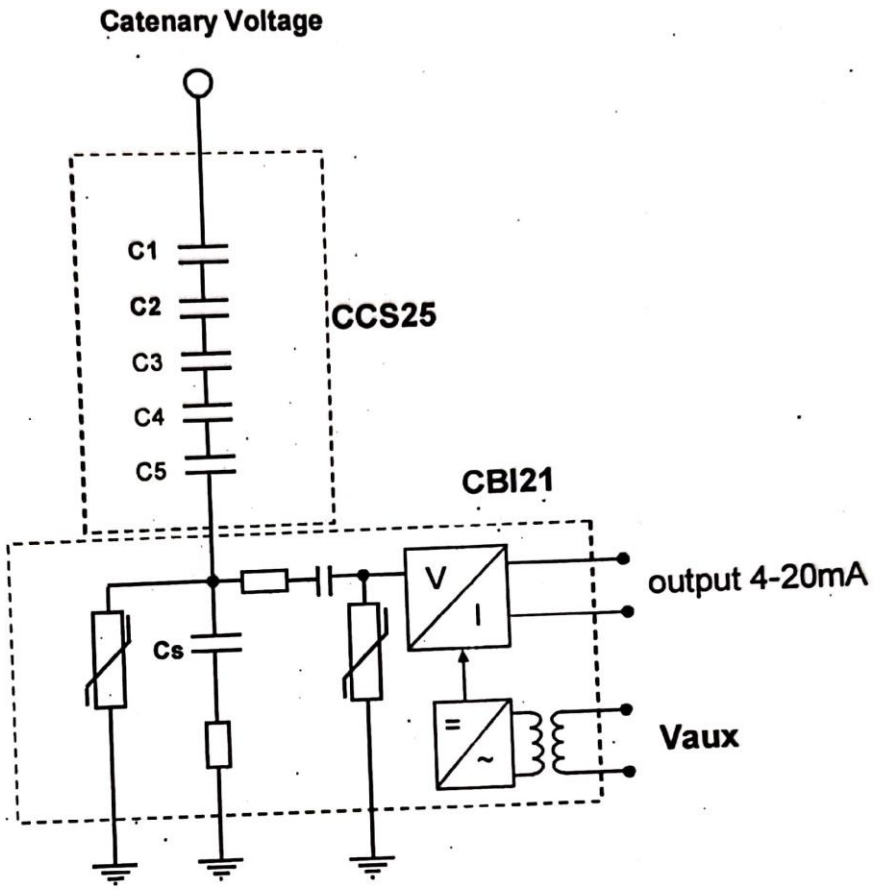
A (mm.)	Ø B (mm.)	Ø C (mm.)	D (mm.)	E (mm.)	F (mm.)	Weight (Kg)
182	63	21	148	26	140	1 Kg aprox.

3.2.2 Electrical features of Current Loop Converter CBI-21

- Supply voltage: 85-265 VAC /86-370 VDC
- Output: 4-20 mA (R_L = 750 Ω max.)
- Consumption: 2 W
- Input/ Output: 0...50 VDC/4..20 mA
- Linear: 0,5%
- Precision: 2%
- Response time: 0,2 sec.
- Output limit: 24 mA

5.0. Maintenance

The equivalent circuit of CCS25+CBI21/MF is:



While catenaries Voltage = 0 V -> Output 4-20mA = 4 mA
27,5 kV -> 20 mA
30,0 kV -> 23 mA

The output is limited to 23 mA.
The output is isolated of auxiliar voltage and secondary voltage.

In standard model , Vaux =230 VAC/ 50-60Hz.
In model /C, Vaux= 85-265VAC / 86-370 VDC

Is Vaux is disconnected, Output 4-20mA=0 mA

Load impedance, recommended: 250Ω or 500Ω.

5.1 . Warranty

Two years for manufacturing defects.

Megawin Switchgear-P-Limited

[redacted] **25kV VACUUM CIRCUIT BREAKER** [redacted]

Project: Delhi Metro Rail Corporation Ltd. [NE -01] R1 [26.09.2016]

DESCRIPTION	UNIT	MANUFACTURER COMPLIANCE
Manufacturer	-	Megawin Switchgear - P - Limited
Place of Manufacturer	-	Salem, Tamilnadu, India
Port of Embarkation	-	-
Standard		IEC 60694, IEC 62271-1 & 62271-100
1. BREAKER DATA		
Rated voltage	kV	25
Maximum service voltage (permanent)	kV	27.5
Service frequency	HZ	50
Number of phases		1
Erection		Outdoor
Rated current	A	1250
3 sec. Short circuit time current	kA	20
Insulation level	kV	52
With stand voltage between open contacts	kV	48
Rated Impulse withstand (1.2/50 micro	kV peak	250
second)		
Rated Power frequency withstand voltage-one	kV r.m.s.	95
minute		
Symmetrical breaking capacity	kA	20
Minimum making capacity	kApeak	50
Sequence on short circuit		CO-15sec-CO
Mechanical life time	Cycles	10000
Electrical life time		10000x1250A 100x20kA
Maximum closing time	ms	60 - 75
Maximum opening time	ms	40 - 45
Insulation material		Ceramic
Weight	kgf	300
Temperature range	°C	-10° to +50°
2. MECHANISM DATA		
Motor power	W	Not Applicable for Magnetic Actuator Mechanism
Service voltage	V dc	110
Starting current		Not Applicable for Magnetic Actuator Mechanism
Closing and opening coil voltage	V dc	110
Degree of protection for auxiliary cubicle		IP55
Notes:		
Temepartaure Range: Megawin Breaker/Interrupter are suitable for -10°C to +50°C to suit Indian climatic conditions.		
Electrical Life Time: Making capacity is 40KA, therfore breaking cu[redacted]ment is 16KA only. However our VCB/VI is tested for 20KA		

[redacted]

