संस्कृति मंत्रालय
भारत सरकार
Ministry of Culture
Government of India

सत्यमेव जयते

E-TENDER DOCUMENT

For

‘Design, Manufacture, Supply, Installation, Testing, Commissioning & Maintenance Works’ for the B Block of Nehru Science Centre, Mumbai

Nehru Science Centre, Mumbai
(A Unit of NATIONAL COUNCIL OF SCIENCE MUSEUMS)
(MINISTRY OF CULTURE, GOVT. OF INDIA)
Dr E Moses Road, Worli Mumbai – 400 018 INDIA

INSTRUCTIONS TO THE CONTRACTORS /BIDDERS FOR E-SUBMISSION OF BIDS ONLINE THROUGH CPPP https://eprocure.gov.in/eprocure/app

This tender document has been published on the Central Public Procurement Portal (URL: https://eprocure.gov.in/eprocure/app). The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal. More information useful for submitting online bids on the CPP Portal may be obtained at: https://eprocure.gov.in/eprocure/app

REGISTRATION

1) Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal (URL: https://eprocure.gov.in/eprocure/app) by clicking on the link "**Click here to Enroll**" on the CPP Portal. Enrolment is free of Charge.
2) As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.
3) Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.
4) Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / TCS / nCode / eMudhra etc.), with their profile.
5) Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSC"s to others which may lead to misuse.
6) Bidder then logs in to the site through the secured log-in by entering their user ID / password and the password of the DSC / e-Token.

SEARCHING FOR TENDER DOCUMENTS

1) There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP Portal.
2) Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective „My Tenders" folder. This would enable the CPP Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.
3) The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

PREPARATION OF BIDS

1) Bidder should take into account any corrigendum published on the tender document before submitting their bids. Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents - including the names and content of each of the document that need to be submitted.
2) Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR / DWF formats. Bid documents may be scanned with 100 dpi with black and white option.
3) To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use "My Space" area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

SUBMISSION OF BIDS

1) Bidder should log into the site well in advance for bid submission so that he/she upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.
2) The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.
3) Bidder has to select the payment option as "offline" to pay the Tender Fee & EMD and enter details of DD/any other accepted instrument.

4) Bidder should prepare the TENDER FEE & EMD as per the instructions specified in the tender document. The original should be posted/couriered/given in person to the Tender Processing Section, latest by the last date and time of bid submission or as specified in the tender documents. The details of the DD/any other accepted instrument, physically sent, should tally with the details available in the

5) Scanned copy and the data entered during bid submission time otherwise the Tender will be summarily rejected.

6) The Tender Inviting Authority (TIA) will not be held responsible for any sort of delay or the difficulties faced during the submission of bids online by the bidders The bidder should see that the bid documents submitted should be free from virus and if the documents could not be opened, due to virus, during tender opening, the bid is liable to be rejected

7) Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. The price bid has been given as a standard/Percentage BoQ format (BoQ_xxxx.xls) with the tender document, then the same is to be downloaded and to be filled by all the bidders. Bidders are required to download the BoQ file, open it and complete the green colored (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BoQ file is found to be modified by the bidder, the bid will be rejected. In e-Tendering, intending bidder can quote his rate in figures only. The rate in words, amount of each item and total is generated automatically. Therefore, the rate quoted by the bidder in figures shall be taken as correct. The Comparative Statement is also generated automatically. The Comparative statement and rate quoted by each bidder shall be downloaded. **The manual calculation check of bids and comparative statement shall be final. In case, any discrepancy is noticed, the decision of appropriate NCSM authority shall be final and binding.**

8) The server time (which is displayed on the bidders" dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc.
The bidders should follow this time during bid submission. The bidders are requested to submit the bids through online e-tendering system to the **Tender Inviting Authority (TIA)** well before the bid submission end date & time (as per Server System Clock).

9) All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized person until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128-bit encryption technology. Data storage encryption of sensitive fields is done.

10) The uploaded tender documents become readable only after the tender opening by the authorized bid openers

11) Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.

12) The bid summary has to be printed and kept as an acknowledgement of the submission of the bid. This acknowledgement may be used as an entry pass for any bid opening meetings.

ASSISTANCE TO BIDDERS

1) Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the,

Tender Inviting Authority (TIA),
Director, Nehru Science Centre, Mumbai (National Council of Science Museums) Dr E Moses Road, Worli
Mumbai- 400 018

or may call us on 022-31059020 / 21, Fax- 022-24932668 or

Email at.: director@nehrusciencecentre.gov.in Website:www.nehrusciencecentre.org

2) Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk.
The contact number for the helpdesk is **1800-3070-2232.**

NOTICE INVITING E-TENDER
(ONLINE)

फ़ाइल संख्या: NSCM//Elec/B-ब्लॉक-फेकेड/2025–26 दिनांक 3 फरवरी, 2026

1. **Nehru Science Centre is a constituent unit of National Council of Science Museums (NCSM)**, an autonomous organisation under the Ministry of Culture, Govt. of India, is the apex body of Science Centres in India.

2. Online e-tender (Percentage Rate Bid) are hereby invited from **licensed, reputed and experienced Electrical Contractors** capable of carrying out the work of **'Design, Manufacture, Supply, Installation, Testing, Commissioning & Maintenance for Façade Architectural Lighting Works ' for the B Block of Nehru Science Centre, Mumbai** with best quality aesthetic excellence and workmanship.

3. The above work primarily comprises of Electrical works such as the proposed design comprises RGBW and Warm White wash lighting, with appropriate beam angles, wattages, and mounting locations, duly aligned with the architectural features of B-Block.

4. The place of work would be: **the B Block terrace of Nehru Science Centre, Mumbai**

5. **Documents are to be submitted online on the Central Public Procurement Portal website https://eprocure.gov.in/eprocure/app,** before the prescribed date & time, using the valid Digital Signature certificate (DSC) obtained from the authorized agencies of NIC & valid GST registration no.

6. **Important Information & Dates:**

Estimated cost of work	₹ 24,74,960/-
EMD (2.5% nearest to thousand)	₹ 61,900/-
Period of completion	90 days (three months)
Bid Document Published Date	03.02.2026 at 01.00 PM
Bid Document Download Start Date	03.02.2026 at 01.30 PM
Bid Document Download End Date	14.02.2026 at 18.00 PM
Pre-Bid Meeting Date	-
Bid submission Start Date	03.02.2026 at 01.30 PM
Bid submission End Date	14.02.2026 at 18.30 PM
Bid Opening (Technical) Date	16.02.2026 at 11.00 PM
Address of Tender Inviting Authority	Director Nehru Science Centre (National Council of Science Museums) Dr EMoses Road, Worli Mumbai- 400 018

7. **ELIGIBILITY CRITERIA:**

The agency must fulfil the criteria mentioned below and submit the documents in support of the following:

7.1 **Financial: -**

7.1.1 **Average Financial Turnover during the last 03 (three) years should be at least 50%** of the estimated cost put to tender during the immediate last three consecutive financial years.

7.2 **Technical (For Electrical work):- (Special Terms & Condition form to be filled separately)**

7.2.1 **Registration/Empanelment with other Govt. Departments/Agencies,** if any. Please provide proof of registration / empanelment.

7.2.2 **The agency must possess a valid Electrical Contractor's License or Original equipment**

manufacturer registration and should submit undertaking for suitable, eligible specific field licensed contractors and OEM. The experience in relevant field may be attached with undertaking.

7.2.3 The agency should have **experience** of having successfully executed **similar works** with Central / State Govt. Departments, PSUs, Autonomous Bodies, Reputed Private Sector (BSE /NSE listed), **during the last 07 (seven) years** ending previous day of last date of submission of tenders: -

3(three) similar completed works (at least one of them should be in Central Government / Central Autonomous Bodies/ State PWD/ Central Public Sector Undertakings), Reputed Private Sector (BSE /NSE listed) **each costing not less than 40% of estimated cost.**

OR

2(two) similar completed works (at least one of them should be in Central Government / Central Autonomous Bodies/ State PWD / Central Public Sector Undertakings), Reputed Private Sector (BSE /NSE listed) **each costing not less than 60% of the estimated cost.**

OR

1(one) similar completed work (at least one of them should be in Central Government / Central Autonomous Bodies/ State PWD / Central Public Sector Undertakings), Reputed Private Sector (BSE /NSE listed) **of aggregate cost not less than 80% of the estimated cost.**

7.3 **Earnest Money Deposit (EMD) : Bidders are required to pay EMD of for an amount of** ₹ 61,900/- i.e. **@2.5% of the estimated value. Accordingly s**canned copy of Demand Draft / Pay order or Banker`s Cheque of any Nationalised / Scheduled Bank in **favour of Nehru Science Centre payable at Mumbai** OR Online payment/transfer receipt in .pdf format towards Earnest Money Deposit (EMD) @2.5% {₹ 61,900/-} of the tender value, rounded to nearest thousands **is to be uploaded / submitted**.

Details of Bank account for NEFT/IMPS/RTGS transfer of EMD are as under: -

Name of the Account Holder	Nehru Science Centre
Account No.	0113101027501 (SB Account)
IFSC Code	CNRB0000113
Branch	Worli, Mumbai – 400018
Bank Name	Canara Bank

No exemptions shall be granted with respect to the submission of the Earnest Money Deposit (EMD) to the Bidders registered under any category, including but not limited to possession of a valid MSME Certificate, UDYAM Registration, or any other form of certification or registration.

Accordingly, submission of the prescribed EMD amount is mandatory for all the Bidders without exception. Non-compliance with this requirement shall render the Bid liable for rejection.

8. The intending bidder must read the terms and conditions of NCSM carefully. He should only submit his bid if he considers himself eligible and if he is in possession of all the documents required.

9. Information and Instructions for bidders posted on website shall form part of bid document.

10. The bid document consisting of plans, specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents can be seen and downloaded from https://eprocure.gov.in/eprocure/app free of cost.

11. Online bid documents submitted by intending bidders shall be opened only of those bidders, who has deposited e-Tender and Earnest Money Deposit and other documents scanned and uploaded are found in order.

12. Those contractors not registered on the website mentioned above, are required to get themselves registered beforehand.

13. The intending bidder must have valid Class I / Class II /Class III Certificates with signing key usage (DSC) to submit the bid.

14. The e-Tenders invited under two envelopes system, the first electronic envelope will be named as Technical Envelope & will contain documents of bidder's satisfying the eligibility conditions and 2nd electronic envelope will be named as Financial Envelope containing Rate Quote Sheet. The bidder shall submit **TECHNICAL BID ENVELOPE** & **FINANCIAL BID ENVELOPE** simultaneously. **The technical bids will be evaluated first and thereafter financial bids of eligible bidders only shall be opened.** These envelopes shall contain one set of the following documents: -

a) TECHNICAL BID ENVELOPE shall contain the following documents in .pdf format: -

i) Scanned copy of **valid Electrical Contractor's License** in .pdf format, with under taking for OEM for conceptual lighting.

ii) Scanned copy of **Enlistment Order/Registration certificate with appropriate Authority** as applicable in pdf format, if any.

iii) Scanned copies of **WORK EXPERIENCE CERTIFICATES / COMPLETION CERTIFICATE** issued by Govt. / Semi-Govt. / Autonomous/ PSUs and/or Reputed Institution of requisite magnitude with appropriate Authority as per NIT in .pdf format.

iv) Scanned copies of **statutory documents viz. GST registration, PAN Card, ESI, EPF, and license for engagement of labourers** from appropriate authority etc. in .pdf format.

v) Scanned copy of **UNDERTAKING (as per Annexure – "B")** duly signed with company seal in .pdf format which also includes the undertaking that "The physical EMD (except in case of online payment of EMD) shall be deposited by me/us with the office of **Nehru Science Centre, Mumbai** calling the bid before the bid opening date otherwise the department may reject the tender/bid and also take action to withdraw my/our enlistment/debar me/us from further tendering in NCSM or any of its constituent units."

vi) **Tender Document in pdf format (TENDERXXXXX.pdf file) digitally signed.**

vii) Relevant **document for Average Financial Turnover on Electrical Installation Works which should be at least 50% of the value of the estimated cost put to tender** during the immediate **last 03 (three) consecutive financial years.**

b) **FINANCIAL BID ENVELOPE** shall contain:

(i) **Rate Quote Sheet (Percentage basis)** in .xls format.

15. It may be noted that the Technical Bid Envelope which are not found in order will be rejected.

16. Tenders which do not fulfil any of the above conditions or are incomplete in any respect are liable for summary rejection.

17. The Museum/Centre does not bind itself to accept the lowest e-tender and reserves to itself the authority to reject or partially accept any or all the e-tenders, e-tendered items or schedules received without assigning any reason whatsoever.

18. Canvassing in connection with e-tenders is strictly prohibited and the e-tenders submitted by the e-tenderers who resort to canvassing will be liable for rejection on that ground alone.

19. All taxes including GST, labour cess, duties, IT TDS, GST TDS etc. on materials freight & transit Insurance F.O.R. site in respect of this contract will be payable by the successful tenderer. Nothing extra

will be payable for increase in such taxes, duties, Labour Cess, etc. even if imposed or levied either before or after the e-tenders are opened or during currency of contract.

20. Before submitting the e-tender, the tenderer shall examine all specifications, drawings, conditions of contract and inspect the site if necessary. The e-tender must be balanced in respect of individual items so that the rates quoted shall remain in force even if the quantities deviate before or during the execution of the work.

21. The successful e-tenderer selected for the work shall sign the formal agreement within 15 days from the date of issue of Letter of Intent to them by the Museum/Centre failing which the LOI for award of work is liable to be cancelled and EMD/Performance Security forfeited.

22. The selected e-tenderer will be issued a Letter of Intent by the Museum/Centre and given 15 days mobilisation time which shall be counted from the date of issue of the Letter of Intent. Within the mobilisation time the tenderer must scrutinise all the working drawings, CPM/PERT/BAR CHART, specifications, etc. and obtain clarifications from the Architect wherever necessary and submit a revised BAR CHART if required by the Museum/Centre. During the mobilisation time, the tenderer shall also mobilise all his resources including men and materials, obtain the supply of water and electricity necessary for construction, erect a temporary cement go-down at site if necessary and Sign an Agreement with Museum/Centre in approved format at site and sign an Agreement with Museum/Centre in approved format on a non-judicial stamp paper of proper denomination. ***The date of commencement of work shall be the date of issue of Letter of Intent***.

23. The validity period of the e-tender shall be at least three months from the date of opening of e- tenders. This period may be extended with mutual consent if the decision regarding issue of Letter of Intent is delayed for any reason.

Pre-Bid Meeting Details

NIL

Appendix to NIT

1. SUMMARY CONDITIONS OF CONTRACT

Defect Liability Period	:	**One year** from the date of virtual completion as certified by the Museum/Centre. Five years of material warranty
Time for Completion	:	**90 days (Three) months** from the date of Letter of Intent as per NIT Clause 5 read with NIT Clause 21.
Minimum value of work for Interim Certificate	:	**10 % of the tendered value** or less at the discretion of the Museum/Centre but not more than one running bill in a month
Earnest Money to be deposited with the tender	:	**₹ 61,900/-** (being 2.5% of the estimated value of tender, rounded off to nearest thousands).
Liquidated damages for non-completion of work in time (Clause 39d of the general conditions of contract).	:	**One percent per week** of the total cost of the work awarded subject to a maximum of 10% of gross value of work done or cost of the work awarded whichever is greater.
Liquidated damages for insufficient progress of work (Clause 39c of the general conditions of Contract).	:	**Half percent per week** of the total cost of the work awarded subject to a maximum of 10% of gross value of work done or cost of the work awarded whichever is greater.

2. RETENTION MONEY FOR INTERIM PAYMENT

Total :10% as per following below

Performance Security/Guarantee		3% of tendered value (After adjusting EMD deposited with tender) to be deposited on award of work before signing of agreement through Demand Draft/ Banker's cheque/ Bank Guarantee from any of the Commercial Bank/ online bank transfer/ Insurance Surety bond/ fixed deposit receipt issued by nationalized/ scheduled bank to be drawn or duly pledged as the case may be, in favour of the **Nehru Science Centre** payable at **Mumbai.**
Security Deposit		7% of the value of the work done to be recovered from R.A bills so as to make up 10% of Gross value of the work done including performance guarantee.
Period of submitting final bill by the successful e-tenderer		**3 months** from the date of virtual completion.

FORMAT FOR BANK GUARANTEE BOND
(For EMD only)

1. In consideration of the (Name and address of the Museum/Centre) hereinafter called the Museum/Centre having stipulated under clause 10 of the Notice Inviting E-tender No.....for the work of (mention name of work as in NIT) at the aforesaid site agreed to accept payment of Earnest Money for due fulfilment of the terms and conditions contained in the said NIT (including appendix) for participation in the e-tender from (Name and address of the prospective e-tenderer) (hereinafter called the prospective e-tenderer) by production of a bank guarantee of (Mention amount of EMD in figure & words) only, we (Name and address of Bank furnishing guarantee (Br. Code.....) (hereinafter referred to as "The Bank") do hereby undertake to pay to the Museum/Centre an amount not exceeding (mention EMD amount in figure & Words) only against any loss or damage caused to or suffered or would be caused to or suffered by the Museum/Centre by reasons of any breach by the said prospective e-tenderer of any of the terms or conditions contained in the said NIT (including appendix) relating to participation in the e-tender.

2. We, (Name of Bank), do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Museum/Centre stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the Museum/Centre under National Council of Science Museums by reasons of any breach by the said prospective e- tenderer of any of the terms or conditions contained in the said NIT (including appendix) or by reason of the prospective e-tenderer's failure to comply with conditions contained in the said NIT relating to participation in the e-tender. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the bank under this guarantee. However, our liability under this guarantee, shall be restricted to an amount not exceeding (mention amount of EMD in figures and words) only.

3. We, (Name of Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period as mentioned in Clauses 20 and 21 of the said NIT (including appendix) or the period stipulated under clause 22 for deciding the e-tender and that it shall continue to be enforceable till the dues of the Museum/Centre under or by virtue of the said NIT (including appendix) have been fully paid and its claims satisfied or discharged or the Museum/Centre certified that the terms and conditions of the said NIT (including appendix) have been fully and properly honoured and carried out by the said prospective e-tenderer for participation in the e-tender and accordingly discharges the guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the periods stipulated above, we shall be discharged from all liability under this guarantee thereafter.

4. We, (Name of the Bank) further agree with the Museum/Centre that they shall have the fullest liberty without our consent and without affecting in any manner our obligation hereunder to extend time of deciding the e-tender as may be expedient and to forbear or enforce any of the terms and conditions relating to the NIT (including appendix) and we shall not be relieved from our liability by reason of any such extension being granted to the said proposed e-tenderer for any forbearance, or act of omission on the part of the Museum/Centre or any indulgence by the Museum/Centre to the said proposed e-tenderer or by any such matter or thing whatsoever which under the law relating to surety.

5. We, (Name of the Bank) lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Museum/Centre in writing.

Dated, the …….. day of ……..…….

For ……..
(Authorised signatory of the Bank with Seal)

FORMAT FOR BANK GUARANTEE BOND *

(For Performance guarantee /Retention Money/Security Deposit only)

1. In consideration of the ……..…….……..

……..…….. (hereinafter called "The Museum/Centre") having agreed to exempt ……..…….…… ..
……..
(Hereinafter called the "successful e-tenderer' from the demand, under Clause 10 of the Notice inviting E- tender No. …… dated and/or the terms and conditions of an Agreement dated Made between the Museum/Centre and successful e-tenderer(s) for ……(hereinafter called "the said agreement") of Performance guarantee **/**Earnest Money/Retention Money for the due fulfilment by the said Contract(s) of the terms and conditions contained in the said NIT or the conditions of (execution of work) or the agreement on production of a bank guarantee of Rs (Rupees ……
…… only), We … (hereinafter referred to as "The Bank") do hereby undertake to pay to the Museum/Centre an amount not exceeding Rs against any loss or damage caused to or suffered or would be caused to or suffered by the Museum/Centre by reasons of any breach by the said successful e-tenderer of any of the terms or conditions contained in the said NIT, the conditions of Contract or the Agreement.

2. We, do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Museum/Centre stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the Museum/Centre under National Council of Science Museums by reasons of any breach by the said successful e-tenderer of any of the terms or conditions contained in the said NIT or the conditions of contract or the Agreement or by reason of the successful e-tenderer's failure to perform as per conditions contained the said NIT or the condition of contract or the Agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However our liability under this guarantee shall be restricted to an amount not exceeding Rs……..

Note:

(Bank guarantee bond towards Performance guarantee/Retention Money/Security deposit as defined under clause 32 of the General Conditions of contract at the time of signing of agreement on award of work acceptable only if furnished by any of the Nationalised / Commercial Banks.)

3. We, ……..…….. further agree that the guarantee herein contained shall remain in full force and effect during the period as mentioned in Clause 22 of the said NIT read with clause 32 of the conditions of contract, or the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till the dues of the Museum/Centre under or by virtue of the said NIT or the conditions of contract or the Agreement have been fully paid and its claims satisfied or discharged or the Museum/Centre certified that the terms and conditions of the said NIT or the conditions of contract or the Agreement have been fully and properly honoured and carried out by said successful e-tenderer and accordingly discharges the guarantee.

Unless a demand or claim under this guarantee is made on us in writing on or before the ……..

We shall be discharged from all liability under this guarantee thereafter.

4. We, further agree with the Museum/Centre that

they shall have the fullest liberty without our consent and without affecting in any manner our obligation hereunder to vary any of the terms and conditions of the said Agreement or to extend time of performance by the said successful e-tenderer from time to time or to postpone for any time or from time to time any of the powers exercisable by the Museum/Centre against the said successful e-tenderer and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said successful e-tenderer for any forbearance, or act of omission on the part of the Museum/Centre or any indulgence by the Museum/Centre to the said successful e-tenderer or by any such matter or thing whatsoever which under the law relating to surety.

5. We, …….…….. lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Museum/Centre in writing.

Dated, the ……. day of ……

For ……
(Authorised signatory of the Bank with seal)

FORMAT FOR LETTER OF INTENT*

…… Date…….

(Mention file number)

Sub: Letter of Intent for the work of ……

Dear Sirs,

With reference to your e-tender dated ……..……..……(and further clarification vide letter number ……..…….. dated ……..……..) # it is intended to award the aforesaid work at the e-tendered amount of Rs……

(Value based on only items of work intended to be awarded for execution)

You are, therefore, requested to sign an agreement as per standard format already printed in the e-tender documents purchased by you while e-tendering for this job. For this purpose, you are requested to send us a non-judicial stamp paper of appropriate value for preparing the contract Agreement within a week from the date of this letter.

You may avail of 15 days mobilisation time from the date of issue of this letter of Intent for mobilising your men, materials and other necessary resources for the construction. During mobilisation period, you are requested to study all the drawings and designs annexed hereto and the Bar-Chart and obtain clarifications from the architect or this office immediately.

Please note that the work has to be completed within ……. weeks/months in which mobilisation time period of 15 days is also included. The date of commencement of work would be reckoned as the date of issue of this letter (as per clause 21 of NIT).

Thanking you,

Yours faithfully,

Sd/-
CoA/Dy .CoA

**** To be issued by the Administrative officer of the parent Museum/Centre, viz, B.I.T.M, V.I.T.M., NSCM, N.S.C.D., C.R.T.L., Science City, even though the work is to be done in any RSC/SRSC/DSC.***

Letter of intent is to be issued in the letter head of the parent Museums/Centres and a Xerox copy is to be maintained as office copy on which signature of the authorised representative of the successful e-tenderer is to be obtained with date at the time of issue of original letter of intent. # Delete words within brackets if not applicable in specific case.

FORMAT FOR ARTICLES OF AGREEMENT

INSTRUCTIONS (not to be typed in Agreement)

(Articles of Agreement have to be typed on non-judicial stamp paper. The value of the stamp paper varies from state to state and is to be known from the particular place. The stamp paper will be purchased by the successful e-tenderer and the agreement may be typed by the Museum/Centre according to the format.)

ARTICLES OF AGREEMENT made at ……..

…….
(Place)

this…… day of ……..
(Date) *(Month & Year)*

between the …….

……..
(Name of the parent Museum/Centre)

(under the National Council of Science Museums, a Society registered under the Societies Registration Act of West Bengal, 1961), hereinafter referred to as the Museum/Centre which expression shall include its successors and assigns on the one part and……
……
…….….....
(name of the successful e-tenderer)

trading in the name and style of ……..
……
……
…….
(Name and complete address of the successful e-tenderer)

hereinafter referred to as the successful e-tenderer which expression shall include his/their respective heirs, executors, administrators and assigns on the other part.

WHEREAS the Museum/Centre is desirous of getting the work of ……..……
. .....therein done and has caused
(Name of the work)

Notice Inviting E-tender (Including appendix), drawings, schedule of quantities and specifications describing the work and conditions of contract to be prepared by…….
……
……

..……
(Name and address of the Architect).

AND WHEREAS the said NIT (including appendix) drawings as per list attached, specifications and the priced schedule of quantities and conditions of contract have been signed by or on behalf of the parties hereto. AND whereas the Successful e-tenderer has deposited in Cash or Bank Draft/Bank Guarantee a sum of Rupees ……..

……

(Exact amount in words)

the amount being 2.5% of the estimated value of the e-tender rounded off to the nearest hundred) with the Museum Centre as Initial Security for the due performance of this Agreement as provided in the said conditions. In the case of Bank Guarantee, the period of Bank Guarantee referred to being valid until the defect liability period as specified in e-tender and to be revalidated to required dates as demanded by the Museum/Centre if completion date is extended.

NOW IT IS HEREBY AGREED AND DECLARED BY AND BETWEEN
THE PARTIES HERETO AS FOLLOWS:

1. In consideration of the payments to be made to him as hereinafter provided the successful e-tenderer shall upon and subject to the conditions herein contained execute and complete the work within …….. months from the date of issue of letter of intent (as defined under NIT clauses 5 and 23) and as per the said drawings and such further detailed drawings as may be furnished to him from time to time and described in the said specifications and the said priced schedule of quantities along with the progress of the building work.

2. The Museum/Centre shall pay to the successful e-tenderer such sum as shall become payable hereunder at the time and in the manner specified in the said conditions.

3. Time is the essence of this agreement and the successful e-tenderer shall proceed with the work, throughout the stipulated period of this contract, strictly according to the CPM/PERT/BAR CHART attached herewith and forming a part of this agreement. At any stage during execution, if any work lags behind the target as indicated in the CPM/PERT/BAR CHART for reasons directly attributable to the successful e-tenderer, he shall pay or allow the Museum/Centre to deduct from any money due to him a liquidated damage as per Clause 39 of the conditions of contract.

4. This agreement comprises the work above and all subsidiary works connected therewith, even though such works may not be shown on the drawings, or described in the said specifications or the priced Schedule of Quantities.

5. The Museum/Centre through the Engineer (As defined under clause 2 of General conditions of contract) reserves to itself the right of altering the drawings and of adding to or omitting any item of work or of having portions of the same carried out departmentally or otherwise and such alterations or variations shall not vitiate this agreement.

6. All disputes and differences of any kind whatever except as excluded under Clause 2 of General Conditions of contract appended herewith, arising out of or in connection with the contract on the carrying out of works (Whether during the progress of the work or after their completion and whether before or after the determination, abandonment or breach of the contract) shall be referred to arbitration as per Clause 44 of the said conditions of contract. In case of any legal dispute, other than the arbitration, the court of jurisdiction shall be at the place written in the first line of this agreement.

The provisions of the Arbitration & Reconciliation Act 1996 or any statutory modification or re-enactment thereof and of the rules made there under for the time being in force shall apply to arbitration proceedings under this clause.

In witness whereof the parties have set their respective hands the day and the year and the place hereinabove written.

Signed by for and on behalf of the Museum/Centre ……..

…….
(Administrative Officer)

In the presence of

1. …….

Seal *(Finance & Accounts Officer)*

2. …….
(Project Co-coordinator/Engineer)

Signed by the said Successful e-tenderer …….

In the presence of

(1)……

Seal

(2)……..

INDEX FOR **Annexure 'A'**
GENERAL CONDITIONS OF CONTRACT
(From page no. 17 to 38)

Extension and Compensation

Miscellaneous

Civil Works only

GENERAL CONDITIONS OF CONTRACT

1. INTERPRETATION

The terms as used in the e-tender documents and agreement and named hereunder shall have the meanings herein assigned to them except where the subject or context otherwise requires:-

"This agreement" shall comprise of the Articles of Agreement along with the Appendix, the Conditions of Contract, the Priced Schedule of Quantities, Specifications and Drawings and CPM/PERT/BAR CHART attached hereto and including those to which only a reference is made herein.

"Work" or "Works" shall mean all work or works defined by Bills of quantities, Drawings, Specifications and such other work or works as the successful e-tenderer may be entrusted with for carrying out under this agreement as per Clause 4 of the Articles of Agreement.

"Museum/Centre" shall mean …… under the National Council of Science Museums which shall include the person for the time being in management of the Society and its assigns.

"Engineer" shall mean the Curator or Technical Officer authorised as such by the Museum/Centre or in the event of his ceasing to be Engineer for the work such other firm or person as may be appointed by the Museum/Centre as Engineer for this work. (Further elaboration given in Clause 2 below):

"Successful e-tenderer" shall mean ……. and shall include his/their respective heirs, executors, administrators and assigns.

"Site" shall mean the site of the construction works as shown on the site plan attached hereto including any buildings and erection thereon and any other land adjoining these to (Inclusive) as aforesaid allotted by the Museum/Centre for the use of successful e-tenderer.

"Act of Insolvency" shall mean any act of insolvency as defined by the Presidency towns Insolvency Act, or the Provincial Insolvency Act or any Amending Statute.

"Notice in Writing" or "Written Notice" shall mean a notice or communication in written, typed or printed or printed characters sent (unless delivered personally or otherwise proved to have been received) by registered post to the last known private or business address or registered office of the addressee and shall be deemed to have received when in the ordinary course of post it would have been delivered. "Virtual Completion" shall mean that the works carried out are fit for occupation in every respect including removal of scaffolding, plant, surplus material and rubbish and cleaning of dirt from work and site.

Words imputing person include firms and corporations words imputing the singular only also include the plural and vice versa where the context so requires.

Short headlines are given to each Clause for convenience only and they will not limit the meaning or scope of the Clause in any way.

2. ENGINEER

The plans, agreement and documents above mentioned shall form the basis of this agreement and the decision of the said Engineer or the other Engineer for the time being as mentioned in the said conditions, in reference to all matters or dispute as to material and workmanship shall be final and binding on both the parties.

The term “Engineer” shall mean the firm or person(s) appointed by the Museum/Centre to superintend the work. He/They will receive his/their instruction for the work from the Museum/Centre.

The successful e-tenderer shall afford the said Engineer(s) every facility and assistance for examining the work and materials and for checking and measuring works and materials.

The Engineer or any Authorised Assistant of the Engineer shall have power to give notice to the successful e-tenderer or to his Supervisors of non-approval of any work, or materials, and such work shall be suspended or the use of such materials shall be discontinued. The work from time to time be examined by the Engineer or the Engineer’s Assistant but such examination shall not in any way exonerate the successful e-tenderer from the obligation to remedy any defects due to materials or workmanship not in accordance with the contract which may be found to exist at any stage of the work or may appear within the defects liability period mentioned in clause 20.

3. SCOPE OF THE CONTRACT

The successful e-tenderer shall carry out and complete the works in every respect in accordance with this contract and in accordance with the directions of the Engineer and to the satisfaction of the Engineer and the Museum/Centre. The Engineer may from time to time issue further drawings and/or written instructions, detailed directions and explanations in regard to:

(a) The variation or modification of the design, quality or quantity of works for the addition or omissions or substitution of any work.

(b) Any discrepancy in the drawings or between the schedule of quantities and/or drawing and/or specifications.

(c) The removal from the site of any material brought therein by the successful e-tenderer and the substitution of any other materials there from.

(d) The removal and/or re-execution of any works executed by the successful e-tenderer.

(e) The dismissal from the works of any person employed thereupon.

(f) The opening up for inspection of any work covered up.

(g) The amending and making good of any defects under Clause 20.

The successful e-tenderer shall comply with and duly execute any work comprised in such instructions, detailed directions and explanations, provided always that if the Engineer’s instructions involved variations from the priced Schedule of Quantities, such instructions shall be issued by the Museum/Centre and the successful e-tenderer shall take the action stipulated in Clause 34.

If the work shown on any such further drawings or detailed drawings or that may be necessary to comply with any such instructions, directions, or explanations be in the opinion of the successful e-tenderer, extra to that comprised in or reasonably to be inferred from the contract he shall before proceeding with such work, give notice in writing to this effect to the Engineer, and in the event of his not doing so three days before the commencement of such work the successful e-tenderer shall not be entitled to any allowance in respect of any such extra work. But if such notice has been duly given and the Engineer and the successful e-tenderer, fail to agree as to whether or not there is any extra, then if the Engineer decides that the successful e-tenderer is to carry out the said work, the successful e-tenderer shall do so accordingly, and the question whether or not there is any extra and if so, the amount thereof shall failing agreement be settled by the Arbitration as provided in Clause 44 on a reference being made by the successful e-tenderer.

4. SCOPE OF WORK

Even if not specifically mentioned in the schedule of quantities, the successful e-tenderer shall be deemed to have allowed necessary material, labour, tools and plants etc. required for satisfactory completion of the items of work as indicated in drawings and description given in the specifications, which are attached herewith unless the item specifies labour only or otherwise. Rates quoted also apply for work in patches, strips, small or large areas, and for different shapes and in different sizes and in different planes (Horizontal/vertical or inclined).

5. INSPECTION OF SITE

The e-tenderer must visit site before giving e-tender and must get acquainted with the working conditions.

The e-tenderer shall examine all specifications, e-tender conditions and drawings before e-tendering for the works.

The e-tenderer shall obtain all information relating to local regulations, bye-laws, application of any and all laws relating to his work or profession. No additional claims shall be admissible on this account.

6. WATER, ELECTRICITY AND CEMENT GODOWN

The successful e-tenderer shall construct at the site at their own cost temporary cement godown within the mobilization time as described in NIT Clause 23, of appropriate size suitable for proper and safe storage of 3 months consumption of cement. They will also arrange at their own cost supply of water and electric power at site required by them for construction.

7. SUCCESSFUL E-TENDERER TO PROVIDE EVERYTHING NECESSARY

The successful e-tenderer shall provide everything necessary for the proper execution of the works according to the true intent and meaning of the drawings and specifications and bill of quantities taken together, whether the same may or may not be particularly shown on the drawings or described in the specifications or included in the bill of quantities, provided that the same is to be reasonably inferred there from and if he finds any discrepancy in the drawings, or between the drawings and specifications and bill of quantities, he shall immediately refer the same to the Engineer who shall decide which shall be followed. Figured dimensions shall be followed in reference to scale.

The Successful e-tenderer shall supply, fix and maintain at his cost during the execution of any works, all the necessary centering, scaffolding, staging, planking, timbering, shuttering, shoring, pumping, fencing, boarding, watching and lighting by night as well as by day required for the proper execution and protection of the public and the safety of any adjacent roads, streets, cellars, vaults, eves, pavement, walls, houses, buildings and all erections, matters or thing, and they shall take down and remove any or all such centering, scaffolding, etc. as occasion shall require or when ordered to do so and shall fully reinstate and make good all matters and all things disturbed during the execution of the works to the satisfaction of the Engineer before a Virtual Completion Certificate is issued.

The Successful e-tenderer shall make his own arrangements for laying temporary water and electrical power lines including excavation if necessary so as not to cause any obstructions along locations approved by the Engineer. The water supply lines, hose pipes, electrical lines, underground or overhead etc. belonging to them should not cause damage to the property of the museum/centre including gardens, plants, flowers, hedges, flower pots in the Campus etc. Any expenditure incurred by the museum/centre due to damage so caused shall be debited to the Successful e-tenderer's account. It is their complete responsibility to ensure that the garden area and its approaches and other areas not allocated to them are not encroached upon by their men

and materials. They have to provide a fence at their cost to confine the activities of construction, labour and materials, to the construction area as approved by the Engineer or his representative. The bitumen carpeted road in front of museum/centre's office, Science and Exhibits Laboratory, Stores and Workshop or garden paths and defined areas will not be allowed to be used by their labour, materials, trucks and other modes of transport system. Their labour is not allowed to use Campus grounds for baths, calls of nature etc.

The museum/ centre shall on no account be responsible for the expenses incurred by the successful e-tenderer for hired ground or electric power or water obtained from elsewhere.

8. DRAWINGS, DESIGNS ETC.

Contract drawings are diagrammatic but shall be followed as closely as actual construction permits. Any deviations made shall be in conformity with the architectural and other service drawings.

Architectural drawings shall take precedence over electrical and other service drawings as to all dimensions.