7. Section 7: Draft Contract Agreement

THIS AGREEMENT made on the …….day of …….. 2026 at Noida, District Gautam Budh Nagar, Uttar Pradesh Between **Noida Metro Rail Corporation Limited** (Hereafter referred to as "NMRC"), a company incorporated under Companies Act 2013, vide corporate identification Number: U60231UP2014SGC066849 and having its registered office at **Block-III, 3rd Floor, Ganga Shopping Complex, Sector-29, Noida -201301, District Gautam Budh Nagar, Uttar Pradesh, India** represented by **Shri Dhirendra Pratap Singh, DGM Electrical** of the company, by virtue of his designation and authorization by, Noida Metro Rail Corporation (hereinafter called as the "Employer"), which expression shall unless excluded by or repugnant to the context or meaning thereof be deemed to include its successors and permitted assigns) of the one part,

AND

…….. having its registered office at **……**, represented by **…….** (herein after called the **"Contractor",** which expression shall unless excluded by or repugnant to the context or meaning thereof be deemed to include its successors and permitted assigns) of the other part. WHEREAS the Employer desires that the Works known as the **"……."** should be executed by the Contractor, and has accepted a contract by the Contractor for the execution and completion of these Works.

The Employer and the Contractor agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Contract documents referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement -

Reference:

(i) Tender No. …… Dated ……..
(ii) Bid Documents duly accepted and submitted by …… dated ……..
(iii) The Bidding Documents which include all the Sections specified below:
   a. Section 1: General Information
   b. Section 2: Terms of Reference
   c. 3 Section 3: Instructions to Bidders
   d. Section 4: Qualification, Evaluation and Selection Process
   e. Section 5: Special conditions of Contract
   f. Section 6: Basic information & Technical Specifications
   g. Section 7: Draft Contract Agreement
   h. Section 8: Appendix and Forms
   i. General Conditions of Contract (GCC)
   j. Safety, Health and Environment Management (SHE)
   k. Amendment/ Modification, if any

(iv) Notice of Award (……) issued by NMRC
(v) Letter of Acceptance of NOA (……) given by …….. to NMRC
(vi) Any other admitted correspondence documents between NMRC and the Bidder.

3. **Duration of Contract**

The Corporation intends to appoint a Contractor to NMRC for a period of 1 (one) year.

4. **Price Schedule**
   NMRC shall consider the following Total Contract Price, as quoted by the Contractor as part of financial bid**.**

5. The courts at District Gautam Budh Nagar, Uttar Pradesh shall have the exclusive jurisdiction to try all disputes arising out of this agreement between the parties.

6. In consideration of the payments to be made by the Employer to the Contractor as specified in this Agreement, the Contractor hereby covenants with the Employer to execute the Works and to remedy defects therein in conformity in all respects with the provisions of the Contract and Notice of Award issued. “Any conditions, deviation, assumption, exclusion, suggestion of alternative clauses, request of amendments in conditions & specifications of work submitted by bidders along with his Technical Bid or Financial bid, which is different from the Tender Document, Corrigendum, Addendum uploaded by NMRC on the E-Tender Portal (http://etender.up.nic.in) or www.nmrcnoida.com and any other correspondence in this regard, shall not be treated as a part of the contract Agreement & shall not be binding upon NMRC in anyway whatsoever at any stage of work during execution or thereafter."

7. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract and NOA.

In witness where of the parties hereto have caused this Agreement to be executed in accordance with the laws of India on the day, month and year specified above.

For and on behalf of the Contractor Signature of the authorized official	For and on behalf of the Employer Signature of the authorized official
Name of the official	**Name of the official**
Stamp/Seal of the contractor	Stamp/Seal of the Employer
In the presence of:	In the presence of:
Sign of Witness 1_____	Sign of Witness 1_____
Name_____	Name_____
Address_____	Address_____
_____	_____
Sign of Witness 2_____	Sign of Witness 2_____