Successful e-tenderer shall verify all dimensions at site and bring to the notice of the Engineer all discrepancies or deviations noticed. The Engineer's decision shall be final and binding.

All drawings issued by the Museum/Centre are the property of the Architects and shall not be lent, reproduced or used on any other works than intended without the written permission of the Architects.

Large size details and manufacturer's dimensions for materials to be incorporated shall take precedence over small scale drawings.

One complete set of drawing, specifications and schedule of quantities shall be furnished by the Engineer to the successful e-tenderer and the Engineer shall furnish, within such time as he may consider reasonable, one copy of any additional drawing which in his opinion may be necessary for the execution of any part of work. Such copies shall be kept on the works, and the Engineer and his representatives shall at all reasonable times have access to the same and they shall be returned to the Engineer by the successful e-tenderer before the issue of the certificate for the balance of this account under the contract.

Museum/Centre will make all efforts to give all drawings, designs, decision etc. from time to time and the successful e-tenderer shall make timely requests for the same. No claim whatsoever shall however be entertained for compensation for the delay in supply of drawings, designs, decisions, running payments, etc. from the Successful e-tenderer. Drawings shown at the time of issue of e-tenders and forming part of the contract shall indicate scope of work and drawings issued subsequently during the execution of work shall be deemed to be drawings elaborating the basic scheme. If any detailed drawings show an item for execution, which in the opinion of the successful e-tenderer is not covered under the items of the contract, he shall immediately refer it to the Engineer, for final decision. Decision of the Engineer as to whether it is an extra item or not or whether it is covered by contracts and if not what extra rate should be paid shall be final and binding on both the parties to the contract i.e. Museum/Centre and the Successful e-tenderer.

9. REFERENCE DRAWINGS & SHOP DRAWINGS

Reference Drawings

The Successful e-tenderer shall maintain one set of all drawings issued to him as reference drawing. These shall not be used at site.

All corrections, deviations and changes made at the site shall be shown on these reference drawings for incorporation in the completion drawings. All changes to be made shall be initiated by the Engineer. Uploaded drawings are tendering purpose only.

Shop Drawings

The Successful e-tenderer at his own cost shall submit to the Engineer as well as to the Architect four copies of shop drawings related to structural steel work, Aluminum door/window, bar bending schedule, Electrical work, Air conditioning work etc. for approval.

10. SCHEDULE OF RATES AND SPECIFICATIONS

Specifications as attached herewith shall be applicable. However, the e-tenderer shall include in his rates all such items of work which are not specifically included in the e-tender schedule but are required to be executed to complete the works in accordance with the drawings, specifications etc. The Museum/Centre is not bound to follow the practice and mode of measurements followed by other departments.

11. ERROR IN SCHEDULE OF QUANTITIES, IF ANY

Should any error appear in the bill of quantities, other than the E-tenderer's prices and calculation, it shall be rectified by the Engineer after informing the Museum/Centre. Such variation shall constitute a deviation of the contract and shall be dealt with as hereinafter provided.

12. NOMENCLATURE OF ITEM

Nomenclatures of the items of works mentioned in the priced schedule are only a brief description of the work. The work shall have to be executed in accordance with the specifications for the work to the satisfaction of the Engineer of the work. Any omission in description will not absolve the successful e-tenderer from his responsibilities to complete the work in a satisfactory manner.

13. METRIC UNITS

The bills of quantity indicate the unit of Metric system. The mode of measurement of different items of work shall be as per details contained in specification and special conditions, with the equivalent of the units mentioned therein in Metric System.

14. CPWD/PWD SPECIFICATIONS AND I.S. CODES

CPWD/PWD specifications & relevant I.S. Code of practice shall be applicable, for all items of work.

15. ORDER OF PRECEDENCE

If any discrepancy is noticed between the conditions and specifications, drawing etc. the following would be the order of precedence:

(a) Schedule of Quantities.
(b) Notice Inviting E-tender (NIT)
(c) General Conditions of Contract (GCC)
(d) Drawings and notes thereon.
(e) Specifications for General Building (civil works) Sanitary and Plumbing, Electrical Installation, Air-conditioning, Acoustic Treatment, Furniture making and/or Wood Paneling, Elevators and Escalators, etc.
(f) CPWD/PWD Specifications & I.S. codes.

16. SETTING OUT WORK ETC.

(a) The successful e-tenderer at his own expense shall set out the works and shall be responsible for the true and perfect setting out of the same and for the correctness of the positions, levels, dimensions and alignment of all parts thereof. If at any time any error shall appear during the progress of any part of the work, the Successful e- tenderer shall at his own expense rectify such error if called upon to the satisfaction of the Engineer.

(b) All soil, filth, or other matter of an offensive nature taken out of any trench, sewer, drains, cesspool or any other place shall not be deposited on the surface, but shall be at once carted away by the Successful e-tenderer to some pit or place to be provided by him.

17. MATERIALS

All materials used for this work shall be conforming to the Specifications.

As far as practicable materials shall conform to the latest Indian Standards as amended up to -date. All materials used on the project shall be approved by the Engineer before use.

Successful e-tenderer may be required to purchase such materials of particular make or from a particular source if in the opinion of Engineer the same is necessary and is required for the proper and reasonable compliance of the specifications and in the interest of better quality of work. The fittings and accessories to be used in the work shall be presented for approval well in advance. Approved fittings shall be kept in the office of the Engineer in a mounted lockable board, to be approved by the successful e-tenderer.

(a) Storage of Materials

All materials shall be stored in a proper manner protected from natural elements so as to avoid contamination and deterioration.

Successful e-tenderer's store shall be open to inspection by the Engineer at all reasonable hours

Locations of stores and storage yards shall be approved by the Engineer prior to construction or occupation.
Successful e-tenderer shall take adequate protection of the materials against fire and other calamities.

All watch and ward staff for his work shall be appointed and maintained by the Successful e-tenderer at his own expense.

(b) Inspection and Testing of Materials

The Successful e-tenderer at his own expense shall make all necessary arrangements for carrying out tests on materials as required by the Engineer. He shall also be required to produce manufacturer's test certificates for the materials supplied by him whenever required by the Engineer. The tests carried out shall be as per the relevant Indian Standards in approved laboratories. The Museum/Centre reserves the right to appoint the testing authorities.

18. FAULTY MATERIALS AND WORK

(a) The Engineer shall during the progress of the work has power to order in writing from time to time the removal from the work, within such reasonable time or times as may be specified in the order, to any materials and/or Workmanship which in the opinion of the Engineer are not in accordance with the specifications or the instructions of the Engineer. The substitution of proper materials or any workmanship and the removal and proper re- execution of any work executed with materials or workmanship not in accordance with the drawings and specifications or instructions shall have to be forthwith carried out by the Successful e-tenderer at his own cost upon receiving such order. In case of default on the part of the Successful e-tenderer to carry out such order the Museum/Centre shall have the power to employ any other person to carry out the same and all the expenses consequent thereon or incidental thereto shall be borne by the Successful e-tenderer and shall be recovered from them by the Museum/Centre from any money due to or that may become due to the Successful e-tenderer or from the amount of retention money.

(b) In lieu of rectifying the work not done in accordance with the contract the Engineer may, with the consent of the Museum/Centre allow such work to remain, and in that case may make allowance for the difference in value together with such further allowance for damage to the Museum/Centre as in their opinion may be reasonable.

Provided always that nothing in this clause shall relieve the Successful e-tenderer from his liability to execute the works in all respect in accordance with those terms and upon and subject to the conditions of this contract or from his liability to make good all defects.

19. ACCESS

The Museum/Centre or its representatives shall at all reasonable time have free access to the works and/or to the workshops factories or other places where materials are being prepared or constructed for the contract and also to any place where materials are lying or from which they are being obtained and the Successful e-tenderer shall give every facility to them for inspection, examination and testing of the materials and workmanship. Except the representative of Public Authorities and those mentioned above, no person shall be allowed on the works at any time without the prior written permission of the Engineer or the Museum/Centre.

If any work is to be done at a place other than the site of works the Successful e-tenderer shall obtain prior written permission of the Engineer for doing so.

20. DEFECT LIABILITY PERIOD AND DEFECTS AFTER COMPLETION

Defect Liability, Period shall be **one year** from the date of virtual completion of work, as certified by the Museum/Centre. Any defect, shrinkage or other faults, which may appear within the defect liability period, in the opinion of the Engineer, arising from materials or workmanship not in accordance with the contract or from failure to take due precautions, shall upon the directions in writing of the engineer and within such reasonable time as shall be specified therein be amended and made good by the Successful e-tenderer at his own cost. In case of default, the Museum/Centre may employ and pay any other person/person to amend and make good such defect, shrinkage or other faults and all damage, loss and expenses consequent thereon or incidental thereto shall be made good and borne by the Successful e-tenderer.

Such damage, loss and expenses shall be recoverable from the Successful e-tenderer by the Museum/Centre or may be deducted by them from any money due or that may become due to the Successful e-tenderer. The Museum/Centre may also in lieu of such amendments deduct from any money due to the Successful e-tenderer, a sum to be determined by the Engineer equivalent to the cost of amending such works, and in the event of the amount retained under Clause 32 (the amount held as retention money) being insufficient, recover the balance from the Successful e- tenderer, together with expenses the Museum/Centre may have incurred in connection therewith.

The Successful e-tenderer shall remain liable under the provisions of this clause notwithstanding the signing by the Engineer of any certificate or the passing of any bills.

21. OPENING OF WORK

(a) All works under or in course of execution or executed in pursuance of the contract shall at all times be open to the supervision of the Museum/Centre, Engineer or their representatives.

(b) The Successful e-tenderer shall notify the Engineer in writing immediately after the trenches or excavations, as shown in the drawings, are executed or as soon as any ground is cut into which from unexpected causes, appears to need immediate attention. After notifying the Engineer he shall await instructions which shall be given within seven days of receipt of such notice. If the Successful e-tenderer puts in, any part of the foundations before he has notified the Engineer and received instructions, he shall be liable to reinstate all work that may subsequently at any time, be damaged on account of any defect or insufficient foundations. The Successful e-tenderer shall at the request of the Engineer, within such time as indicated by the Engineer, shall open up for inspection any other work and should the Successful e-tenderer refuse or neglect to comply with such request, the Museum/Centre through the Engineer may employ other workmen to open up the same. If the work has been covered up in contravention of Engineer's instructions, or if on being opened up, be found not in accordance with the drawings and specifications or the instructions of the Engineer, the expenses of opening up and covering it up again, whether done by the Successful e-tenderer or such other workmen shall be borne by or be recoverable from the Successful e-tenderer or may be deducted from any money due or which may become due to the Successful e-tenderer or from the amount held as retention money. If the work has not been covered up in contravention of such instructions, and be found in accordance with said drawings and specifications or instructions, the expenses aforesaid shall be borne by the Museum/Centre and shall be added to the contract sum provided always that in the case of foundations or of any other urgent work so opened up and requiring immediate attention, the Engineer shall within seven days after receipt of written notice from the Successful e-tenderer that the Work has been so opened, make or cause to make the inspection thereof and at the expiration of such time if such inspection shall not so have been made, the Successful e-tenderer may cover the same and shall not be required to open it up again, except at the expense of the Museum/Centre.

22. WORK IN SUBSOIL WATER/RAIN WATER/WATER

If during execution of work, sub-soil water is met with, or water enters the working space due to rains or any other cause, the Successful e-tenderer shall do dewatering using pumps or manual labour and also carry out additional work consequent thereupon, including shoring, strutting, work in liquid mud, sludge etc. without extra payment.

23. HEIGHTS

Successful e-tenderer's rates shall include lifts up to all heights given in drawings or as required during execution. They should satisfy themselves for correctness and allow for variation if necessary. Nothing extra will be paid for additional lifts except where special items for lifts exist in schedule. E-tenderer shall include in his e-tender rates allowance for works at extra heights required for double or multiple staging, tall cantering, scaffolding etc. for all items including extra labour if any. If any deviation from the contract drawings in respect of height is noticed by the e- tenderer in any subsequent working drawing issued to him during continuance of the works that must be brought to the notice of the Engineer (in writing) sufficiently before commencing execution of the work. The decision of the Engineer as to whether this will be an extra item or not or whether the Successful e-tenderer is entitled to get any extra payment or not for execution of this extra height will be final and binding.

24. SCAFFOLDING, CENTERING & SHUTTERING

The Successful e-tenderer shall use external scaffolding to ensure true line in vertical and horizontal planes. Centering, shuttering and scaffolding required for execution of this work may vary from single floor height to multi-floor heights, which may require multiple staging, scaffolding, centering and shuttering. Since the payments will be made to the successful e-tenderer at net quoted rates, irrespective of the heights involved the e-tenderers must see and study the drawings carefully before e-tendering their rates.

25. GLAZING

If glass of required thickness is not available in the market the successful e-tenderer shall have to use next higher thickness available without any extra payment. Rate for glazing shall include for providing and fixing either clear or frosted glass as shown in drawings or as directed by the Engineer.

26. WOOD WORK

Sizes mentioned in schedule of quantity or in drawings are the finished sizes. Successful e- tenderer shall allow necessary increase in sizes for planning required. In case the sizes of wooden members fixed are less than the one shown in the drawing schedule of quantity allowing for tolerance, payment will be made for actual size used at site. The rate quoted shall also include the allowance for curved or tapered or any other shape of the wooden member.
Wherever the wooden member abuts against masonry/RCC work, all the unexposed surfaces of wood work shall be required to be treated with two coats of suitable ant termite paint. E-tenderer's rates shall include application of two coats of ant termite paint.

27. SITE CLEARANCE AND CLEAN UP

The Successful e-tenderer shall, from time to time clear away all debris and excess materials accumulated at the site.

After all fixtures, equipment and appliances have been installed and commissioned, they shall clean up the same and remove all plaster, paints, stains, stickers and other foreign matter of discolouration leaving the construction in ready to use condition.

On completion of all works they shall demolish all temporary storages put up by them, remove all surplus materials and leave the site in a broom clean condition.

28. RATES

The rates quoted by the Successful e-tenderer shall be paid at net rates. He should include in his rates allowance for increase or decrease in the prices due to market fluctuation. He shall not be entitled to any separate amount on account of GST, other taxes, labour cess or any other cess, duties, etc., which are in force or will be enforced or enhanced by Government or local bodies during contract period or after e-tendering. Accepted e-tender rates shall not be changed due to changes in wages of labour either.

29. QUANTITIES

All the quantities given in schedule of quantities are provisional.

The e-tenderers shall be deemed to have given Balanced Rates for each item, irrespective of the quantities given. Also irrespective of variation in quantities to any extent the e-tenderer shall be paid at accepted contract rates only. Museum/Centre reserves the right to increase or decrease quantities to any extent.

30. ESCALATION CLAUSE

(This clause is deleted & not applicable for this tender)

31. SECURED ADVANCE

(a) The Successful e-tenderer shall not be entitled to be paid for the materials brought to site, which remains unused or unfixed. The Engineer, with the concurrence of the Museum/Centre may pay an advance up to 85% of the cost of such material as calculated from the respective e-tender item. When in any certificate, of which the Successful e-tenderer has received payment the value of material at site has been included, such materials shall become the property of the Museum/Centre but the Successful e-tenderer shall be liable for any loss or damage to any such material. They shall furnish an indemnity bond in the prescribed form along with their claim for advance against materials brought to site for bonafide use in specific items under the schedule of quantities.

(b) The secured advance so paid shall be adjusted in the running account bills as and when the materials are used subject to wastage.

(c) If the specification or schedule of quantities of the work provided use of any special description of materials to be supplied by the Museum/Centre or it is required that the Successful e-tenderer shall use certain stores to be provided by the Museum/Centre, such materials and stores and the price to be charged therefore as hereinafter mentioned, being so far as practicable for the inconvenience of the Successful e-tenderer but not so as in any way to control the meaning or effect of this contract, the Successful e-tenderer may be supplied with such materials and stores as and when required from time to time to be used by him for the purpose of the Contract only, and the value of the full quantity of material and stores supplied at the rates specified in the said schedule appendix memorandum may be set off or deducted from any sum then due or thereafter to become due to the Successful e-tenderer under the contract or otherwise, or from the retention money or against the sale proceeds thereof, if the same is held up in Government Securities, the same or sufficient portion thereof being in this case sold for the purpose. All materials supplied to the Successful e-tenderer by the Museum/Centre shall remain absolute property of the Museum/Centre. The Successful e-tenderer shall be fully responsible for their storage and maintenance and shall not on any account remove those from the site of the work. The material shall at all times be open to inspection by the Engineer and/or the Museum/Centre. At the time of the completion of work or termination of the contract, or even earlier if so required by the museum/centre, the same shall be returned to them. The successful e-tenderer shall not be entitled to return any such material unless the same is, in the opinion of the Engineer of the Museum/Centre in perfectly good condition; and shall have no claim for compensation on account of any such materials so supplied to him as aforesaid being unused by him or for any wastage in or damage to any such materials.

(d) Owing to restriction in obtaining certain materials from the market, the Museum/Centre may undertake to supply certain materials at specified rates as stated in the appendix. In case of delay in supply of these materials by the Museum/Centre, the Successful e-tenderer is required to keep himself in touch with the day to day position regarding the supply of such materials from the Museum/Centre and to adjust the progress of the work in a manner that his labour do not remain idle, nor thereby lodge any claim due to or arising out of delay in obtaining such materials. No claim whatsoever shall be entertained by the Museum/Centre on account of delays in supply of these materials.

(e) The Successful e-tenderer shall ensure that only the required quantities of materials are got issued and the surplus quantities of materials, if in good condition, shall be taken by the Museum/Centre at the rates fixed in the Appendix.

(f) Essentiality Certificates/Permits/Recommendation Letters for materials available at controlled rates etc. would be given by the Museum/Centre, if required by the successful e-tenderer. It will, however, be their responsibility to obtain materials against the certificates or otherwise, and no claim on this account or any extension of time for completion of works will be entertained by the Museum/Centre. The Successful e-tenderer shall use materials thus procured exclusively in this work and for misuse, if any, he shall be solely responsible.

32. RETENTION OF MONEY

This shall mean and be 5.50% of the total value of work awarded or the gross value of the work as paid for against this contract whichever is greater including the **EMD @2.5% and Performance Security/Guarantee @ 7.5% total 10% (Performance Security/Guarantee 3%to be deposited before signing of the agreement).** The successful e-tenderer can give **Performance Security/Guarantee money through online payment or in the form of a Demand Draft / Banker's Cheque / Insurance Surety bonds / Bank Guarantee from a Commercial Bank/ Fixed Deposit Receipt issued by Nationalized/Commercial bank to be drawn or duly pledged as the case be, in favour of NEHRU SCIENCE CENTRE payable at MUMBAI.**

In case of termination of contract, this retention money shall be forfeited and amount necessary to make up this amount shall be recovered from any money due to the successful e-tenderer under this contract, or any other contract.

100% of the retention money/Security deposit without interest will be refunded to the successful e-tenderer after completion of **Defect Liability Period of one year from the date of virtual completion of work and after the successful e-tenderer has rectified all the defects pointed out to him. Material warranty to be submitted for five years including DLP.**

33. AUTHORITIES, NOTICES AND PATENTS

The successful e-tenderer shall confirm to the provision of any Act of the Legislature relating to the works, the Regulations and Bye-Laws of any corporations and of any electric and other Companies and/or authorities with whose systems the structure is proposed to be connected, and shall, before making any variation from the drawings or specifications that may be necessitated by so conforming, give to the Engineer written notice, specifying the variation proposed to be made, and the reason for making it, and apply for instructions thereon. If compliance with this clause involves any extra work not included in this contract, he shall specify these items of work and the allowance or extra payment required on their account. In case he shall not, within seven days, received such instructions, shall proceed with the work, conforming to the provision and/or regulation of bye-laws in question.

The amount claimed as an extra or whether there is an extra or not shall be decided by the Engineer and will be subject to arbitration clause if so required.

The successful e-tenderer give all notices required by the said regulations or bye-laws to be given to any authority and pay to such authority or to any public office all fees that may be properly chargeable in respect of the works and lodge the receipts with the bill.

The successful e-tenderer shall indemnify the Museum/Centre against all claims in respect of patent rights, and shall defend all action arising from such claims and shall himself pay all royalties, licence fees, damages, cost and charges of all and every sort that may be legally incurred in respect thereof.

34. DEVIATIONS

The successful e-tenderer may when authorise and when directed, in writing by the Engineer with the approval of the Museum/Centre add or omit or vary the works shown upon the drawings, or described in the specifications, or included the bill of quantities, but they shall make no addition, omission or variation without such authorisation or direction. A verbal authority direction by the

Engineer shall, if confirmed by him in writing within seven days, be deemed to have been given in writing.

No claim for an extra shall be allowed unless it shall have been executed under the provisions of Clause 33 or by the authority of the Engineer with the concurrence of the Museum/Centre as therein mentioned. Any such extra if herein referred to, as an authorised extra shall be governed by Clause 35. No variation i.e. additions or substitutions shall vitiate the contract.

35. PRICE FOR DEVIATIONS

Deviations shall be valued at the net rates contained in the E-tenderers' original e-tender or where the same may not apply direct at rates analogous to the prices therein contained. If the altered, additional or substituted work included any class of work for which no rate is specified in the contract, then the Successful e-tenderer shall within seven days of the date of receipt of the order to carry out the work, inform the Engineer with a copy to the Museum/Centre the rate which he intends to charge for such class of work with proper analysis. In the event of his not doing so, within a reasonable time before the commencement of such work, he shall not be entitled to any allowance or payment in respect of any such extra work. When such notice has been duly given, the Engineer with the consent of the Museum/Centre may agree to such a rate but if the Engineer does not agree to this rate, the Engineer may cancel his order to carry out such class of work and arrange for it to be carried out departmentally or through any other agency or in such a manner as he may consider advisable or he may decide that the Successful e-tenderer shall carry out such items of work and in such case he shall only be entitled to be paid in respect of the work carried out or expenditure incurred by him according to such rate or rates as shall be fixed by the Engineer which will, however be subject to the Arbitration Clause.

However, in respect of the rates for extra/new items, if there are any, the opinion of the Engineer as to whether it is an extra item or not, and if so, what rates should be paid shall be final and binding on the successful e-tenderer shall be derived from contract items so far as applicable and the rates which cannot be derived from contract will be fixed on the basis of actual cost of materials and labour, plus 15% as successful e-tenderers' overheads and profits on all trades except on the cost of materials supplied departmentally.

Successful e-tenderer shall not claim any idle and remobilization charge for interim delay due to late decision by the Museum/Centre. Such legitimate interim delays shall however be considered for extension of time, if any.

Furthermore, they shall submit analysis of rates with justifications for claiming extra on any deviation item at least 45 days prior to the probable date of execution of the referred item.

36. MEASUREMENTS

In case of dispute between the successful e-tenderer and the Museum/Centre as to under which item a particular work is to be measured the decision of the Engineer shall be final and binding on both the parties to the contract. If for any items, the mode of measurements is not specified the decision of the Engineer about the mode of measurement shall be final and binding on both the parties to the contract.

37. PREPARATION OF RUNNING AND FINAL BILLS

Minimum value of work for interim certificate shall be 10% of the tendered value (or less at discretion of the Museum/Centre) but not more than one running bill, in a month, if paid separately.

75% advance bill against work done but unmeasured and adjustable fully in the next running bill may be certified by the Engineer, at his discretion in the interest of the work.

The Engineer or his representative shall take measurements in presence of Successful e-tenderer's representative and record them in the Measurement Book from time to time and shall prepare abstract for running and final bill, including recovery statements. The bill abstract shall be prepared on standard CPWD form on the basis of abstract of quantities prepared by the Engineer in triplicate. The Successful e-tenderer should sign the bill and Measurement Book with the remark "Measurement and bill accepted". However, in the final bill, the successful e-tenderer shall have to certify – "The bill is accepted in full and final settlement of all claims and demands against this work".

In case a large amount is blocked in the final bill pending technical/audit check, advance up to the extent of 75% of net final bill amount may be paid to the successful e-tenderer, with the approval of the Engineer at his direction even after the completion date is over.

The recovery from Running Account Bills for the materials issued by the Museum/Centre shall be made on the basis of the quantity consumed in the work as assessed by the Engineer, giving a due allowance for wastage. The Successful e-tenderer shall submit once a month a statement showing the materials received, consumed and the balanced carried over to the subsequent month so that a watch could be maintained on the material.

38. CERTIFICATES AND PAYMENTS

(a) The Engineer may from time to time intimate in writing to the Successful e-tenderer that he requires the works to be measured and they shall attend or send qualified agent to assist the Engineer or the Engineer's representative in taking such measurements, and calculations and to furnish all particulars or to give all assistance required by the Engineer. Should they not attend or neglect or omit to send such agent then the measurement taken by the Engineer or approved by him shall be taken to be correct measurements of the work unless objected to within one month of their being recorded in the measurement book or books. Such measurements shall be taken in accordance with the mode of measurements mentioned in the specifications.

(b) The Successful e-tenderer or his agents may at the time of measurement take such notes of measurements as they may require.

(c) The Engineer or his authorised representative will issue on the basis of necessary measurement interim valuation certificates to the Successful e-tenderer in respect of items of work, rates for which exist in the priced schedule of quantities or have been subsequently agreed upon between the parties, and shall send the measurement books and the valuation certificates to the Museum/Centre. The Successful e-tenderer shall be entitled under these certificates of the Engineer to payments, within 15 days from the date of each certificate, unless objected as provided in sub-clauses (a) & (b) at the rate of maximum 90% of the value of work so executed and the balance being retained towards retention money. The engineer shall issue such certificates within fifteen days of notice from the Successful e-tenderer provided measurements have been taken and the value of the work done since last payment exceeds the amount stated in the appendix and not more than one certificate is required in a fortnight, provided always that the issue by the Engineer of any certificate during the progress of the work or after their completion shall not have any effect as a certificate of satisfaction or relieve the Successful e-tenderer from his liability under Clause 20 and 21. Provided all defects are removed and the retention money is not forfeited or has not become liable to be forfeited under this contract, 100 % of the amount under retention money shall be refunded without interest after one year of defect liability period is over from the date of virtual completion of the works or the final bill is passed for payment whichever is later.

(d) All intermediate payments shall be recorded as payments by way of advance against the final payment only and not as payment for work actually done and completed. The final bill shall be submitted by the Successful e-tenderer within 3 months of the date fixed for

completion of the work. The measurement of the work taken by the Engineer or his representatives after one week's notice to the Successful e-tenderer shall be final and binding on him unless objected to within one month of their being recorded in the measurement books.

(e) The Museum/Centre may in consultation with the Engineer, but absolutely at his discretion, make an advance payment on account, which will be merged in the next intermediate payment, based on measurements.

(f) Advance for materials brought to site: The Successful e-tenderer shall execute a bond in favour of the Museum/Centre in the prescribed format attached hereto for each advance or intermediate payment received by him. If the Successful e-tenderer commits any default in the terms of the said bond and he fails to pay the bond amount, the Museum/Centre shall have the power to:

(i) Seize and utilise the said materials or any part thereof for the completion of the works.

(ii) Remove and sell by public auction the materials seized or any part thereof, and out of the proceeds of the sale, retain all sums repayable to the Museum/Centre together with interest thereon at the rate prescribed by Govt. of India from time to time for capital outlays.

(iii) Deduct all or any part of moneys owing from out of the retention money or any other sum or sums due to the Successful e-tenderer under this agreement.

(g) The Successful e-tenderer agrees that before final payment shall be made on the contract, he will sign and deliver to the Museum/Centre either in the measurement books or otherwise as required, a valid release and discharge certificate from any and all claims and demands whatever from the Museum/Centre for all matters arising out of or connected with the contract.

39. TIME AND DAMAGES FOR NON-COMPLETION OF WORK IN TIME

(a) All the construction works shall progress strictly as per the enclosed CPM/PERT/BAR CHART. If however, the Successful e-tenderer desires some minor modifications in the same he may apply to the Museum/Centre within mobilisation time and before execution of the agreement indicating the reasons for which changes are required. The Museum/Centre may after scrutiny, agree to the modifications suggested if the reasons cited by the successful e-tenderer are considered valid. The decision of the Museum/Centre in this respect will be final and binding. The modifications, if any, are to be incorporated in the CPM/PERT/BAR CHART and this will form a part of the agreement.

(b) The starting time specified for carrying out of the work as entered in the CPM/PERT/BAR CHART shall be reckoned from the date of issue of the Letter of Intent. The date of completion or such date as is duly extended under Clause 40 shall be strictly observed by the Successful e-tenderer. The work shall, throughout the stipulated period of the contract, be proceeded with all diligence (Time being deemed to be the essence of this Contract) by the successful e-tenderer strictly according to the CPM/PERT/BAR CHART which is a part of this agreement.

(c) At any stage during the execution of the work if the work lags behind the target indicated in the CPM/PERT/BAR CHART for reasons directly attributable to the Successful e-tenderer, he shall be liable to pay as agreed liquidated damages equivalent to half percent of the total cost of work awarded every week for the period the work lags behind the CPM/PERT/BAR CHART subject to a maximum of 10% of the total value of work, awarded or gross value of work done, whichever is greater.

(d) In the event of Successful e-tenderer's inability to complete the construction work by the scheduled date of completion, the Museum/Centre shall have the right to terminate the contract as per Clause 42 or allow the successful e-tenderer to continue and complete the work within specific date. In the latter case, during the period of continuation, the successful e-tenderer shall pay as agreed liquidated damage equivalent to one per cent of the total cost of work awarded for every week that the work remains unfinished subject to a maximum of 10% of the total value of work awarded or gross value of work done, whichever is greater.

40. EXTENSION OF TIME

If the successful e-tenderer shall desire an extension of time for completion of the work on the grounds of his having been unavoidably hindered in its execution and for reasons not attributable to him on the following grounds:-

(a) by reason of any exceptionally inclement weather like Cyclone, severe flood etc., normal monsoon shall not be considered a valid reason for extension of time,

(b) by reason of proceedings taken or threatened by, or legal disputes with adjoining or neighbouring owners,

(c) due to delay in the work of other agencies or tradesman engaged or nominated by the museum/centre: if such delay is directly responsible for delay in execution of this work,

(d) by reason of any general strike or lockout affecting the building made, strike or any kind of labour trouble in successful e-tenderer's own organisation shall not be a valid reason for extension,

(e) in the event of delay in execution of work wholly attributable to delay in supply of drawings by Architect or Museum/Centre in spite of request from the successful e-tenderer well in advance, he shall apply in writing to the Engineer within seven days of the date of the hindrance on account of which he desires such extensions as aforesaid and the engineer, with the consent of the Museum/Centre may if reasonable ground be shown therefore allow such extension of time, if any, be necessary or proper,

(f) in case of the total value of the work exceeds the total value of the e-tender owing to deviation in quantities or extra items, the successful e-tenderer will be entitled to ask for extension of time in proportion to the increased value of work. Increase in value of work due to escalation as per Clause 30 shall not be a valid reason for extension of time.

(g) No extension of time shall be given to the successful e-tenderer for non-supply or delay in supply of cement and/or steel as per Clause 56. The successful e-tenderer hereby agrees that extension of time requested for by him and granted by the Museum/Centre shall be treated as an extension of time allowed to them without any claim for compensation or damages for any reasons whatsoever including those for which the extension is granted.

If an extension of time is granted by the Museum/Centre for reasons of delay either attributable or not attributable to the successful e-tenderer as indicated above then it shall be without any escalation.

41. SUSPENSION OF WORK BY THE SUCCESSFUL E-TENDERER

If the successful e-tenderer suspends the works without obtaining extension of time or in the opinion of the Engineer neglects or fails to proceed with due diligence in executing his part of the contract or if he makes default more than once in the manner mentioned in Clause 20 above the Museum/Centre or the Engineer shall have power to give notice in writing to the successful e- tenderer requiring that the works be proceeded with reasonable speed and output must be

commensurate with the CPM/PERT/BAR CHART. Such notice shall specify the act of default on the part of the successful e-tenderer. After such notice has been given the Successful e-tenderer shall not be at liberty to remove from the site of work or from any ground continuous thereto any plant or materials belonging to him which had been placed thereon for the purpose of the work, and the Museum/Centre shall have a lien upon all such plants and materials to subsist from the date of such notice being given, until the notice have been complied with. Provided always that such lien shall not under any circumstances subsist after the expiration of thirty-one days from the date of such notice being given, unless the Museum/Centre has entered upon and taken possession of the works and site and of all such plants and materials until the works have been completed under the power hereinafter conferred upon it. If the Museum/Centre exercises the above power it may engage any other agency to complete the works or finish the works departmentally and exclude the successful e-tenderer, his agents and servants from entry upon or access to the same except that the successful e-tenderer or any one person appointed in writing by him and accepted by the Museum/Centre may have access at all reasonable times during the progress of works to inspect, survey and measure the works. Such written appointments marked with Museum/Centre's consent or a copy thereof shall be delivered to the Engineer before the person so appointed comes to the works. The Museum/Centre shall taker such steps as, in the opinion of the Engineer may be reasonable and necessary for completing the works without undue delay & expense, using for that purpose the plants and materials above mentioned, in so far as they are suitable and adopted to such use. Upon the completion of the works the Engineer shall certify the amount of expenses properly incurred, consequent on the incidental to the default of the successful e-tenderer as aforesaid, in completing the works by other persons. Should the amount so certified as the expenses properly incurred, including Museum/Centre's overhead if the works were carried out departmentally, be less than the amount which would have been due to the Successful e-tenderer upon the completion of the works by him, the difference shall be paid to the Successful e-tenderer by the Museum/Centre. Should the amount of the former exceed the later, the difference shall be paid by the Successful e-tenderer to the Museum/Centre. The Museum/Centre shall not be liable to make any further payment or compensation to the Successful e-tenderer for or on account of the proper use of the plants for the completion of the works under provisions hereinbefore contained other than such payment as is included in the contract price. After the works have been so completed by person other than the successful e-tenderer under the provisions hereinafter contained, the Museum/Centre shall give notice to the Successful e-tenderer of such completion and may require him from time to time, before and after such completion, to remove his plants and likewise all such materials as aforesaid as may not have been used in the completion of the works, from the site. If such plants and materials are not removed within such reasonable time, the Museum/Centre may remove and sell the same, holding the proceeds, less the cost of the removal and sell, to the credit of the successful e-tenderer. The Museum/Centre shall not be responsible for any loss sustained by the successful e-tenderer from the sale of plants in the event of the successful e-tenderer not removing it after notice, or for any damage thereto or deterioration thereof in any event.

42. DETERMINATION OF CONTRACT BY THE MUSEUM/CENTRE

If the successful e-tenderer goes into liquidation, whether voluntary or compulsory or shall make an assignment or a composition for the benefit of the greater part, or shall enter into a Deed of Agreement with its creditors or if the Receiver of the Successful e-tenderer shall be unable, within fourteen days after notice to him requiring him to do so, to show to the reasonable satisfaction of the Museum/Centre that he is liable to carry out and fulfil the contract and if so required by the Museum/Centre to give reasonable security therefore or if the successful e-tenderer shall suffer execution to be issued or shall suffer any payment under this contract to be attached by or on behalf of any of the creditors or the Successful e-tenderer or shall assign, charge or encumber this charge or encumber this contract thereunder or shall neglect or shall fail to proceed to perform all or any of the act, matters or things by the contract, to be observed and performed by the successful e-tenderer for three clear days after written notice shall have been given the successful e-tenderer in manner, matter hereinafter mentioned, requiring the successful e-tenderer to observer perform the same or shall use improper material or workmanship in carrying on the works or shall in the opinion of the Engineer not exercised such due progress as stipulated in the enclosed

CPM/PERT/BAR CHART forming part of this contract which would enable the works to be completed within the time agreed upon or shall abandon the contract, then, and in any of said cases, the Museum/Centre may notwithstanding any previous waiver, determine the contract by a notice in writing in which case the retention money (including the earnest money and the initial security deposit) and whether paid in one sum or deducted by instalment shall stand forfeited and be absolutely at the disposal of the Museum/Centre. The Successful e-tenderer shall have no claim or compensation for any loss sustained by him by reasons of his having purchased or procured any materials or entered into any engagements or made advances on account of or with a view to the execution of the work or the performance of the contract. The successful e-tenderer shall not be entitled to recover or be paid any sum for any work actually performed under the contract unless and until the Engineer will have certified in writing the performance of such work and the value of work payable in respect thereof and the successful e-tenderer shall only be entitled to be paid the value so certified. The certificate of the Engineer shall be based on measurements taken by him or under his supervision and with due notice to the Successful e- tenderer and on rates in the priced schedule or as subsequently communicated by the Engineer with the approval of the Museum/Centre, under this agreement except for arithmetical errors, shall be final and conclusive. The Successful e-tenderer must remove his plant, materials, scaffolding etc. from the site within 10 days (ten days) of the receipt of the notice from the Museum/Centre after which they will vest in the Museum/Centre who may, dispose them off as per Clause 41 by sale or auction on account of and at the risk of the successful e-tenderer who will have no claim for loss or compensation on this account.