Name_____ Name_____

Address_____ Address_____

_____ _____

8.Section 8: Appendix and Forms of Tender

8.1 Appendix 1: Metro Alignment

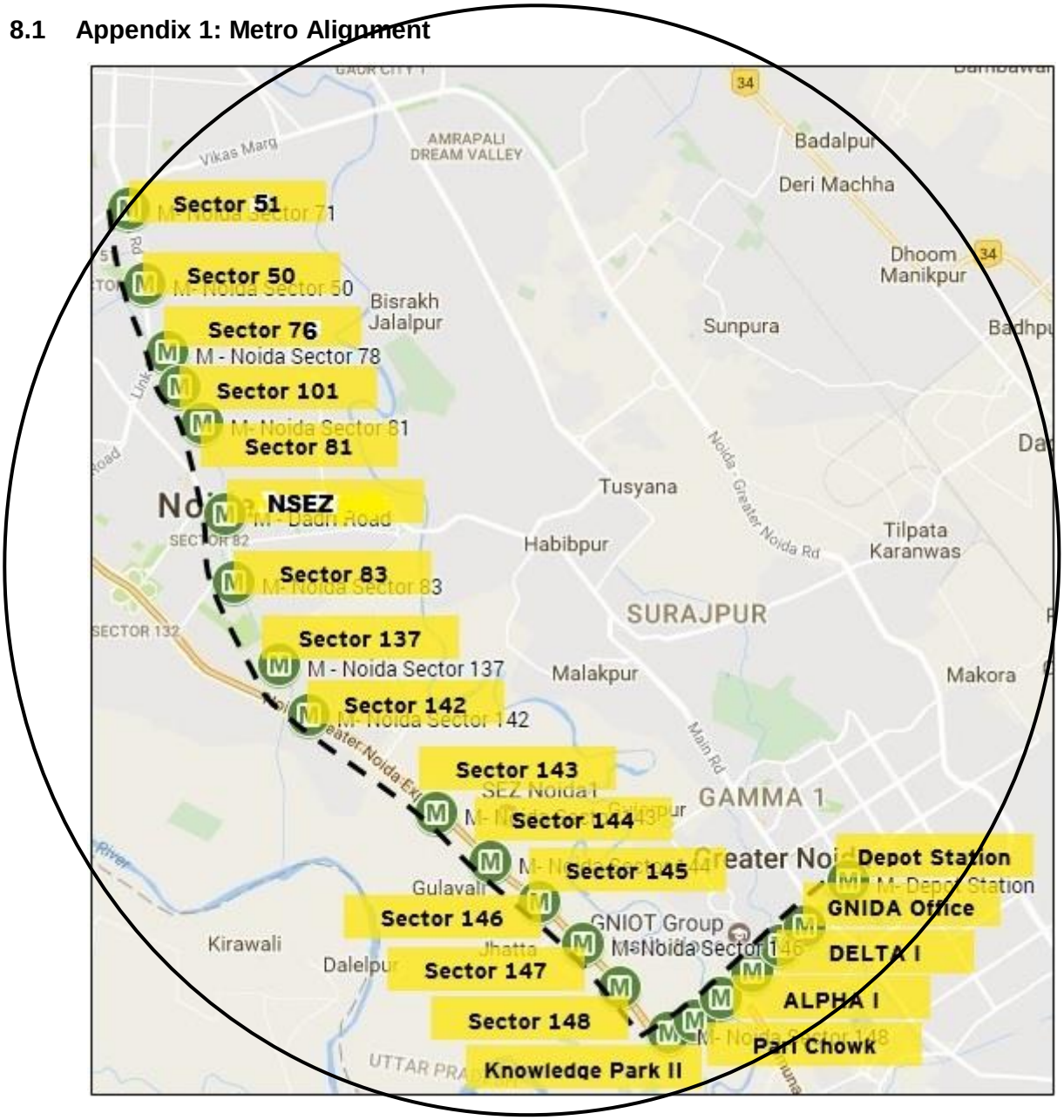


Fig: The commissioned Metro Line

Please Note: The map shown above is indicative (not to scale)

S.NO.	Name of the site
1.	Sector 51 Station
2.	Sector 50 Station
3.	Sector 76 Station
4.	Sector 101 Station
5.	Sector 81 Station
6.	NSEZ Station
7.	Sector 83 Station
8.	Sector 137 Station
9.	Sector 142 Station
10.	Sector 143 Station
11.	Sector 144 Station
12.	Sector 145 Station
13.	Sector 146 Station
14.	Sector 147 Station
15.	Sector 148 Station
16.	Knowledge Park II Station
17.	Pari Chowk Station
18.	ALPHA I Station
19.	DELTA I Station
20.	GNIDA Office Station
21.	Depot Station
22.	Depot
23.	Staff Quarters
24.	All viaduct
25.	RSS
26	Other NMRC offices

8.2 Forms of Tender (FOT)

8.2.1 Form 1: Letter of Proposal Submission

[Location, Date]

To,

DGM (Electrical)
Noida Metro Rail Corporation (NMRC) Limited
Block-III, 3rd Floor, Ganga Shopping Complex, Sector-29,
Noida -201301
District Gautam Budh Nagar, Uttar Pradesh

Subject: **Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment.**

Dear Sir,

We, the undersigned, offer to provide **Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment** in N-GN corridor (21 stations and Depot) for 02 years in accordance with your RFP Document dated [Insert Date] and our Proposal. We are hereby submitting our Technical and Financial Proposal. We confirm that we have read the RFP Document in totality and abide by the terms and conditions stated in the document.

We acknowledge that we have

- Studied and analyzed and satisfied ourselves about all the requirement of the tender including but not limited to market and market conditions
- Carefully assessed the commerciality of Project and that we will be fully responsible for all its assessment in this regard.
- Seen / visited / assessed the potential locations and fully understand and comprehend the technical, financial, commercial and investment requirements.

We have filled the complete information correctly in **Form 21.**

We hereby declare that all the information and statements made in this Proposal are true and accept that any misinterpretation contained in it may lead to our disqualification. Our Proposal is binding upon us.

We understand you are not bound to accept any Bid you receive.

_____

Yours Sincerely,

Authorized Signature [In full and initials]:

Name and Title of Signatory:

Name and address of Firm:

8.2.2 Form 2: Firm Details

1.	**Title and name of the Project:** **Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment.**
2.	State the structure of the Bidder's organization (Bidders to complete/delete as appropriate) Sole Bidder
3.	For Bidders who are individual companies or firms, state the following: Name of Company or firm: …… Legal status: (e.g. incorporated private company, proprietorship, etc.) …… Registered address: ……..…… Year of incorporation……..…… Principal place of business: ……..…… Contact person: …….. Contact person's title: …… Address, telephone, facsimile number and e-mail ID of contact person: …… …… ……...
4.	Employees Provident Fund No. (attach documentary proof) -
5.	Employees State Insurance Acts in India No. (attach documentary proof) -
6.	GST Registration No. (attach documentary proof) -
7.	PAN (attach documentary proof) -

Form 3: Capability Statement

It is Compulsory for the bidder to fill this statement and the bidder must upload those document that support this statement

Tender Reference No : _____

Name of Work : _____

Name of Bidder: _____

S.No.	**ELIGIBILITY CRITERIA**		**(To be filled by the Bidder)**
1	Sole proprietorship, registered partnership firm, public limited company, private limited company of any of the above can submit the Bid. The firms and the companies should be registered in India.	Yes/ No	
2	The Bidder should have a minimum experience of having satisfactorily completed similar works during last 7 (seven) years period ending last day of month previous to the one in which the bids are invited should be either of the following i. One similar completed work costing not less than the amount equal to **Rs. 75.78 Lakh approx.** (Rupees Seventy Five Lakh Seventy Eight Thousand only) or ii. Two similar completed works each costing not less than the amount equal to **Rs. 47.36 Lakh approx.** (Rupees Fourty Seven Lakh Thirty Six Thousand only) or iii. Three similar completed works each costing not	7 Years	

<table>
<tr><th>S.No.</th><th>ELIGIBILITY CRITERIA</th><th></th><th>(To be filled by the Bidder)</th></tr>
<tr><td></td><td>less than the amount equal to Rs. 37.89 Lakh approx. (Rupees Thirty Seven Lakh Eighty Nine Thousand only)</td><td></td><td></td></tr>
<tr><td></td><td>Similar work</td><td>“Similar work” for this contract shall be SITC (Supply, Installation, Testing, Commissioning) of 25 kV Over Head Equipments (OHE) in any Railway/Metro organisation.</td><td></td></tr>
<tr><td>3</td><td>The Bidder should have in the last 3 (three) Financial Years preceding the Bid Due Date -

The Bidder should have minimum average annual turnover of Rs. 94.73 Lakh approx. in the last 3 (three) Financial Years (2022-23, 2023-24, 2024-25)</td><td><table><tr><td>FY 2022-23</td><td></td></tr><tr><td>FY 2023-24</td><td></td></tr><tr><td>FY 2024-25</td><td></td></tr><tr><td>Total</td><td></td></tr></table></td><td></td></tr>
<tr><td>4</td><td>Liquidity – Not applicable.</td><td>NA</td><td></td></tr>
<tr><td>5</td><td>Net Worth – Not applicable</td><td>NA</td><td></td></tr>
<tr><td>6</td><td>Profit Before Tax(PBT) during any of the financial year should be positive during immediately preceding 03 financial year.
(2022-23,2023-24,2024-25)</td><td><table><tr><td>FY 2022-23</td><td></td></tr><tr><td>FY 2023-24</td><td></td></tr><tr><td>FY 2024-25</td><td></td></tr><tr><td></td><td></td></tr></table></td><td></td></tr>
<tr><td>7</td><td colspan="2">The Bidder must have either the Registered Office or the functional Branch Office located in Delhi NCR.</td><td></td></tr>
<tr><td>8</td><td colspan="2">The Bidder should be registered with the Goods and Services Tax Authorities.</td><td></td></tr>
<tr><td>9</td><td colspan="2">The Bidder should not have been blacklisted/ banned/ declared ineligible for corrupt and fraudulent practices by the Government of India/ any State Government/ Government Agency and Supreme court and contracts have been terminated/ foreclosed by any company / department due to non- fulfilment of Contractual obligation in last 5 (five) financial years.</td><td></td></tr>
</table>

8.2.3 Form 4: Work Experience

The following format shall be used for statement of experience of Bidder:

SN	Similar Contract description	Contract Identification Number	Award date & Completion date	Employer's Name, address, telephone number, e-mail etc	Role in contract		Completion cost	Value of similar work in completed work
					Individual	Registered firm/Public limited company/ Pvt ltd company		
1								
2								
3								
4								
	Add required number of rows							

Authorized signatory

Name:

Date:

Name of the Bidder with seal

NOTE:

1. Only the value of contract as executed by the applicant/member in his own name should be indicated. Where a work is undertaken by a group, only that portion of the contract which is undertaken by the concerned applicant/member should be indicated and the remaining done by the other members of the group be excluded. This is to be substantiated with documentary evidence
2. The tenderer shall upload details of work executed by them in the prescribed format for the works to be considered for qualification of work experience criteria. Documentary proof such as completion certificates from the client clearly indicating the nature/scope of work, actual completion cost and actual date of completion for such work should be uploaded. In case work is executed for private client documentary proof such as copy of work order, Bill of quantities, Bill wise details of payment received certified by CA, TDS certificates for all the payments received, copy of final/ last bill paid by the client should be uploaded. The offers submitted without this documentary proof will not be evaluated.

3. Value of successfully completed portion of any ongoing work up to the last day of the previous month of tender submission will also be considered for qualification of work experience criteria.
4. For completed works, value of work done shall be updated to the last day of the previous month of tender submission price level assuming 5% inflation for Indian Rupees every year and 2% for foreign currency portions per year. The exchange rate of foreign currency shall be applicable 28 days before the submission date of tender.
5. If the above work(s) comprise(s) other works also, then client's certificate clearly indicating the amount of work done in respect of the "similar work" shall be furnished by the tenderer in support of work experience along-with their tender submissions.

8.2.4 Form 5: Financial Capability Details

Bidder should submit their financial details as per the following:

This is to certify that the Average Annual Turnover of M/s ……

having registered office at ……

……..., as applicable, is as below:

S.No.	Financial year	Name of the Bidder	Turnover from Similar Work
1.	2022-23		
2.	2023-24		
3.	2024-25		
	Average Annual Turnover		

S.No.	Financial year	Name of the Bidder	Liquidity

S.No.	Financial year	Name of the Bidder	Net Worth

S.No.	Financial year	Name of the Bidder	Profitability
1.	2022-23		
2.	2023-24		
3.	2024-25		

Certificate of the Chartered Accountants/Statutory Auditors

Based on Audited Accounts and other relevant documents of_____ (Name of Bidder), we M/s _____, Chartered Accountants/ Statutory Auditors, certify that the above information pertaining to FY 2022-23, 2023-24 and FY 2024-25 is correct.

Signature and Seal of
Chartered Accountants/Statutory Auditors
(with membership no. & UDIN No.)

Authorised Signatory
(Name & Designation of Authorised Signatory)

In case the Financial Statements for the latest financial year are not audited and therefore the Bidder cannot make it available, the Bidder shall give an undertaking to this effect and the statutory auditor/charted accountant shall certify the same. In such a case, the Bidder shall provide the Audited Financial Statements for 3 (three) years preceding the year for which the Audited Financial Statement is not being provided.

NOTE:

1. All such documents reflect the financial data of the bidder and not that of sister or parent company.
2. The financial data in above prescribed format shall be certified by CA/ Company Auditor under his signature and stamp in original along with membership no. & UDIN.
3. The Bidder shall provide the audited annual financial statements as required.

8.2.5 Form 6: Memorandum

Name of Work: Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment.

I/We agree to keep the quoted rate open for acceptance for 180 days from the due date of submission thereof and not make any modification in its terms and conditions.

I/We hereby declare that I/We shall treat the quotation documents, drawings and other records connected with the works as secret/ confidential documents and shall not communicate information derived there from to any person other than the information in any manner prejudicial to the safety of NMRC.