43. TERMINATION OF CONTRACT BY SUCCESSFUL E-TENDERER

If payment of the amount payable by the Museum/Centre under the certificate of interim payment issued by the Engineer in accordance with clause 38 shall be in arrears and unpaid for sixty days after notice in writing requiring payment of the amount shall have been given by the Successful e-tenderer to the Museum/Centre in manner hereinafter mentioned or if works be stopped for six months under the order of the Museum/Centre for any reason not connected with any default on the part of the Successful e-tenderer or by any injunction or other order of any court of law made for any reasons not connected with any such default on the part of the successful e-tenderer then and in any of the said cases the successful e-tenderer shall be at liberty to terminate the contract by notice in writing to the Museum/Centre and he shall be entitled to recover from the Museum/Centre payment for all works executed and for useful materials (but not plants) purchased for the purpose of the contract and is brought to the site. In arriving at the amount of such payment, the net rates contained in the successful e-tenderer's e-tender shall be followed, or where the same may not apply, rates proportional to the prices therein contained. Rates for materials may be determined by the Engineer on actual vouchers produced by the successful e-tenderer and/or prevailing market rates at the discretion of the Engineer. The Successful e-tenderer shall not be entitled to recover or be paid any sum for any work actually performed under the contract, unless and until the Engineer has certified in writing the performance of such work and the value payable in respect thereof and the successful e-tenderer shall only be entitled, to be paid the value so certified. The certificate of the Engineer shall be based on measurements taken by him or under his supervision after due notice to the successful e-tenderer and shall be final and conclusive except for arithmetical errors The successful e-tenderer must remove his plant, materials, scaffolding etc. from the site within ten days or such time as may be extended by the Museum/Centre in writing, from the receipt of the notice from the Museum/Centre after which they will vest in the Museum/Centre who may dispose them off as per Clause 42 by sale or auction on account of and at the risk of the successful e- tenderer who will have no claim for loss or compensation on this account

44. ARBITRATION

(a) Except where otherwise provided in the contract all questions and disputes relating to the meaning of the specifications, design, drawing, and instructions hereinbefore mentioned and so to any question, claim right, matter or thing whatsoever, in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works, or the execution of the same whether arising during the progress

of the work or after the completion or abandonment thereof but excluding disputes on material and workmanship as per Clause 17 & 18 which is binding on both parties, shall be referred to the sole arbitration of a person nominated by the Director General, National Council of Science Museums and if the former is unable or unwilling to act to the sole arbitration, of some other person appointed by the Director General, NCSM willing to act as such arbitrator. The submission shall be deemed to be submission to Arbitration under the meaning of the Arbitration & Reconciliation Act, 1996 or any statutory modification or re-enactment thereof for the time being in force. The award of arbitrator so appointed shall be final, conclusive and binding on all parties to this contract.

(b) It is agreed that the Successful e-tenderer shall not delay the carrying out of the work by reasons of any reference to arbitration and shall proceed with the work with all due diligence and shall, until the decision of arbitration, abide by the decision of the Engineer duly conveyed to him.

(c) The Arbitrator(s) may from time to time with the consent of the parties, extend the time for making and publishing the award.

45. COMPENSATION

All sums payable by way of compensation or liquidated damage under any of these conditions shall be considered as reasonable compensation to be applied to the use of Museum/Centre without reference to the actual loss or damage sustained and whether or not any damage shall have been sustained.

46. WORK ON HOLIDAYS

Successful e-tenderer shall not carry out work on any Government holidays except with the permission of the Engineer. The contract period will be inclusive of such holidays.

47. WORK SUPERVISOR AND FOREMAN

The Successful e-tenderer shall keep a qualified and experienced Engineer for supervision of works to ensure best quality work. He shall also give all necessary personal superintendence during the execution of the works and as long thereafter as the Engineer may consider necessary until the expiration of the 'Defect Liability Period' stated in Clause 20 above. The Successful e- tenderer shall also during the whole time, the works are in progress, employ competent Foreman approved by the Engineer whose qualification must conform to the requirements specified by the Engineer. In special cases he shall be constantly in attendance of the building while the men are at work. Any directions, explanations, instruction or notices given by the Engineer to such Foreman shall be held to be given to the Successful e-tenderer.

48. DISMISSAL OF WORKMEN ETC.

The Successful e-tenderer shall on the request of the Engineer immediately dismiss from the works any person employed thereon who may, in the opinion of the Engineer be unsuitable or incompetent or who may in the opinion of the Museum/Centre or the Engineer misconduct himself and such person shall not be again employed or allowed on the works without the written permission of the Engineer and/or the Museum/Centre.

49. ASSIGNMENT OR SUBLETTING OR BRIBES

(a) This contract shall not be assigned or sublet without the written approval of the Museum/Centre. If the Successful e-tenderer shall assign or sublet this contract, or attempts to do so or become insolvent or commence insolvency proceedings or make any composition with his creditors or attempt to do so, or if any bribe, gratuity, gift, loan, pre-requisite award, reward or advantage pecuniary or otherwise, shall either directly or indirectly be given, promised or offered by the Successful e-tenderer, any of his servants or agents to any officer of the Museum/Centre or to person who shall become in any way

directly or indirectly interested in the Contract, the Museum/Centre may thereupon by notice in writing rescind the contract and the retention money of the Successful e-tenderer shall thereupon stand forfeited and be absolutely at the disposal of the Museum/Centre, and the same consequences shall ensure as if the contract had been rescinded under Clause 42 thereof and (in addition) the Successful e-tenderer shall not be entitled to recover or to be paid for any work therefore actually performed under the contract.

(b) The whole of the works including the contract shall be executed by the Successful e-tenderer and he/they shall not directly or indirectly transfer or assign or underlet the contract or any part, share or interest therein nor shall he take a new partner without the written consent of the Museum/Centre and no subletting shall relieve the Successful e- tenderer from the full and entire responsibility of the contract or from active superintendence of the works during the progress.

50. OTHER PERSON ENGAGED BY MUSEUM/CENTRE

The Museum/Centre reserves the right to use the premises and any portion of the site for the execution of any work not included in this contract, which he may desire to have carried out by other persons, and the successful e-tenderer shall allow all reasonable facilities for the execution of such work, but is not required to provide any plant or materials for the execution of such works except by special arrangement with the Museum/Centre.

51. OTHER AGENCIES AND PROVISIONAL SUMS

(a) The Successful e-tenderer is to afford all reasonable facilities to all other agencies, sub-agencies, specialists, merchants, tradesman and others who may at any time be appointed by the Engineer with the consent of the Museum/Centre for executing any work or supplying any goods relating to the constructions, servicing, equipping or furnishing of the building under construction or in the compound. In case of delay in completion of his work due to other agencies' work, the Successful e-tenderer shall only have a right to ask for extension of time but no other claim on this or any other account shall be entertained by the Museum/Centre.

(b) If any provisional sum is included in the bill of quantities, they are to be deducted wholly if not required or in part the Museum/Centre reserves to itself the right to appoint any agency to do the work allowed for in provisional sums and the successful e-tenderer shall not have any right to claim any profits on this account.

52. LABOUR WAGES AND REGULATIONS

Notwithstanding any contained in the conditions of this contract the Successful e-tenderer shall comply with the provision of the contract labour (Regulation & Abolition) Act 1970 and various rules framed thereunder by different State Government, in respect of all labourers directly or indirectly employed by the Successful e-tenderer in the works through labour contracts or otherwise the Successful e-tenderer shall be considered as "Principal Employer".

The Successful e-tenderer agrees to grant Provident Fund benefits in accordance with Employees Provident Fund Act 1962 and Scheme thereunder to his workers. The successful e-tenderer shall pay not less than "fair wages" to labourers engaged by him on the work. No labour below the age of fourteen years shall be employed. The successful e-tenderer shall at his own expense provide or arrange for provision of footwear for any labour doing cement mixing work.

53. INSURANCE FOR DAMAGE TO PERSON AND PROPERTY

(a) The Successful e-tenderer shall be responsible for all injury to persons, animals or things and for all damages to property, structural and decorative, whether such injury or damage arise from carelessness or accident or in any way connected wherewith. This clause shall

be held to include, *inter alia*, any damage due to causes as aforesaid to buildings (whether immediately adjacent or otherwise) and to roads, streets, footpaths, bridges or ways as well as all damage caused to the buildings and works forming the subject of this contract by the inclemency of weather. The Successful e-tenderer indemnifies the Museum/Centre and holds him harmless in respect of all expenses arising from such injury or damage to person or property aforesaid and also in respect of any claim made in respect of injury or damages consequent upon such claim.

(b) The successful e-tenderer shall reinstate all damage of every sort mentioned in this clause, so as to deliver up the whole of the contract works complete and perfect in every respect and so as to make good and otherwise satisfy all claims for damage as aforesaid to the property or third parties.

(c) The Successful e-tenderer also indemnifies the Museum/Centre against all claim which may be made upon the Museum/Centre during the currency of this contract by any employee or representative of an Employee of the agency, or any sub-agency, employed by him, for any injury to or loss of life or such employees, or for compensation payable under any law for the time being in force to any workman or to the representative of any deceased or incapacitated workmen.

(d) The Successful e-tenderer also indemnifies the Museum/Centre in respect of any costs, charges and/or expenses, including legal costs as between Solicitor and client, occurring out of any award of compensation and/or damages consequent upon such claims.

(e) The Museum/Centre shall be at liberty and is hereby empowered to deduct the amount of any damages, compensation cost, charges and/or expenses arising or ascertaining from or in respect of any such claim and/or damages as aforesaid from any sum, or sums due to, or become due to the Successful e-tenderer.

54. NOTICE

Notice for the Museum/Centre, the Engineer or the Successful e-tenderer may be served personally or sent by registered post addressed to the office of the Museum/Centre or the last known place of business of the Engineer and the Successful e-tenderer or in the case of the successful e-tenderer also be being left on the works. Any notice sent by registered post shall be deemed to be served at the time when in the ordinary course of post it would be delivered.

55. APPOINTMENT OF APPRENTICES AS PER APPRENTICES ACT

The Successful e-tenderer shall during the currency of the contract when called upon by the Engineer engage and also ensure engagement by sub-agencies and other employed by the successful e-tenderer with the works such number of apprentices in categories mentioned below and for such periods as may be required by the Engineer. The Successful e-tenderer shall train them as required under the Apprentices Act 1961 and the Rules made thereunder and shall be responsible for all obligations of the Museum/Centre under the said act including the liability to make payments to apprentices as required under the said Act.

(a) **In Respect of Civil works**

(i)	Brick Layer	: One apprentice for every 7 person engaged in this category
(ii)	Building Construction	: One apprentice for every 7 person engaged in this category

(iii) Carpenter : One apprentice for every 7 person engaged in this category

(iv) Surveyor : One apprentice for every 14 person engaged in this category

(b) **In respect of Sanitary and Water Supply**

Plumber : One apprentice for every 2 person engaged in this category

(c) **In respect of Electrical Works**

Wireman : One apprentice for every 7 person engaged in this category

The Successful e-tenderer shall comply with the provision of Apprentices Act 1961 and Rules and Orders issued hereunder from time to time.

If the Successful e-tenderer fails to do so, his failure will be deemed to be a breach of contract and the Museum/Centre reserves the right to cancel the contract. The Successful e-tenderer also shall be liable to any pecuniary liability arising on account of any violation by him of the provisions of the Act.

56. CEMENT & STEEL (for civil works only)
(This clause is deleted & not applicable for this tender)

57. REGARDING WEIGHT OF MATERIALS SUPPLIED BY THE MUSEUM/CENTRE (for civil works only)
(This clause is deleted & not applicable for this tender)

58. RETURN OF STEEL (for civil works only)
(This clause is deleted & not applicable for this tender)

59. CEMENT CONSUMPTION (for civil works only)
(This clause is deleted & not applicable for this tender)

60. CONCEALED R.C.C. BEAMS/LINTELS (for civil works only)
If in R.C.C. slab extra bars or steel cage is provided to act as a lintel or beam over an opening, the same will be measured as slab and not as beam/lintel. If in case of R.C.C. wall, extra bars or steel cage is provided to act as a lintel or beam over an opening, the same will be measured as wall and not as lintel/beam. R.C.C. column integrated in shear wall shall be measured as wall if of same thickness, and as R.C.C. column if its thickness is more than that of shear wall.

61. PROJECTION (for civil works only)
Slab projection from the face of wall/column shall be measured under item R.C.C. work in slabs and not under item R.C.C. work in chajjas.

62. DRIP GROOVE (for civil works only)
The Successful e-tenderer shall provide drip groove at all ends of slabs/lintels/beams, if required, to protect rain water from entering inside the boundary of the structure, within quoted rates of R.C.C. work

63. PLASTERING ON RCC SURFACE (for civil works only)

Wherever R.C.C. surface are to be plastered to bring it in line with the brick and/or stone wall plaster of the same mix, payment for such plaster, will be made under the item of plastering only irrespective of the fact whether there is any increase due to odd or even surface of brick or stone work below and/or adjoining it.

64. M.S. REINFORCEMENT (for civil works only)

Rate quoted for placing in position and fabrication of mild steel/ribbed tor/TMT steel reinforcement should include for straightening and cleaning including removing the rust of the bars at works site, cutting, cranking, hooking hoisting at required levels, cost of providing binding wire of 18 to 20 SWG etc. complete and no separate payment will be made on this account. Payment for reinforcement, however, to be considered on the basis of measurement as per drawing plus standard laps actually provided at site, plus chairs and spacing bars allowed by the Engineer.

65. BRICK WORK (for civil works only)

Rate shall include for tapering of bricks over column footings, over walls, steps, etc. and for exposed brick work, or any other work. Rate for brick work also includes work in pillars and small horizontal courses.

66. BRICK WORK(S) HEIGHTS/DEPTHS (for civil works only)

The height or width of foundation steps and superstructures will be measured as per actuals. The successful e-tenderer shall use suitable bricks and adjust the thickness of mortar joints to make up the widths or heights as per drawings, with due regard to size of brick available.

67. EARTHWORK

The measurements of earthwork in trenches for foundation, sewer lines etc. shall be made according to the section of trenches shown on the drawing. The successful e-tenderer shall include in his rate excavating for stepping and slopping back, working space for workmen as found necessary on account of condition of soil. Excavation so made in excess shall not be measured & paid for.

Annexure – 'B'

(Ref.No:फ़ाइल संख्या: NSCM//Elec/B-ब्लॉक-फेकेड/2025–26)
WORK: 'Design, Manufacture, Supply, Installation, Testing, Commissioning & Maintenance Works'
for the B Block of Nehru Science Centre, Mumbai
(Format for Declarations & Undertaking to be typed on bidder agency's letterhead and to be submitted in Part –I (TECHNICAL ENVELOPE) of the e-tender document)

DECLARATION -1

This is to certify that neither I/we/any of us is in anyway related to any employee in the National Council of Science Museums, Kolkata or any of its constituent units.

Date: (Signature of the tenderer)
with company seal/rubber stamp

Place:

DECLARATION -2

I/We hereby declare that I/we have not quoted any extra condition along with the Part-II (FINANCIAL ENVELOPE) of the e-tender.

Date: (Signature of the tenderer)
with company seal/rubber stamp

Place:

UNDERTAKING

This is to certify that I/we have carefully gone through the specifications, given in the e-tender document & have clearly understood the site working conditions, time schedule given and have accordingly quoted my balanced rates after going through all details.

I/we hereby give an undertaking that I/we shall carryout the work strictly as per the given specifications, and shall complete the same within the stipulated time frame.

I/We also undertake that the physical EMD instrument shall be deposited by me/us with the office of **Nehru Science Centre, Dr. E Moses Road, Worli, Mumbai-400018** inviting the e-tender before the bid opening date otherwise the **Nehru Science Centre, Mumbai** inviting the e-tender may reject the bid and also take action to withdraw my/our enlistment or debar me/us from further tendering in NCSM or its constituent units.

Date: (Signature of the tenderer)
with company seal/rubber stamp

Place:

All works shall be carried out as per the relevant IS codes, IE rules & CPWD Specifications unless otherwise stated.

1. Water and Electricity required for the work shall be arranged by the Contractor at their own cost.

2. Bidders/Tenderers should acquaint themselves fully with the description of work, scope of services, time schedule and terms & conditions including all the provisions of the tender document before framing up their tender.

3. Bidders/Tenderers are requested to seek clarification(s) on drawings, designs & specifications, if any, from NCSM office before quoting.

4. Bidders/Tenderers should inspect and examine the site and its surroundings and satisfy themselves before submitting their tenders as to nature of work, site conditions, means of access to the site etc. Non-familiarity with the site conditions will not be considered a reason either for extra claims or for not carrying out the work in strict conformity with the specifications.

5. Bidders/Tenderers possessing & uploading the documents as detailed under various ELIGIBILITY, EXPERIENCE and STATUTORY DOCUMENTS REQUIREMENT CRITERIA will only be technically qualified and considered for opening of their price bids. Technically qualified bidders have no right to claim for award of the work. **Nehru Science Centre, Mumbai** reserves the right to cancel or award the work to any bidder/tenderer.

6. **Bidders/Tenderers are advised to submit the tender strictly based on the terms and conditions and specification contained in the NIT/Tender Documents and not to stipulate any deviations. Conditional tenders are liable to be rejected.**

7. **Nehru Science Centre, Mumbai** does not bind itself to accept the lowest bid/tender. The NSCM also reserves the right to accept or reject any tender in part or full without assigning any reason whatsoever.

8. The NSCM also reserves the absolute right to reject any or all the tenders at any time solely based on the past unsatisfactory performance by the bidder(s) and the opinion/decision of the NSCM regarding the same shall be final and conclusive.

9. No corrections or overwriting will be entertained in schedule of rates by using correcting fluid. All correction in the schedule of rate should be initialed.

10. The quoted rates shall be inclusive of all taxes & duty including GST, LW Cess, IT GST, TDS GST etc cost of all material & accessories for erection, connections, testing, commissioning; required labour including skilled manpower for execution and supervision of the work; tools, tackles, plant & machineries required for the work including their transportation; etc. All contingencies, breakage, wastage, sundries, scaffolding, etc. complete shall also be taken care of in the quoted rates.

11. The rates quoted by bidder/tenderer shall remain firm till completion of all works even during the extended period, if any, on any account what so ever. It may be noted that no deviation on this account will be acceptable and offer not containing firm price shall not be considered.

12. In case of discrepancy between Schedules of quantities, the Specifications and / or the Drawings, the following order of preference shall be observed.
    a) Description in Schedule of Quantities.
    b) Technical/Particular Specifications and Special Conditions, if any.
    c) General Specifications.

13. If there are varying or conflicting provisions made in any one documents forming part of the Contract, the Accepting Authority shall be the deciding authority with regard to the intention of the document.

14. Any error in description, quantity or rate in Schedule of Quantities or any omission there from shall not vitiate the Contract or release the Contractor from the execution of the whole or any part of the Works comprised therein according to drawings and specifications or from any of his obligations under the Contract.

15. During working at site, some restrictions may be imposed by Engineer- in-Charge/Security staff of the Centre/Council or Local Authorities regarding safety and security, etc., the Bidder/Tenderer shall be bound to follow all such restrictions/instruction & nothing extra shall be payable on this account.

16. No compensation shall be payable to the Bidder/Tenderer for any damage caused by rains lightning, wind, storm, floods tornado, earth quakes or other natural calamities during the execution of work. They shall make good all such damages at their own cost; and no claim on this account will be entertained.

17. No labour hutment shall be allowed in the premises. All labourers should leave the site after the day's work. The security, Watch & ward of the onsite contractor's materials/work etc. shall be at his cost only.

18. All rates quoted by the bidders/tenderers shall remain firm for the contract period/extended contract period.

19. If the bidder/tenderer fails to proceed with the work within the stipulated time as specified from the date of issue of letter of intent/letter to proceed with the work, the NCSM shall forfeit the earnest money deposited by them along with the tender.

20. The earnest money/security deposit will be forfeited if the bidder/tenderer fails to start/complete the work within stipulated time which will be mentioned in the acceptance letter.

21. The bidder/tenderer shall be fully responsible for any injury or damaged caused to the workmen deployed at site for carrying out the work and NCSM has nothing to do with such happenings and in no way shall be held responsible for the same.

22. All safety provision required for the work sg=hall be taken by the successful bidder and the successful bidder shall provide all necessary safety equipment/accessories like Helmet, Safety Shoes, Safety Belt etc. to it's workmen during execution of works as the requirement. Also, compliances of all the labour laws, Insurance for the workmen/labour and/or third party insurance etc. shall be the sole responsibility of the successful bidder/tenderer.

23. The successful bidder will have to prepare detailed **SHOP DRAWINGS** in AutoCAD or similar CAD format taking guidance from our tender drawing and submit for seeking approval for the same from the project Architect/Consultant before actually starting the work at site.

24. All civil works related to Electrical Installation Work shall be carried out by the Bidder/Tenderer themselves and nothing extra on this account shall be considered or paid. Wherever, some wall breakages for passing cables/strips or air-conditioning services viz. Refrigerant piping, drain water piping, etc. are required, the same shall be done by the with utmost care to prevent damages to the existing walls/structures/services and **mending good such breakages/damages will be the responsibility of the Work executing agency itself within their quoted rates/costs.**

25. **The Work executing agency will have to work in close co-ordination & co-operation with various other agencies working at site** viz. Civil Contractor, Electrical/Air-conditioning Contractor, etc. and **particularly the agency working for FALSE CEILING and WALL PANELLING/PARTITION Works** for proper workmanship & finish of the WORKS.

26. The drawings attached with the NIT are for tender purpose only and are subjected to change / modification subsequently as per site condition(s).

27. On completion of the work, the successful bidder will also have to submit 3 hard copies of the **AS BUILT DRAWINGS** as well as their soft copy in AutoCAD or similar CAD format.

-x-x-x-

TECHNICAL SPECIFICATIONS FOR ELCTRICAL INSTALLATION WORK

1. INTERNAL WIRING

1.1 SYSTEM OF WIRING

The system of wiring shall consist of PVC insulated copper stranded conductor flexible FRLS wires in non-metallic (Rigid medium Duty ISI -marked fire retarded PVC Conduits of minimum 2mm Wall thickness and Sizes starting from 25mm diameter conduits and shall be concealed or surface mounted above false ceiling as called for.

1.1.1 GENERAL

Prior to laying and fixing of conduits, the contractor shall prepare the conduiting layout by marking all conduit routes for approval by the Engineer/Consultant, carefully examine the working drawings prepared by him and approved by the Engineer/Consultant indicating the layout, satisfy himself about the non-interference of the routes, sufficiency of number and sizes of conduits, location of junction boxes, sizes and location of switch boxes and other relevant details. Any discrepancy found shall be brought to the notice of the Engineer-in-charge. Any modifications suggested by the contractor should get written approval before the actual laying of conduits is commenced.

In laying of conduits it is important that **not more than two right angle bends** are provided for each circuit without a pull box. No junction box shall be provided in the entire length of conduit run for drawing of wires. Only switch outlets, lighting fixture outlets, equipment power outlets and socket outlets shall be considered for drawing of wires.

1.2 PVC CONDUIT AND ACCESSORIES

PVC Conduit

Conduits and accessories shall conform to latest edition of IS-9537 part 3 and shall be **medium duty with minimum wall thickness of 2.0mm** rigid tubes which are unscrewed without coupling and with plain ends. All conduits used shall be **ISI-marked and shall not be less than 20 mm diameter.**

PVC conduit shall be used for all concealed/ embedded installation.

PVC Conduit Accessories

Accessories used for conduit shall be of an **approved brand and type complying with relevant IS codes.**

All accessories used shall be of standard white or black colour, identical to conduit used.

Plain conduits shall be joined by slip type of couplers with manufacturer's standard sealing cement.

All conduit entries to outlet boxes, trunking and switchgear are to be made with adaptors female thread and screwed male bushes.

PVC-switch and socket boxes with round knockouts are to be used. The colours of these boxes and the conduits shall be the same.

Standard PVC circular junction boxes are to be used with conduits for intersection, Tee-junction, angle-junction and terminal. For the drawing-in of cables, standard circular through boxes shall be used.

Samples of accessories shall be submitted for approval prior to installation.

All jointing of PVC conduits shall be by means of adhesive jointing. Adequate expansion joints shall be allowed to take up the expansion of PVC conduits.

1.3 BENDS IN CONDUIT

Where necessary, bends or diversions may be achieved by means of bends and/ or circular cast iron boxes with inspection cover and with adequate and suitable inlet and outlet screwed joints. In case of recessed system each junction box shall be provided with a cover properly secured and flush with the finished wall surface. No bends shall have radius less than 7.5cms or three times the outside diameter of the conduits.

For metallic conduits, bends of defined radius shall be made by compactly filling fine sand inside the conduit length, to avoid non-uniform shape, once the bend is done. Proper jigs shall be used to ensure that the Enamelling/ Galvanising of the Conduit is not damaged.

1.4 FIXING OF CONDUITS

All conduits shall be installed so as to avoid exposure to steam, hot water or any other process pipes. After the conduits, junction boxes, outlet boxes and switch boxes are installed in position, their outlets shall be properly plugged or covered so that water, mortar, rodents and insects, insects or any other foreign matter does not enter into the conduit system. Surface conduits shall be fixed by means of heavy gauge GI saddles secured at intervals not more than 1000mm, and on either side of couplers or bends or similar fitting saddles shall be fixed at a distance of 300mm from centre of each fitting. For conduit fixing suitable PVC/ Nylon fasteners shall be used.

Recessed conduiting shall be done by making chase in the masonry by chase cutter; the conduit shall be fixed in the chase by means of GI hooks not more than 600 mm apart. After fixing of conduit the chase shall be filled with cement mortar after fixing of chicken mesh and brought to the original finish level of the surface to the entire satisfaction of Owner

1.5 SWITCH OUTLETS AND JUNCTION BOXES

All outlet boxes for switches, sockets and other receptacles shall be rust proof and shall be of 1.6thick mild steel sheets with HOT dipped galvanizing (or as specified in BOQ), having smooth external and internal surfaces to true finish. All outlet boxes for receiving plug sockets and switches shall be fabricated to approved sizes. All boxes shall have adequate number of knock out holes of required diameter and earthing terminal screws. Outlet boxes shall generally be of 50mm depth subject to maximum depth of 65 mm.

1.6 INSPECTION BOXES

50mm dia. inspection boxes and pull boxes shall have smooth external and internal finish to facilitate removal and replacement of wires, where required.

1.7 FISH WIRE

To facilitate subsequent drawing of wires in the conduit, **GI fish wires of 2.0 mm (14 SWG) shall be provided along with the laying of recessed conduit.**

1.8 CONDUCTORS

All PVC insulated copper conductor flexible FR, as specified in SOQ, wires shall conform in all respects to Standards as listed under sub-head Indian Standards and shall be IS approved and ISI marked.

1.9 BUNCHING OF WIRES

Wires carrying current shall be so bunched that the outgoing and return wires are drawn into the same conduit. Wires originating from two different phases shall not run in the same conduit. All wires shall have ferrules for identification. Lighting and power circuits shall be separate. Each Power/ Light Circuit's Neutral shall be individual per Circuit and shall not be looped from any other Circuit.

1.10 DRAWING CONDUCTORS

The drawing and jointing of PVC insulated copper conductor wires shall be executed with due regard to the following precautions. While drawing wires through conduits, care shall be taken to avoid scratches and kinks which may cause breakage of conductors. There shall be no sharp bends. Wire reel stands to be used for pulling of wires to avoid kinks. Care shall be exercised while drawing the wires from reels, by taking appropriate measures to ensure that wires are not spread on ground, causing dust and dirt accumulation on the new wires.

Maximum permissible number of 1100 volt grade PVC insulated wires that may be drawn into rigid non-metallic or PVC Conduits are given below:

Size of wires Nominal Cross-section Area (Sq. mm.)	Maximum number of wires within conduit size(mm)				
	20	25	32	40	50
1.5	7	12	16	--	--
2.5	5	10	14	--	--
4	4	8	12	--	--
6	3	6	8	--	--
10	--	4	5	6	--
16	--	3	3	6	6
25	--	--	2	4	6
35	--	--	--	3	5

Insulation shall be removed by insulation stripper only. Few Strands of wires shall not be cut/ reduced for convenience in connecting into terminals. The terminals shall have sufficient cross sectional area to take all strands and its connecting brass screws shall have flats ends. All looped joints shall be connected through terminal block/ connectors. The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less. All light points shall be terminated through a connector.

Conductors having nominal cross sectional areas exceeding 10 sq.mm shall always be provided with cable sockets. At all bolted terminals brass flat washer of large area and approved steel spring washer shall be used. Brass nuts and bolts with brass washers shall be used for all connections.

Only licensed wiremen (Before doing the work or before appointing him on site contractor has to submit his wiring licence to Owner) and cable jointers shall be employed to do jointing work. Before entrusting cable jointing work to any technician, or before appointing Cable Jointers or Wiremen on Site, Contractor has to submit such Technicians'/ Wireman's/ Cable Jointer's license to Owner.

All wires and cables shall be embossed with the manufacturer's label with ISI mark and shall be brought to site in original packing. For all internal wiring, PVC insulated wires of 1100 volts grade (FRLS) shall be used.

The sub-circuit wiring for point shall be carried out in loop system and no joints shall be allowed in the length of the conductors. No wire shall be drawn into any conduit until all defective work of conduit installation of any nature that may cause injury to wire is completed. Care shall be taken while pulling out the wires so that no damage occurs to conduits/ wire itself, the conduits shall be thoroughly cleaned of

moisture, dust, dirt or any other obstruction. The minimum size of PVC insulated copper conductor wires for all sub-circuit wiring for light points & power points shall be minimum 1.5 sq.mm & 2.5 sq.mm. Copper respectively. Separate neutral to be pulled for each circuit.

1.11 JOINTS

All joints shall be made at main switches, distribution boards socket outlets, lighting outlets and switches boxes only. No joints shall be made in conduits and in junction boxes. Conductors shall be continuous from outlet to inlet.

1.12 MAINS AND SUB-MAINS

Mains and sub-mains cable or wires where called for shall be of the rated capacity and approved make. Every main and sub main wires shall be drawn into an independent adequate size of conduit. Earthing shall be in conformity with relevant IS codes and calculations shall be submitted for verification. An independent earth wire of the proper rating shall be provided for every single phase sub-main. For every 3 -phase sub-main, 2 No. earth wires of proper rating shall be provided along with the sub-main.

The earth wires shall be drawn along with circuit wires through conduit. Where mains and sub-mains cables are connected to switchgear, sufficient extra lengths of cable shall be provided to facilitate easy connections and maintenance. Where ever necessary, powder-coated 1.6 mm thick sheet steel covering (also called trunking) shall be provided to cover the group of conduits and cables entering and exiting the Wall mounted/ Floor mounted Sub DBs, DBs and FDBs so that the Installation looks neat. The colour of such sheet steel covering (trunking) shall be matching with the colour of the SDBs, DBs and FDBs.

1.13 LOAD BALANCING

Balancing of circuits in three phase installation shall be as planned by the Consultants in the tender drawings and shall be checked by the contractor before the commencement of wiring and shall be strictly adhered to.

1.14 COLOUR CODE OF CONDUCTORS

Colour code shall be maintained as indicated by the Consultant for the entire wiring installations. Red, yellow, blue shall be for three phases, black for neutral and green with yellow band shall be for earthing.

2.0 SWITCHES, RECEPTACLES (MODULAR) LIGHTING FIXTURES & LIGHTINGCONTROL EQUIPMENT

2.1 SWITCHES

All switches shall be enclosed type flush mounted suitable for 240 volts AC. All switches shall be fixed inside the switch boxes on adjustable flat MS strips/ plates with tapped holes and brass machine screws, leaving ample space at the back and sides for accommodating wires. Switch controlling the light point shall be connected to the phase wire of the circuit and load on each switch shall be restricted to maximum 800 watts & maximum 1500 watts per circuit. All wiring accessories shall be BIS approved. Perfect alignment shall be maintained while fixing of the back boxes.

2.2 WALL SOCKET OUTLET

a. Wall socket outlets shall be of the three pin. The switch controlling the socket outlet shall be on the phase wire of the circuit and not more than two socket outlets of 16 amps shall be connected on one circuit. An earth wire shall be provided along with the circuit wires and shall be connected to earthing screw inside the box. The earth terminal of the socket shall be connected to the earth terminal provided inside the box. All sockets shall be shuttered type.

b. Every socket outlet shall be controlled by an individual switch unless mentioned otherwise.

c. The switch controlling the socket outlet shall be on the `Live' side of the line.

d. 6 / 16 amps socket outlet shall normally be fixed at any convenient height above the floor level as desired by the Architect. The switch for 6 and 16 amps, socket outlet shall be kept along with the socket outlet. However, in special case, if desired by the Architect the 6/16 amp. Socket outlet can be placed at the normal switch level.

e. Where socket outlets are placed at lower level, they shall be enclosed in a suitable metallic box with the system of wiring adopted or shutter type sockets shall be provided as specified.

f. In an earthed system of supply, a socket outlet and plug shall be of three pin type, the third terminal shall be connected to earth.

g. Conductors connecting electrical appliance with socket outlet shall be flexible twin cord with an earthing cord which shall be secured by connecting between the earth terminal of plug and the metallic body of the electrical appliance.

h. Where use of shutter type of interlocking type of socket is required for any special installation, the items should be separately and specifically listed in the Schedule of Quantities of that particular work.

2.3 LIGHTING FIXTURES & ACCESSORIES

The light fixtures and fittings shall be assembled and installed in position complete and ready for service, in accordance with details, drawings, manufacturer's instructions and to the satisfaction of the Project Manager.

2.3.1 SCOPE

Scope of work under this section shall include inspection at suppliers/ manufacturer's premises at site, receiving at site, safe storage, transportation from point of storage to point of erection, erection and commissioning of light fittings, fixtures and accessories including all necessary supports, brackets, down rods and painting etc. as required.

2.3.2 STANDARDS

The lighting and their associated accessories such as lamps, reflectors, housings, ballasts etc., shall comply with the latest applicable standards, more specifically the following:

General and safety requirements for Luminaires	: IS – 1913 (Part-1) Part-1 Tubular fluorescent lamps
Industrial lighting fittings with metal reflectors	: IS - 1777
Decorative lighting outfits	: IS - 5077
Bi-pin lamp holders for tubular fluorescent lamps	: IS - 3323
Bayonet lamp holders	: IS - 1258
Electronic Ballasts for fluorescent lamps – General & Safety requirement	: IS – 13021 (Part-1)
Ballast for HP MV lamps	: IS - 6616
Tubular Fluorescent lamps	: IS - 2418 (Part-1 to 4)
Luminaries – General requirement	: IS – 10322 (Part-1)
Luminaries – Constructional requirement	: IS – 10322 (Part-2)
Luminaries – Screw and Screw less termination	: IS – 10322 (Part-3)
Luminaries – Methods of Tests	: IS – 10322 (Part-4)

Particular requirement – General purpose Luminaries	: IS – 10322 (Part-5/ Sec-1)
Particular requirement – Recessed Luminaries	: IS – 10322 (Part-5/ Sec-2)
Particular requirement – Luminaries for Road and Street lighting	: IS – 10322 (Part-5/ Sec-3)
Particular requirement – Portable General purpose Luminaries	: IS – 10322 (Part-5/ Sec-4)
Particular requirement – Flood Lighting	: IS – 10322 (Part-5/ Sec-5)
High pressure mercury vapour lamps	: IS – 9900 (Part-1)
Tungsten filament general electric lamps	: IS - 418

2.3.3 LIGHT FITTINGS-GENERAL REQUIREMENTS

a. Fittings shall be designed for continuous trouble free operation under atmospheric conditions without reduction in lamp life or without deterioration of materials and internal wiring. Degree of protection of enclosure shall be IP-65 for outdoor fittings except bulkhead fitting. Bulkhead fitting shall be provided with IP-54 protection.

b. Fittings shall be so designed as to facilitate easy maintenance including cleaning, replacement of lamps/ ballasts.

c. Each fitting shall have a terminal block suitable for loop-out connection by 1100 V PVC insulated copper conductor wires upto 4 sq.mm.

d. The internal wiring should be completed by the manufacturer by means of standard copper wire and terminated on the terminal block.

e. All hardware used in the fitting shall be suitably plated or anodized and passivated.

f. Earthing: Each lighting fitting shall be provided with an earthing terminal. All metal or metal enclosed parts of the housing shall be bonded and connected to the earthing terminal so as to ensure satisfactory earthing continuity throughout the fixture.

g. Painting/ Finish: All surfaces of the fittings shall be thoroughly cleaned and degreased and the fittings shall be free from scale, rust, sharp-edges, and burns.

h. The housing shall be powder coated/ stove-enamelled or anodised as required. The surface shall be scratch resistant and shall show no sign of cracking or flaking when bent through 90 deg. over 12 mm dia mandrel.

i. Metal used in BODY of lighting fixtures shall be not less than 22 SWG or heavier if so required to comply with specification of standards. Sheet steel reflectors shall have a thickness of not less than 20 SWG. The metal parts of the fixtures shall be completely free from burns and tool marks. Solder shall not be used as mechanical fastening device on any part of the fixture.