_____

Signature of the bidder with seal
Dated:

Witness:

Address:

Occupation

8.2.6 Form 7: Undertaking

I confirm that We (Tenderer),

_____

a. Have not been banned /declared ineligible for corrupt and fraudulent practices by any government/government-undertaking/ semi-government/ govt. controlled institutions, any court of law having jurisdiction in India for the past 5 (five) years.

b. Do not have any pending litigation & non-performing contracts during last 5 (five) years. Further, has not been barred by any government/government-undertaking/ semi-government/ govt. controlled institutions

c. Have not abandoned any work in last 5 (five) years.

d. Have not delayed in similar work completion during orders executed in last 5 (five) years.

e. Do not ever been terminated due to poor performance.

f. Have not suffered Bankruptcy/ insolvency in last 5 (five) years.

g. Have not been blacklisted/ debarred by any organization.

h. Have not been be involved in any illegal activity and/or has not been charge sheeted for any criminal act during the last 5 (five) years.

i. Have not submitted any misleading information in the Bid.

j. Are financially sound to perform the work.

Authorized signatory

Name:

Date:

Name of the Bidder with seal

8.2.7 Form 8: Power of Attorney

(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution.)
Power of Attorney to be provided by the Bidding Company in favour of its representative as evidence of authorized signatory's authority.

Know all men by these presents, We ……(name and address of the registered office of the Bidding Company) do hereby constitute, appoint and authorize Mr./Ms……(name and residential address) who is presently employed with us and holding the position of _____, as our Attorney to do in our name and our behalf all or any of the acts, deeds or things necessary or incidental to submission of our Bid for **Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment.** In response to the RFP Document dated _____ issued by Noida Metro Rail Corporation ("NMRC" or "the Corporation"), including signing and submission of the Bid and all other documents related to the Bid, including but not limited to undertakings, letters, certificates, acceptances, clarifications, guarantees or any other document which the Corporation may require us to submit. The aforesaid Attorney is further authorized for making representations to the NMRC or any other authority, and providing information / responses to the NMRC, representing us in all matters before the NMRC, and generally dealing with the Corporation in all matters in connection with our Bid till the completion of the bidding process as per the terms of the RFP Document and further till the Contract is entered into with the NMRC and thereafter till the expiry of the Contract.

We hereby agree to ratify all acts, deeds and things done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall be binding on us and shall always be deemed to have been done by us.

All the terms used herein but not defined shall have the meaning ascribed to such terms under the RFP Document.

Signed by the within named
.....[Insert the name of the executant company]
through the hand of
Mr. ……
duly authorized by the Board to issue such Power of Attorney
Dated this …… day of ……

Accepted
……
Signature of Attorney
(Name, designation and address of the Attorney)

Attested
……
(Signature of the executant)
(Name, designation and address of the executant)

……
Signature and stamp of Notary of the place of execution

Common seal of …… has been affixed in my/our presence pursuant to Board of Director's Resolution dated……

WITNESS

1. …….
   (Signature)
   Name ……..

   Designation.....……..
2. …….
   (Signature)
   Name ……..

   Designation.....……..

Notes:

(1) The mode of execution of the power of attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and the same should be under common seal of the executant affixed in accordance with the applicable procedure. Further, the person whose signatures are to be provided on the power of attorney shall be duly authorized by the executant(s) in this regard.

(2) In the event, power of attorney has been executed outside India, the same needs to be duly notarized by a notary public of the jurisdiction where it is executed.

(3) Also, wherever required, the executant(s) should submit for verification the extract of the charter documents and documents such as a board resolution / power of attorney, in favour of the person executing this power of attorney for delegation of power hereunder on behalf of the executant(s).

Form 9: Bid Capacity Information

Name and brief particulars of contract (Clearly indicate the part of the work assigned to the applicant(s))	Name of client with telephone number and fax number	Contract Value In Rupees Equivalent (Give only the value of work assigned to the applicant(s)	Value of balance work yet to be done in Rupee equivalent as on last day of the previous month of tender submission	Date of Completion as per Contract Agreement	Expected Completion Date	Delay if any, with reason	Value of work to be done during next 36 months with effect from the first day of the month of tender submission
Total							

S.No.	Financial year	Total Value of Works done as per audited financial statements
1	FY 2022-2023	
2	FY 2023-2024	
3	FY 2024-2025	

Bid Capacity (Bidder shall calculate, mention his bid capacity and enclose the supporting calculation)
A = Rs. ……
N = ……years
B = Rs. ……

Assessed available bid capacity = 2*A*N – B

Certificate of the Chartered Accountants / Company Auditor

We, M/s _____, Chartered Accountants/ Company Auditors, certify that the above information is correct.

Name of Chartered Accountants / Company Auditor

Signature and Seal of Chartered Accountants/ Company Auditor

Membership Number & UDIN No. of Chartered Accountants/ Company Auditor

Authorised Signatory

(Name & Designation of Authorised Signatory)

NOTE:

1. The financial data in above prescribed format shall be certified by Chartered Accountant/ Company Auditor in original under his signature &stamp along with audited financial statements.
2. Value of existing commitments for on-going works during period of **12** months w.e.f. from the first day of the month of tender submission has to be uploaded by the tenderer in Form. These data shall be certified by the Chartered Accountant with his stamp and signature in original with membership number.

8.2.8 Form 10: Salable Form for Tender Document (Non refundable)

Job No. ……..

The required fee of tender form has been deposited in _____ Bank A/c No. _____ RTGS/NEFT and the scanned copy of UTR receipt with Transaction Id is being enclosed with E-tender documents. If the copy of UTR receipt is not uploaded with the E-tender the tender shall be rejected.

DETAILS OF ERNEST MONEY ATTACHED

The required amount of Earnest money has been deposited in _____ Bank A/c No. _____ RTGS/NEFT and the scanned copy of UTR receipt with transaction Id is being enclosed with E-tender documents. If the copy of UTR receipt is not uploaded with the E-tender the tender shall be rejected.

BIDDER

Signature and Stamp

8.2.9 Form 11: Declaration of Refund of Earnest Money

Noida Metro Rail Corporation (NMRC) Limited
Block-III, 3rd Floor,
Ganga Shopping Complex, Sector-29, Noida -201301,
District Gautam Budh Nagar, Uttar Pradesh, India

1	**Bidder Name**	
2	**Bidder Address**	
3	**Bank Name**	
4	**Bank Branch**	
5	**A/c No**	
6	**IFSC Code**	
7	**PAN No.**	
8	**Tin/TAN No.**	
9	**GST No.**	
10	**Phone No.**	
11	**Mobile No.**	
12	**Email-Id**	
13	**Type of Account**	

For Office Use Only

14	**Party Unique Id**	

The above provided information is true to the best of my knowledge.

Date: **Signature with Stamp/Seal**

8.2.10 Form 12: Undertaking pertaining to Personnel

- We confirm to deploy experienced personnels as per approved work program and conditions mentioned in the tender document. I will keep the bio data (Name, Father's Name, Address, Age, Passport size photo, Emp. No. etc) of all the deployed staff as well as in between as and when any of my employee is replaced with new one.
- The personnel experienced in the related field will perform all the necessary inspection about functioning, system cognizance etc. for effective working .
- We confirm to deploy man power requirement of SHE Organization as required under Conditions of contract on Safety and Health for OHE works in Traction O&M wing.

Date: **Signature with Stamp/Seal**

8.2.11 Form 13: Resources proposed for the O&M - Plant & Equipment

1. We hereby confirm to deploy all the materials, parts,tools and equipments, loose items/SPS as per the site requirements and conditions mentioned in the tender document.
2. We will ensure that all the documents pertaining to the system requirements will be upto date.

Date: **Signature with Stamp/Seal**

8.2.12 Form 14: Proposed Personnel

Affix self-attested photograph

NAME ……

ID TYPE AND ID NO. ……

FATHER'S NAME :……..

DATE OF BIRTH :……..

PERMANENT ADDRESS : ……..

……

RESIDENTIAL ADDRESS : ……..

……

MARITAL STATUS :……...

EDUCATIONAL QUALIFICATION :……

TECHNICAL QUALIFICATION :……

EXPERIENCE ……

LANGUAGE KNOWN :…….

NATIONALITY ……..…..

CATEGORY :…….

DATE: ……...

PLACE: ……

SIGNATURE

(To be filled by contractor)

Attested by authorized person:

8.2.13 Form 15: Obligation/ Compliance to be ensured by Contractor

Sl. No.	Items	Compliance of Contractor (To be filled by contractor)	
		Yes	No
1	License for employing contract labour		
2	Compliance of minimum wages Act by payment of wage on 7th of every month through Bank or in the presence of nominated representative of employer (NMRC Supervisor/manager)		
3 (a)	Compliance of provision of ESI & EPF Act		
3 (b)	Ensure treatment in ESI hospital in case of accident/injuries suffered in performance of work and compensation under ESI Act.		
4	Send Accident report to Regional Labour Commissioner (RLC) & ESI authorities.		
5	Observance of working hours, weekly rest and overtime payments as per minimum wages Act-1948.		

Note: - A Non- filling or "No" by contractor will lead to non-eligibility for contractor in further tendering process.

S.N	Description	Reference Clause	Requirement
i	"date for commencement" of the Works	Clause 8.1 of the GCC	Date given in NOA or Employer's Notice to Proceed
ii	Liquidated Damages	Clause 8.5 of the GCC	Total maximum limit of LD including sums payable by the employer to designated contractors is 15% as mentioned in GCC.
iii	Insurance for workers/ employees	Clause 15.4 of the GCC	All of the contractor's employees shall have to be covered under ESI and ECA as per Special conditions of contract.
iv	Insurance cover for Contractor's All Risk and other requirements as specified in the GCC	Clause 15 of the GCC	**100%** of the Total Contract Price.
v	Amount of Third Party Insurance	Clause 15.3 of the GCC	INR 0.75 Million for any one incident, with no. of incidents unlimited.
vi	Period in which all insurances have to be effected	Clause 15.5 of the GCC	Within 1 week from the "date of commencement"

Signature of authorized signatory of Tenderer

8.2.14 Form 16: Performa for Clarifications / Amendments on the RFP

Sl. No.	Document	Clause No. and Existing Provision	Clarification required	Suggested Text for the Amendment	Rationale for the Clarification or Amendment

Authorized signatory

Name:

Date:

Name of the Bidder with seal

8.2.15 Form 17: Bid Offer/ BOQ (Format)

To
Deputy General Manager (Electrical)
Noida Metro Rail Corporation (NMRC) Limited
Block-III, 3rd Floor, Ganga Shopping Complex
Noida -201301,
District Gautam Budh Nagar, Uttar Pradesh

THIS FORM IS NOT TO BE FILLED. THE BIDDERS ARE REQUIRED TO FILL THE FINANCIAL PROPOSAL IN XLS FORMAT AFTER DOWNLOADING THE FORM FROM THE E-PROCUREMENT WEBSITE FOR THIS TENDER DOCUMENT

Sub: Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment.

Dear Sir,

I/we have read and examined the RFP document, general terms and conditions.

I/we hereby quote for the Total Price for **Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment** in N-GN corridor (21 stations and Depot) for 01 year as specified below, payable by NMRC.

BOQ SUMMARY SHEET

Sr. No.	Items	Unit	Quantity	Unit rate	Amount
A. Lightening arrestor :					
1	Supply of 42kV Lightning Arrester along with surge counter and disconnector assembly	Nos.	13		
2	Supply of Support channel,Outrigger and Back Angle GI bolt, nut, washer, lock nut and SPS for installing the Lightning arrester on OHE mast.(as per drwing specification)	Set	13		
3	Supply and installation of 105 sqmm cu jumper wire including PG clamps and terminal connectors of suitable size.(approx. 6m jumper wire per location)	Meter	100		
4	Supply of 93.3 sqmm ACSR earth wire including connector of suitable size on both ends(approx 10 m Earth wire per location)	Meter	150		
5	Installation, Testing and commissioning of 42kV Lightning arrester along with all accessories (such as surge counter, disconnector assembly etc. as per drawing).	Set	13		
B. Earth Pit Restoration					
6	Earth pit restoration (GI earthing and cu earthing) work through suitable chemical treatment. Desried value = below 1 Ohm	No.	35		