2.3.4 ACCESSORIES FOR LIGHT FITTINGS - REFLECTORS

The reflectors shall be made of CRCA sheet steel/ aluminium/ Silvered glass/ Chromium plated sheet copper as specified. The thickness of reflectors shall be as per relevant standards. Reflectors made of steel shall have stove enamelled/ vitreous enamelled/ epoxy coating finish. Aluminium used for reflectors shall be anodized/ epoxy stove enamelled/ mirror polished. The finish for the reflector shall be as specified. The reflectors shall be free from scratches/ blisters and shall have a smooth and glossy surface having optimum light reflecting coefficient. Reflectors shall be readily removable from the housing for cleaning and maintenance without use of tools.

2.3.5 LAMPS

LED Lamps shall be energy effective compact single ended light sources in 3 to 15W ratings consisting of two narrow glass tubes welded together. The lamp shall be complete with integral glow switch starter and capacitor and two pin electrical connection. The lamp shall be colour rendered to give warm colour impression. The compact lamp shall have a long life and shall be energy efficient.

3.0 MEDIUM VOLTAGE 1.1 KV GRADE XLPE CABLES

3.1 GENERAL

The MV cables shall be supplied, inspected, laid, tested and commissioned in accordance with drawings, Specifications, relevant Standard Specifications and cable manufacturer's instruction.

3.2 MATERIAL

The MV cables shall be cross linked polyethylene (XLPE) insulated PVC sheathed of 1100 volts grade as asked for in the schedule of quantities. All shall be with aluminium conductor.

3.3 TECHNICAL REQUIREMENTS

3.3.1 All XLPE Aluminium Power cables shall be 1100 Volts grade, multi core constructed as per IS: 7098 Part-I of 1988 as follows:

a. The inner sheath should be bonded over with thermo-plastic material for protection against mechanical and electrical damage.

b. Armouring should be provided over the inner sheath to guard against mechanical damage. Armouring should be Galvanised steel wires or galvanised steel strips. (In single core cables used in A.C. system armouring should be non-magnetic hard aluminium Wires/ Strips. Round steel wires should be used where diameter over the inner sheath does not exceed 13 mm; above 13 mm flat steel armour should be used. Round wire of different sizes should be provided against specific request.)

c. The outer sheath should be specially formulated heat resistant black PVC compound conforming to the requirement of type ST2 of IS: 5831-1984 extruded to form the outer sheath.

3.3.2 Conductor shall be of electrolytic Aluminium conforming to IS: 8130 and are compact circular or compact shaped.

3.3.3 Insulation shall be of XLPE type as per latest IS general purpose insulation for maximum rated conductor temperature 70 degree centigrade.

3.3.4 In Inner sheath laid up cores shall be bonded over with thermoplastic material for protection against mechanical and electrical damage.

3.3.5 Insulation, inner sheath and outer sheath shall be applied by extrusion and lapping up process only.

3.3.6 Armouring shall be of galvanised steel wire/ flat.

3.3.7 Repaired cables shall not be used.

3.3.8 Current ratings of the cables shall be as per IS: 3961.

3.3.9 The XLPE insulated cables shall conform to latest revision of IS and shall be read along with this specification. The Conductor shall be stranded Aluminium circular/ sector shaped and compacted. In multi core cables the core shall be identified by red, yellow, blue and black colouring of insulation.

3.3.10 The cables shall be suitable for laying in racks, ducts, trenches, conduits and underground buried installation with uncontrolled back fill and chances of flooding by water.

3.3.11 Progressive automatic in line sequential marking of the length of cables in meters at every one meter shall be provided on the outer sheath of all cables.

3.3.12 Cables shall be supplied in non-returnable wooden drums as per IS: 10418. Both ends of the cables shall be properly sealed with PVC/ Rubber caps so as to eliminate ingress of water during transportation, storage and erection.

3.3.13 The product should be coded as per IS: - 7098 Part-I as follows: -

Aluminium Conductor	:	A
XLPE Insulation	:	2X
Steel round wire armour	:	W
Steel strip armour	:	F
Steel Double round wire armour	:	WW
Steel Double strip armour	:	FF
Non-magnetic (Al.) round wire armour	:	Wa
Non-magnetic (Al.) strip armour	:	Fa
PVC outer sheath	:	Y

3.4 INSPECTION

All cables shall be inspected by the contractor upon receipt at site and checked for any damage during transit.

3.5 JOINTS IN CABLES

The Contractor shall take care to see that all the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilization and avoid cable jointing. This apportioning shall be got approved by the Engineer-in-charge before the cables are cut to lengths. Where joints are unavoidable heat shrinkable type joints shall be made. The location of such joints shall be got approved from the Engineer-in-charge and shall be identified through a marker.

3.6 JOINTING BOXES FOR CABLES

Cable joint boxes shall be installed with heat shrinkable sleeve and of appropriate size, suitable for XLPE armoured cables of particular voltage rating.

3.7 JOINTING OF CABLES

All cable joints shall be made in suitable, approved cable joint boxes and the filling in of compound shall be done in accordance with manufactures' instructions and in an approved manner.

All straight through joints shall be done in epoxy mould boxes with epoxy resin.

All cables shall be joined colour to colour and tested for continuity and insulation resistance before jointing commence. The seals of cables must not be removed until preparations for jointing are completed. Joints shall be finished on the same day as commenced and sufficient protection from the weather shall be arranged. The conductors shall be efficiently insulated with high voltage insulating tape and by using of spreaders of approved size and pattern. The joints shall be completely topped up with epoxy compound so as to ensure that the box is properly filled.

3.8 CABLE END TERMINATIONS

Cable end termination shall be done in cable terminal box using crimping sockets and proper size of glands of double compression type

3.9 BONDING OF CABLES

Where a cable enters any piece of apparatus, it shall be connected to the casing by means of an approved type of armour clamp and gland. The clamps must grip the armouring firmly to the gland or casing, so that no undue stress is passed on to the cable conductors.

3.10 CABLE INSTALLATION

Cables shall be laid by skilled and experienced workmen using adequate rollers to minimize stretching of the cable. The cable drums shall be placed on jacks before unwinding the cable. Great care shall be exercised in laying cables to avoid forming kinks.

3.10.1 LAYING OF CABLES ON CABLE TRAYS

The relative position of the cables, laid on the cable tray shall be preserved and the cables shall not cross each other. At all changes in direction in horizontal and vertical planes, the cable shall be bent smooth with a radius as recommended by the manufacturers. All cables shall be laid with minimum one diameter gap and shall be clamped at every metre to the cable tray. Cables shall be tagged for identification with aluminum tag and clamped properly at every 20M. Tags shall be provided at both ends and all changes in directions both sides of wall and floor crossings. All cable shall be identified by embossing on the tag the size of the cable, place of origin and termination.

All cables passing through holes in floor or walls shall be sealed with fire retardant Sealant and shall be painted with fire retardant paint upto one meter on all joints, terminations and both sides of the wall crossings by “VIPER CABLE RETARD”.

3.10.2 LAYING OF CABLES IN GROUND

The width of trench for laying single cable shall be minimum 350 mm. Where more than one cable is to be laid in horizontal formation, the width of the trench shall be workout by providing 200 mm gap between the cables, except where otherwise specified. There shall be clearance of 150 mm between the end cable and the side wall of the trench. The minimum depth of the cable trench shall not be less than 750 mm for single layer of cables. When the cables are laid in more than one tier the depth of the trench shall be increased by 300 mm for each additional tier.

Excavation of trenches:

The trenches shall be excavated in reasonably straight lines. Wherever there is a change in direction, suitable curvature shall be provided. Where gradients and changes in depth are unavoidable, these shall be gradual. The excavated soil shall be stacked firmly by the side of the trench such that it may not fall back into the trench. The bottom of the trench shall be levelled and shall be made free from stone, brick bats etc. The trench shall then be provided with a layer of clean, dry sand cushion of not less than 100 mm in depth. Prior to laying of cables, the cores shall be tested for continuity and insulation resistance. The cable drum shall be properly mounted on jacks, at a suitable location, making sure that the spindle, jack etc. are strong enough to carry the weight of the drum and the spindle is horizontal. Cable shall be pulled over rollers in the trench steadily and uniformly without jerks and strains. The entire drum length shall be laid in one stretch. However, where this is not possible the remainder of the cable shall be removed by `Flaking' i.e. by making one long loop in the reverse direction. After the cable has been uncoiled and laid into the trench over the rollers, the cable shall be lifted off the rollers beginning from one end by helpers standing about 10 meters apart and laid in a reasonably straight line. Cable laid in trenches in a single tier formation shall have a cover of clean, dry sand of not less than 150 mm. above

the base cushion of sand before the protective cover is laid. In the case of vertical multi-tier formation after the first cable has been laid, a sand cushion of 300 mm shall be provided over the initial bed before the second tier is laid. Finally the cables shall be protected by second class bricks before back filling the trench. The buried depth of uppermost layer of cable shall not be less than 750mm.

Back Filling:

The trenches shall be back filled with excavated earth free from stones or other sharp edged debris and shall be rammed and watered, if necessary, in successive layers not exceeding 300 mm. Unless otherwise specified, a crown of earth not less than 50 mm in the centre and tapering towards the sides of the trench shall be left to allow for subsidence.

3.11 CABLES INSIDE BUILDING

Cables inside buildings shall be laid on the cable trays.

3.12 CABLE ROUTE MARKER

Route marker shall be provided along straight runs of the cables not exceeding 30 meters also for change in the direction of the cable route and underground joints.

Route marker shall be of cast iron painted with aluminium paint. The size of marker shall be 100 mm dia with "Cable" and voltage grade inscribed on it.

3.13 CABLE TRAYS

Ladder and perforated type Cable Trays shall be of Hot dip Galvanized type and factory fabricated out of CRCA sheet with standard accessories like tee, bends, couplers etc. for different loads and number and size of cables as given below:

Cable trays shall be galvanized as per Specification given under 3.14.

a. 1500 mm wide
Runners 25 x 100 x 25 x 3 mm
Rungs 2# 20 x 40 x 20 x 3 mm 250 mm C/ C
Suspenders 2 No. 40 x 40 x 5 mm GI angle 1500 mm C/ C with base support of 40x 40 x 5mm GI angle.

b. 1200 mm wide
Runners 25 x 100 x 25 x 3 mm
Rungs 2# 20 x 40 x 20 x 3 mm 250 mm C/ C
Suspenders 2 No. 40 x 40 x 5 mm GI angle 1500 mm C/ C with base support of 40x 40 x 5mm GI angle.

c. 1000 mm wide
Runners 25 x 100 x 25 x 3 mm
Rungs 2# 20 x 40 x 20 x 3 mm 250 mm C/ C
Suspenders 2 No. 40 x 40 x 5 mm GI angle 1500 mm C/ C with base support of 40x 40 x 5mm GI angle.

d. 750 mm wide
Runners 20 x 75 x 20 x 2.5 mm
Rungs 20 x 30 x 20 x 2.5 mm 250 mm C/ C
Suspenders 2 No. 32 x 32 x 5 mm GI angle 1800 mm C/ C with base support of 40x 40 x 5mm GI angle.

e. 600 mm wide
Runners 20 x 75 x 20 x 2.5 mm
Rungs 20 x 30 x 20 x 2.5 mm 250 mm C/ C
Suspenders 2 No. 32 x 32 x 5 mm GI angle 1800 mm C/ C with base support of 40x 40 x 5mm GI angle.

f. 450 mm wide
Runners 20 x 75 x 20 x 2.5 mm
Rungs 20 x 30 x 20 x 2.5 mm 250 mm C/ C
Suspenders 2 No. 25 x 25 x 4 mm GI angle 1800 mm C/ C with base support of 40x 40 x 5mm GI angle.

g. Supply and fixing of perforated type cable trays of the following sizes of pre-galvanized iron.
i. 600 x 40 x 40 x 2 mm thick
ii. 450 x 40 x 40 x 2 mm thick
iii. 300 x 40 x 40 x 2 mm thick
iv. 150 x 40 x 40 x 2 mm thick

Note: *Suitable length of 10 mm dia. GI rod suspenders at 1800 mm interval shall be included in the item for perforated type cable tray.*

3.14 SPECIFICATION FOR HOT DIP GALVANIZING PROCESS
(For Mild Steel Used For Earthing, Cable Trays Or Junction Boxes For Electrical Installation.)

General Requirements

a) Quality of Zinc

Zinc to be used shall conform to minimum Zn 98 grade as per requirement of IS: 209-1992.

ii. Coating Requirement

Minimum weight of zinc coating for mild steel flats with thickness upto 6 mm in accordance with IS: 6745-1972 shall be 400 g/ sqm.

The weight of coating expressed in grams per square metre shall be calculated by dividing the total weight of Zinc by total area (both sides) of the coated surface.

The Zinc coating shall be uniform, smooth and free from imperfections as flux, ash and dross inclusions, bare patches black spots, pimples, lumpiness, runs, rust stains bulky white deposits, blisters. Mild steel flats/ wires shall undergo a process of degreasing pickling in acid, cold rinsing and then galvanizing.

3.15 FIRE RETARDANT CABLE PAINT & FIRE BARRIER

The fire retardant paint/ barrier shall be listed by independent test agencies such as UL, FM or OPL and be tested to, and pass the criteria of ASTM E 814 (UL1479) standard test method for fire test through-penetration fire stops and ASTM E 1996 (UL 2079) standard test method for fire resistive joint system/

3.15.1 FIRE RETARDANT CABLE PAINT

The Fire resistant cable coating/ painting shall be intumescent/ ablative, water based compound, The coating shall expand up to 10 times, supplied in a manufacturer seal container indicating manufacturing and expiry dates. The coating material shall be non-toxic, asbestos free, & halogen free and shall have good mechanical strength. The colour of paint shall be white and density of coating shall be 1.3kg/ ltr, coating shall have a snap time of 30 minutes, the expansion shall begin at 230 deg..C and it shall have a oxygen index of 41%.

Coating shall be applied by ordinary paint brush after cleaning the cables of dust and oil deposition. A minimum textured finish of 3 mm wet film thickness shall be achieved by applying the material in 2-3 layers leaving intervals of 2 to 8 hours depending upon the moisture and thickness, moisture and temperature hours between each coat.

3.16 TESTING OF CABLES

Cables shall be tested at works for all routine tests as per IS including the following tests before being dispatched to site by the project team.

a) Insulation Resistance Test.
b) Continuity resistance test.
c) Sheathing continuity test.
d) Earth test.(in armoured cables)
e) Hi Pot Test.

Test shall also be conducted at site for insulation between phases and between phase and earth for each length of cable, before and after jointing. On completion of cable laying work, the following tests shall be conducted in the presence of the Engineer-in-charge.

a) Insulation Resistance Test(Sectional and overall)
b) Continuity resistance test.
c) Sheathing continuity test.
d) Earth test.

All tests shall be carried out in accordance with relevant Standard Code of Practice and Electricity Rules. The Contractor shall provide necessary instruments, equipment and labour for conducting the above tests and shall bear all expenses in connection with such tests. All tests shall be carried out in the presence of the Engineer-in-charge, results will be noted and signed by all present and record be maintained.

4.A. DISTRIBUTION PANELS

Main Distribution Panels, Sub-Distribution Panels and Final Distribution shall be covered under this section. Panels/ Boards shall be suitable for operation on 3 Phase/ single phase, 415/ 240 volts, 50 cycles, 4 wire system with neutral grounded at transformer. All Distribution panels shall be CPRI tested design and manufactured by a approved manufacturer. CPRI certificate shall be made available.

Distribution panels shall comply with the latest Relevant Indian Standards and Electricity Rules and Regulations and shall be as per IS-13947-1993.

4.1 CONSTRUCTION FEATURES

Distribution panels shall be 2 mm thick sheet steel cabinet for indoor installation, dead front, floor mounting/ wall mounting type and shall be form 3b construction. The Distribution panels shall be totally enclosed, completely dust and vermin proof and shall be with hinged doors and folded covers, Neoprene gasket, padlocking arrangement and bolted back. All removable/ hinged doors and covers shall be grounded by flexible standard connectors. Distribution panel shall be suitable for the climatic conditions as specified in Special Conditions. Steel sheets used in the construction of Distribution panels shall be 2 mm thick and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet metal shall be seam welded, all welding, slag shall be rounded off and welding pits wiped smooth with plumber metal. The general construction shall confirm to IS-8623-1977 (Part-1) for factory built assembled switchgear & control gear for voltage upto and including 1100 V AC.

All panels and covers shall be properly fitted and square with the frame, and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with wing nuts. Self-threading screws shall not be used in the construction of Distribution panels. A base channel of 75 mm x 40 mm x 5 mm thick shall be provided at the bottom for floor mounted panels. Minimum operating clearance of 275 mm shall be provided between the floor of Distribution panels and the lowest feeder compartment.

Distribution panels shall be of adequate size with a provision of spare switchgear as indicated on the Single Line Diagram. Feeders shall be arranged in multi-tier. Knockout holes of appropriate size and number shall be provided in the Distribution panels in conformity with the location of cable/ conduit connections. Removable sheet steel plates shall be provided at the top to make holes for additional cable entry at site if required.

Every cabinet shall be provided with Trifoliate or engraved metal name plates. All panels shall be provided with circuit diagram engraved on PVC sheet. All live accessible connections shall be shrouded and shall be finger touch proof and minimum clearance between phase and earth shall be 20 mm and phase to phase shall be 25 mm.

4.2 BUS BAR CONNECTIONS

Bus bar and interconnections shall be of high conductivity electrolytic grade copper/aluminium as indicated in the bill of quantities complying with requirement of IS: 5082 – 1981 and of rectangular cross section suitable for carrying the rated full load current and short circuit current and shall be extendable on either side. Bus bars and interconnections shall be insulated with heat shrinkable sleeve of 1.1 KV grade and shall be colour coded. Bus bars shall be supported on glass fibre reinforced thermosetting plastic insulated supports at regular intervals to withstand the force arising from in case of short circuit in the system. All bus bars shall be provided in a separate chamber and all connections shall be done by bolting. Additional cross sectional area to be added to the bus bar to compensate for the holes. All connections between bus bars and breakers shall be through solid copper/aluminium of proper size to carry full rated current and insulated with insulating sleeves. Maximum current density for the bus-bars shall be 0.8 A/ sq.mm for aluminium and 1.4 A/ sq.mm for copper bus-bars.