7	New earth pit excavation (40*40 Cm) with GI earthing & Cu earthing (GI strip and copper rod to be buried minimum upto the depth of 3 meter) Desired value of individual earth = max. 1 Ohm	No.	45		

C. Feeding jumper

8	Securing the catenary wire at Fedding location with 18 meter contact wire clamped at both the sides by bull dog clamp and suitable PG clamp to be provided along the secured length (8 No. per location)	No.	5		
9	New span droppers to be installed at secured location between the old and newly provided contact wire (encumberance lies between 1 mtr to 1.2 mtr)	No.	24		

D. Aluminium Painting of Weight & Mast of ATD

10	Painting of each Counter Weight of ATD set (07 No. of weights per ATD and 06 sides per weight) with 2 coats of aluminium paint (ISI mark) andsingle primer coating after removing the Old paint by scrubbing to the satisfaction of EPIC. Painting will be done after removing the tension on counter weight. The paint and other consumables shall be arranged by Contractor. Each ATD weight set contains 06 weight of 60 kg with dimension of 490*330*53 mm and one weight of 40 Kg with the dimension of 490*330*33 mm.	Set	81		
11	Marking of "Y" Value for 0.65°C , 5°C, 10°C, 15°C, 20°C, 25°C, 30°C, 35°C, 40°C , 45°C,50°C,55°C,60°C,65°C on mast along with implantation, height and Half Tension Length of span. The temperature marking shall be provided with black letters on yellow back ground after removing the Old paint by scrubbing to the satisfaction of EPIC. Area of painting will be 8000 sq. cm per mast and total such mast will be 81.	Square meter	65		
12	Marking of implantation & height of mast The marking shall be provided with black letters on yellow back ground. Area of painting will be 1000 Sq. cm (50*20 cm) per mast and total such mast will be 1650.	Square meter	165		

E. CAD Welding					
13	Supply of 70 sq. mm, 1.1kV,PVC insulated copper cable	Meter	200		
14	Cadmium welding of 70 sq.mm Copper conductor with head hardened rail web with cad welding material and required equipment.	No.	230		

F. Supply of material and instruments

15	Supply of 02 sets of counter weight. Each set contains 06 weights of 60 kg each with the dimension of 490*330*53 mm and 1 no. weight of 40 kg with the dimension of 490*330*33 mm with groove for suspension of weight. The weight should meet the criteria of RDSO.	Set	2	-	-
16	Digital Earth Resistance meter Product description: Auto ranging,2 pole, 3.5 digit,Accuracy ±2%,, resolution= 0.1,measurable range upto 1999,memory upto 800 record, warranty minimum 01 year, OR simlar to kyoritsu make model no. KEW4106.	No.	1		
17	Non-Contact type high voltage tester for volatege measurement range 230-33kV	No.	1		
18	Digital Multimeter Product Description: 3.5 digit display,safety rating category iii under IEC 61010,AC/DC coltage accuracy 0.1%, AC/DC voltage resolution 0.1 milivolt, AC/DC current range 10 ampere, Resistance accuracy 1%,Resistance resolution 0.1 ohm,waaranty 03 years OR similar to Fluke make, model no. Fluke 179)	No.	2		
19	Clamp meter Product Description: Auto ranging,Jaw size 51 milimeter, Resistance 1000kΩ±.5 %, Frequency range 100khz±.5%, AC current 1000Amp.±1.5 %, AC/dc voltage range 1000±1% OR similar to Motwane make, Model No. DCM39A,	No.	2		
20	Digital Vernier caliper Product Description: Least count 0.1mm, range 0-450 mm, accuracy 0.01mm,warranty 01 year, metal part Hardened steel OR similar to MITOYO Make, Model No. Mitoyo500-500-10 Product should be supplied with protective case.	No.	2		
21	Digital Spirit level Product Description: Horizontal vial with length 600 mm, measurement accuracy 0.2 degree, ingress protection IP 54, OR similar to insize make, model no. 4910-600	No.	2		
22	BM (25kV, Type: PMTB, Make: Megawin, Insulation level : 95/250kV, Rated voltage and current : 27.5kV/1250A)	No.	1		
23	VCS (25kV VCS, Type : Make, Proat CCS25+ CBI21_MF, UN: 27K5V AC)	No.	4		
24	Supply of 3.3kV , 400 sq.mm aluminium cable	Meter	100		

I	**Grand Total without GST (A+B+C+D+E+F)**	
Ii	**GST (@18%)**	
Iii	**Packing and forwarding charges (if any @5%)**	
Iv	**GST on packing and forwarding (@18%)**	
V	**Total sum (i+ii+iii+iv)**	

Please Note:

- The Bidder with the lowest quoted cost for **Miscellaneous Over Head Equipment (OHE) related work and supply of measuring tools and equipment.** in N-GN corridor (21 stations and Depot) for 01 year in the financial quote (L1 bidder) shall be selected for the award of contract.
- The work executed against the BOQ items would be paid after the verification of NMRC representative (Incharge of OHE/Shift incharge).
- The Contractor may raise their 'On Account'' payments **on quarterly basis** as per the status of work on the last day of the respective month.
- The BOQ attached are meant to give the tenderer an idea of the work involved.
- We have completely read and understood the Bid Document. The Financial Tender submitted is unconditional and fulfils all the requirements of the Tender Document.
- Our Financial Proposal shall be binding upon us subject to the modifications resulting from contract negotiations, up to expiration of the validity period of the Proposal. We understand you are not bound to accept any Proposal you receive.

_____

Signature and Name of the Authorized Person

_____

NAME OF THE BIDDER AND SEAL

8.2.16 Form 18: Undertaking as per Clause 4.1b of RFP

(i) We do hereby undertake that following is the list of all the on-going works & completed works awarded by NMRC/ any Central / State government department / public sector undertaking / other government entity or local body / Private firms of value more than 40% of cost of work within last one year (from the last day of the previous month of tender submission)

Applicant's legal name
…….....Date…….
JV/Consortium Member's legal name……..... Page ……..
Of…….. Pages

S.no.	Contract No. & Name of Work	Name of Employer / Client	Name of the contractor including constituent members in case of JV/Consortium	Performance of work.	Performance based on
				* Satisfactory/ unsatisfactory	*Client's certificate/ Undertaking by tenderer
1					
2					
Add required number of rows					

* Strikethrough whichever is not applicable.

(ii) We also do hereby undertake that the performance of works has been indicated above for all the works which are either based on client/Employer certificate or our undertaking. We also understand that NMRC at its sole discretion may get performance of any such work, for which undertaking of satisfactory performance has been given by us, directly from the Client / Employer for the Works listed above and if performance from Client / Employer for such work is found to be unsatisfactory, we shall be considered non-complaint to the tender condition.

Note:

a) The tenderer may either submit satisfactory performance Certificate issued by the Client / Employer for the works or give an undertaking regarding satisfactory performance of the work with respect to completion of work/execution of work (for on-going works) failing which their tender submission shall not be evaluated and the tenderer shall be considered non-responsive and non-compliant to the tender conditions. In case of non submission of either satisfactory performance Certificate from Client / Employer or undertaking of satisfactory performance of any of the above work, the performance of such

work shall be treated as unsatisfactory while evaluating the overall performance of tenderer in terms of Note (b) below.

b) If the tenderer has reported four or less number of works in the Form 18 then there should not be any unsatisfactory performance in any of the works of tenderer. Otherwise, the tenderer shall be considered ineligible for participating in tender process. In other cases, if the Overall Performance of tenderer in more than 20% of the works reported in the Form 18 (rounding off to the nearest lower whole number) is unsatisfactory, the tenderer including the constituent 'substantial member(s)' of JV/Consortium shall be considered ineligible for participating in tender process and they shall be considered ineligible applicants.

c) If there are any adverse remarks in the client's completion/performance certificate, the same shall be examined during technical evaluation.

d) If there is any misrepresentation of facts with regards to performance in any of the works reported above, the same will be considered as "fraudulent Practice" under clause 4.33.1a (ii) of GCC and the tender submission of such tenderers will be rejected besides taking further action as per Clause 4.33.1a (vi) (a) & 13.2.1 of GCC.

e) The undertaking shall be signed by authorized signatory of the tenderer.

Stamp & Signature of Authorized Signatory

8.2.17 Form 19: Undertaking as per Clause 4.12 of RFP

We hereby jointly and severally certify in accordance with clause 9.a' of the Order no. P-45021/2/2017-PP (BE-11) of Ministry of Commerce and Industry. Department for Promotion of Industry and Internal Trade (DPIIT) {formerly Department of Industrial Policy and Promotion (DIPP), Government of India dated 28.05.2018 that the item offered meets the minimum local content of atleast 90% .The details including name of vendor, location and percentage of local content is enclosed as Form 20.

We acknowledge that false declaration by the tenderer regarding local value addition including payments to be made to their vendors for local value addition shall be treated as a fraudulent practice under GCC clause 4.33.1 (a) (i) of this tender for which the tenderer or its successors can be debarred for a period up to three years along with such other actions as may be permissible under the law.

In cases of procurement for a value in excess of Rs. 10 crores, we also undertake to submit a certificate from statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content, in accordance with clause '9.b' of the Order no. P-45021/2/2017-PP (BE-II) of Ministry of Commerce and Industry. Department for Promotion of Industry and Internal Trade (DPIT) {formerly Department of Industrial Policy and Promotion (DIPP)). Government of India dated 28.05.2018, after Completion of works to the Engineer**.**

STAMP & SIGNATURE OF AUTHORISED SIGNATORY

Note

1. This appendix need to be submitted only if bidder wants to avail the purchase Preference as specified in Clause of 000.

2. The undertaking shall be signed by authorized signatory of the tenderer. In case of JV/Consortium by the authorized signatory of the constituent members counter signed by the authorized signatory of tenderer.

8.2.18. Form 20: list of goods, works or services tentatively proposed to be offered with local value addition (if applicable)

S. No.	Description of Items(Goods/Works/Services)	Vendor	Location	% of Local Content

8.2.19. Form 21: Bid Details

The following list is intended to help the tenderers in submitting offer which are complete. An incomplete offer is liable to be rejected. Tenderers are advised to go through the list carefully and take necessary action.

S.No.	Particulars	Attached Yes / No / Not Applicable	Page no. (Mandatory)
1	Bid Processing Fees		
2	Earnest Money Deposit		
3	Forms of Tender (FOT) Form 1: Letter of Proposal Submission		
4	Form 2: Firm Details		
5	Form 3: Capability Statement		
6	Form 4: Work Experience		
7	Form 5: Financial Capability Details		
8	Form 6: Memorandum		
9	Form 7: Undertaking		
10	Form 8: Power of Attorney		
11	Form 9: Bid Capacity Information		
12	Form 10: Salable Form for Tender Document		
13	Form 11: Declaration of Refund of Earnest Money		
14	Form 12: Undertaking pertaining to Personnel		
15	Form 13:Resources proposed for the O&M-Plant & Equipment		
16	Form 14: Proposed Personnel		
17	Form 15:Obligation/ Compliance to be ensured by Contractor		
18	Form 16:Proforma for Clarifications / Amendments on the RFP		
19	Form 17: Bid Offer/ BOQ		
20	Form 18: Undertaking as per clause 4.1b of RFP		
21	Form 19: Undertaking as per clause 4.12 of RFP		
22	Form 20: List of the Goods, Works & Services Tentatively Proposed to be offered with Local Value Addition		
23	Form 21: Bid Details		
24	Statutory proof of existence as the legal entity		
25	PAN certificate as per legal entity		
26	A copy of the Audited balance sheets and Profit and Loss Statements for the last 3 (three) financial years		
27	Self attested copy of ITR		
28	Copy of GST registration certificate, EPF, ESI		

S.No.	Particulars	Attached Yes / No / Not Applicable	Page no. (Mandatory)
29	Any other document asked by the Employer if submitted, specify the documents Or Any other document which the Tenderer considers relevant		