Maximum allowable temperature for the Bus bar to be restricted to 85 deg C

4.2.1 TEMPERATURE - RISE LIMIT

Unless otherwise specified, in the case of external surface of enclosures of bus bar compartment which shall be accessible but do not need to be touched during normal operation, an increase in the

temperature rise limits of 25° C above ambient temperature shall be permissible for metal surface and of 15° C above ambient temperature for insulating surfaces as per IS 8623(Part-2) 1993.

All main distribution panels and sub distribution panels shall be provided with MCCB of appropriate capacity as per Single Line Diagram. All final Distribution boards shall be provided with Miniature Circuit Breakers. Final Single Phase Distribution boards shall be connected to the incoming supply through double pole MCB units & earth leakage circuit breakers. All wiring for final distribution boards shall be concealed behind 5 mm thick Bakelite sheet or M S sheet cover. All Distribution boards shall be completely factory wired, ready for connection. All the terminals shall be of proper current rating and sized to suit individual feeder requirements. Each circuit shall be clearly numbered from left to right to correspond with wiring diagram. All the switches and circuits shall be distinctly marked with a small description of the service installed.

Continuous earth bus sized for prospective fault current shall be provided with arrangement for connecting to station earth at two points. Hinged doors/ frames shall be connected to earth through adequately sized flexible braids.

4.3 CABLE COMPARTMENTS

Cable compartment of adequate size shall be provided in the Distribution panels for easy clamping of all incoming and outgoing cables entering from the top/ bottom. Adequate supports shall be provided in cable compartment to support cables.

4.4 MOULDED CASE CIRCUIT BREAKER (MCCB)

a. LCD display [Per phase current- Voltage & Power] for both Thermo -magnetic and Microprocessor based MCCB.
b. Integrated earth leakage module can be provided for compactness and ready use in the din rail channel.
c. Internal battery: The protection unit has an internal battery, so it can be adjusted even if the circuit breaker is switched off. Tests can be carried out and faults viewed directly via. LCD.
d. For the entire range Ics = 100 % of Icu for 1 sec @ 440V AC confirm to IEC-60947 part- II.

GENERAL CHARACTERISTS:-

a. MCCB shall have four poles.
b. MCCB shall be fixed and draw-out.
c. MCCB shall have line load reversibility. Three phase breakers shall be designed to break all the poles simultaneously and they shall have a single mechanism.
d. MCCB shall be provided with an inverse time delay electronic over current trip devices. The trip device shall be direct acting.

RATING & BREAKING CAPACITY:-

a. The MCCB shall have rated operating voltage = 500V till 160A and 690V for 250A and above and rated impulse withstand voltage = 6kV till 160A and 8kV for 250A and above.
b. The MCCB shall have breaking capacities from 16kA to 100kA.
c. The MCCB shall be din rail mounted till 250A.

PROTECTION UNIT:-

1>***For Thermal Magnetic Release:***

a) The range should be available from 16A to 1250A.

b) The overload setting should be from 0.7 to 1 times of Ir.

2>***For Microprocessor Release:***

a) The range should be available from 40A to 1600A.
b) The microprocessor based release should have the following settings:
   i) Overload Settings: 0.4 to 1 times of Ir
   ii) Short Circuit Settings: 1.5 to 10 times of Ir.
   iii) Earth fault Settings: 0.2 to 1 times of In.
   iv) Neutral protection settings: 0 – 50% – 100%Ir.
c) Separate LED indication for each fault.
d) LED indication for internal temperature of 75° C and above.
e) LED pre overload alarm at 90%of Ir and 105%of Ir.
f) The MCCB should have inbuilt feature of logical selectivity by which it can give a time delay of 50msecbetween upstream and downstream MCCB.
g) Facility for segregating Priority and Non-Priority loads must be available in the MCCB.

SAFTETY ARRANGEMENT AND INTERLOCK:-

1. Manually closing mechanism should be accommodated in a Moulded housing of robust and vermin-proof construction.

2. MCCB shall be provided with double insulation (insulation between front cover and internal power circuits to avoid any accidental contact with live current carrying path with the front cover open)

3. The tripping devices shall be ambient temperature compensated type. The insulating case shall be made of high strength heat resistant and flame retardant thermosetting insulating material.

ACCESSORIES:-

1. MCCB's should have common accessories like auxiliary contact, fault signaling contact, shunt trip and under voltage release for entire range.
2. MCCB shall be suitable for plug in and draw out type starting from 250A.
3. MCCB should have direct and vary depth rotary handles.
4. The MCCB shall have common auxiliaries for the entire range.
5. The electronic earth leakage module can be connected side by side or underneath for MCCBs upto 630A and above 6. 630A, a residual current relay with a coil.
6. The MCCB should have both Key locks and Padlocks.

4.5 MINIATURE CIRCUIT BREAKER (MCB)

Miniature Circuit Breaker shall comply with IS-8828-1996/ IEC898-1995. Miniature circuit breakers shall be quick make and break type for 240/ 415 VAC 50 Hz application with magnetic thermal release for over current and short circuit protection. The breaking capacity shall not be less than 10 KA at 415 VAC. MCBs shall be DIN mounted. The MCB shall be Current Limiting type (Class-3). MCBs shall be classified (B, C, D ref IS standard) as per their Tripping Characteristic curves defined by the manufacturer. The MCB shall have the minimum power loss (Watts) per pole defined as per the IS/ IEC and the manufacturer shall publish the values. MCB shall ensure complete electrical isolation & downstream circuit or equipment when the MCB is switched OFF.

The housing shall be heat resistant and having a high impact strength. The terminals shall be protected against finger contact to IP20 Degree of protection. All DP, TP, TPN and 4 Pole miniature circuit breakers shall have a common trip bar independent to the external operating handle.

4.6 EARTHING

Earthing shall be provided as per IS: 3043-1987.

4.7 PAINTING

All sheet steel work shall undergo a process of degreasing, pickling in acid, cold rinsing, phosphating, passivating (TEN tank processing) and then painted with electrostatic paint (Powder coating). The shade of colour of panel inside/ outside shall be as per BOQ confirming to IS Code No.5.

4.8 LABELS

Engraved PVC labels shall be provided on all incoming and outgoing feeder. Circuit diagram showing the arrangements of the circuit inside the distribution panels shall be pasted on inside of the panel door and covered with transparent plastic sheet.

4.9 METERS

i. All voltmeters and indicating lamps shall be through MCB's.
ii. Meters and indicating instruments shall be flush type.
iii. All CT's connection for meters shall be through Test Terminal Block (TTB).
iv. CT ratio and burdens shall be as specified on the Single line diagram.

4.10 CURRENT TRANSFORMERS

Current transformers shall be provided for Distribution panels carrying current in excess of 60 amps. All phase shall be provided with current transformers of suitable VA burden with 5 amps secondary for operation of associated metering.

The CTs shall confirm to relevant Indian Standards. The design and construction shall be dry type, epoxy resin cast robust to withstand thermal and dynamic stresses during short circuits. Secondary terminals of CTs shall be brought out suitable to a terminal block which shall be easily accessible for testing and terminal connections. The protection CTs shall be of accuracy class 5P10 and measurement CTs shall be of accuracy class I.

4.11 POTENTIAL FREE CONTACTS

Potential free contacts shall be provided for connection to Building Automation System in panels indicated in Schedule of Quantities.

4.12 CONTACTOR

Contactor shall be built into a high strength thermoplastic body and shall be provided with arc shield for quick are extinguishing. Silver alloy tips shall be provided to ensure a high degree of reliability and endurance under continuous operation. The magnet system shall consist of laminated yoke and armature to ensure clean operation without hum or chatter.

Starter's contactors shall have 3 main and 2 Nos. NO/ NC auxiliary contacts and shall be air break type suitable for making and breaking contact at minimum power factor of 0.35. For design consideration of contactors the starting current of connected motor shall be assumed to be 6 times the full load current of the motor in case of direct-on-line starters and 3 times the full load current of the motor in case of Star Delta Starters. The insulation for contactor coils shall be of Class "E".

Coil shall be tape wound vacuum impregnated and shall be housed in a thermostatic bobbin, suitable for tropical conditions and shall withstand voltage fluctuations. Coil shall be suitable for 240/ 415 + 10% volts, 50 cycles AC supply.

4.13 THERMAL OVER LOAD RELAY

Thermal overload relay shall have built in phase failure sensitive tripping mechanism to prevent against single phasing. The relay shall operate on the differential system of protection to safeguard against three phase overload, single phasing and unbalanced voltage conditions.

Auto-manual conversion facility shall be provided to convert from auto-reset mode to manual reset mode and vice-versa at site. Ambient temperature compensation shall be provided for variation in ambient temperature from –5deg C + 55 deg C.

All overload relays shall be of three element, positive acting ambient temperature compensated time logged thermal over load relays with adjustable setting. Relays shall be directly connected for motors upto 35 HP capacity. C.T. operated relays shall be provided for motors above 35 HP capacity.

4.13 INDICATING PANEL

All meters and indicating instruments shall be in accordance with relevant Indian Standards. Meters shall be flush mounted type. Indicating lamps shall be of low burden, and shall be backed up with 2 amps MCB/ MPCB as per relevant fault level and toggle switch.

4.14 TESTING

Testing of panels shall be as per following codes:

a. IS: 8623 (Part -I) 1977 for factory built assemblies of switch gear for voltages upto and including 1000 VAC.
b. IS: 13947: 1993 Degree of protection.
c. IS: 5578 & 11353: 1985 Arrangement of bus bars.

4.15 WIRING

In wiring a distribution panel it shall be insured that total load of various distribution panel and/ or consuming devices is divided evenly between the phases and number of ways as per Consultants drawing. All wiring shall be only.

4.16 ANTI-CONDENSATION SPACE HEATERS

1 No. 100 W, 240 volts, single phase, 50 Hz AC Anti Condensation space heaters controlled by thermostat and protected by 6 amps MCB's or MPCB's as per fault level at the panel shall be provided in each vertical section of main LT panel and 1 No. 60 watt Anti Condensation space heater with thermostat shall be provided in each cable alley of main distribution boards and sub distribution boards.

4.17 INSTALLATION

Installation of all LT panels shall include but not limited to the following to complete the installation, testing and commissioning:

a. Transporting materials from stores to exact location of installation.
b. Supply and installation of required base frame made of MS angle or channel sections and duly painted with black paint.
c. Positioning, aligning, fixing, assembling, and installation of LT panel issued free of cost by Client after carrying out proper cleaning and inspection.
d. Site supervision, testing for proper functioning/ operation, and pre-commissioning tests.

4.18 COMMISSIONING AND ON-SITE TESTING

a. All switchboards shall be tested for dielectric test with 1000V megger.
b. All earth connections shall be checked for continuity.
c. All bus-bar connections shall be checked and tightened properly.
d. All cable terminations and terminal shrouding shall be checked if they are properly done.
e. The operation of protective devices shall be tested by secondary injection test.
f. The operation of circuit breaker shall be tested for all interlocks.
g. Functional test shall be done for all MCCBs and other components.
h. Indicating lamps and meters shall be checked for proper working.

4. B. FINAL DISTRIBUTION BOARDS (FDBs)

Final Distribution Boards (FDBs) shall be suitable for operation on 3 Phase/ single phase, 415/ 240 volts, 50 cycles, neutral grounded at transformer. The DB shall be minimum di-electric strength of 2.5 KV/ Sec. All Distribution Boards shall manufactured by a manufacturer listed in Appendix-I.

FDB's shall comply with the latest Relevant Indian Standards and Electricity Rules and Regulations and shall be as per IS-13947-1993.

4.1 CONSTRUCTION FEATURES

FDB's shall be made out of 1.6 mm thick high quality CRCA sheet steel and shall be pre-treated and powder coated sheet steel used in the construction of FDB shall be folded and braced as necessary to provide a rigid support for all component. FDB shall be suitable for indoor/ outdoor installation, wall mounting free standing type, in double door construction. The Final Distribution Boards shall be totally enclosed, completely dust and vermin proof and shall be with hinged doors, Neoprene gasket, padlocking arrangement. All removable/ hinged doors and covers shall be grounded by 4.0 sqmm tinned stranded copper connectors. Final Distribution Boards shall be suitable for the climatic conditions. Joints of any kind in sheet metal shall be seam welded, all welding, slag shall be rounded off and welding pits wiped smooth with plumber metal. The general construction shall confirm to IS-8623-1977 (Part-1) for factory built assembled switchgear & control gear for voltage upto and including 1100V AC.

All panels and covers shall be properly fitted and square with the frame, and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with wing nuts. Self-threading screws shall not be used in the construction of FDBs.

Knockout holes of appropriate size and number shall be provided in the FDB's in conformity with the location of cable/ conduit connections. Detachable sheet steel gland plates shall be provided at the top/ bottom to make holes for additional cable entry at site if required.

Final Distribution Boards shall comprises of the following:

a. A panel for mounting where appropriate incoming supply circuit breaker & other auxiliaries for Control & distribution as required.
b. Installation accessories shall be part of the DB for fixing conductor and rails for mounting MCCB's and MCB's etc. neutral bus bars &earthing bus bars required in the circuit. All bus-bars in the FDB shall be insulated type.
c. Service cable/ interconnection shall be part of the Distribution Boards.
d. The board shall be installed at a height such that the operating is within reach of the normal human height i.e. 1.2 to 1.8 meters from finish floor level.
e. Degree of protection shall be IP-54 for indoor application.
f. All three phase distribution boards shall have 4 rows and single phase distribution boards shall have single rows for housing of MCB's and RCCB's unless noted otherwise.

g. Phase segregation to be maintained in all three phase distribution boards.
h. Earthing shall be provided in each FDB's.

4.2 TESTING

Testing of panels shall be as per following codes:

a. IS: 8623 (Part -I) 1977 for factory built assemblies of switch gear for voltages upto and including 1000 VAC.
b. IS: 13947: 1993 Degree of protection

4.3 WIRING

In wiring a distribution panel it shall be insured that total load of various distribution panel and/ or consuming devices is divided evenly between the phases and number of ways as per Consultants drawing.

5.0 POWER FACTOR CORRECTION SYSTEM

5.1 SCOPE

Design, manufacture, supply, erection, testing and commissioning of Indoor type power correction capacitor banks for power factor improvement as per specification given below:

5.2 STANDARD

Unless otherwise stated below, the capacitor shall comply with the following standards (and their latest amendments): IS 13340-1993, IS 13341-1992, IEC 60831-1+2

5.3 ENCLOSURE

The panel shall be indoor type, free standing, and floor mounting with IP42 degree of protection. It shall be completely made of CRCA sheet steel. The enclosure shall have sturdy support structure with angle supports as necessary and shall be finished with powder coating in the approved colour shade/ s to match the colour of the other panels. The thickness of powder coating should be minimum 60-80 microns.

Suitable provisions shall be made in the panel for proper heat dissipation. Air aspiration louvers for heat dissipation shall be provided as a necessary.

The front portion shall house the switchgear and the rear portion shall house capacitors and series reactors. The enclosure is to be suitably sized to accommodate all the components, providing necessary air clearance between live and non-live parts, providing necessary working clearance.

5.4 APFC RELAY/ CONTROLLER

Microprocessor based APFC relay (Intelligent VAr controller) shall sense the PF in the system and automatically switch ON/ OFF the capacitor unit or stage to achieve the preset target PF. The controller shall have the following features:

- Digital settings of parameters like PF, Switching time delay, Step limit etc.
- Indication of PF, preset parameters.
- Minimum threshold setting of 1% of CT current.
- No-volt release.

- Protective shut down in case of harmonic overload.
- Indication for Failure to achieve the target PF, Harmonic overloading, Step failure etc.

5.5 CAPACITOR UNIT

Each basic unit of mixed dielectric extra low loss/ All Poly Propylene (APP) capacitor shall be built with a number of elements. These elements shall be combination of capacitor tissue paper and bi-axially oriented polypropylene film impregnated with non PCB bio-degradable impregnate or Film Foil capacitor manufactured using Poly propylene film placed between 2 layers of metal foil and winding. The elements shall be connected to the external bus bars through these leads in a series parallel connection to form a three phase unit.

The capacitor units shall be floor mounting type using minimum floor space. The container of capacitors shall be made out of 2 mm thick M S sheet steel of polyester paint coated finish. Each standard unit shall be provided with internal fuses (operation co-ordinated with case-rupture characteristics to avoid rusting).

Total Harmonic Distortion (THD) of up to 5% on voltage and current waveforms shall not affect the life of capacitors. 660±10% variation in line voltage shall not affect the life of the capacitors.

5.6 CAPACITORS

- General specifications: 3 phase, delta connected, 50 Hz.
- Voltage: Shall be designed for minimum **525V** and shall withstand system over voltage, increased voltage due to series reactor and harmonics.
- Capacitor type: Super heavy duty with double side metallised capacitor tissue paper. Oil impregnated and self-healing type with bi-axially oriented polypropylene film shall be fitted with pressure sensitive disconnector in each individual capacitor cell.
- Overvoltage +10% (12h/ 24h), + 15% (30m/ 24h), + 20% (5m), +30% (1m) as per Clause 6.1 of IS 13340-1993.
- Overcurrent : 2.5 x In
- Peak Inrush current withstand : 350 x In
- Total watt-losses including discharge resistors: $\leq$ 0.45 W/ k V Ar.
- Temperature category: -25 deg.C to 70 deg.C.
- Capacitor shall be self-heating type and oil impregnated for longer life. The impregnate shall be non-PCB, biodegradable type, must be properly treated and de-gasified, so as not to have any degeneration properties and shall be non-oxidizing.
- The design shall be modular for simple mechanical assembly, no extra accessories/ metal parts to be required. Unit must be free standing with an IP 41 protection level

5.7 DISCHARGE RESISTANCE

Capacitors shall be provided with permanently connected discharge resistors so that residual voltage of capacitors is reduced to 50 volts or less within one minute after the capacitors are disconnected from the source of supply.

5.8 TERMINALS

Each capacitor bank shall be provided with a terminal chamber and cable glands suitable for PVC insulated aluminium conductor armoured cables as specified.

5.9 EARTHING

Two separate earthing terminals shall be provided for earth connection of each bank.

5.10 LOW VOLTAGE FILTER REACTOR

Filter reactor shall be series type having a three phase, iron core construction suitable for indoor use. The reactor shall be air cooled and the layout shall be in accordance with IEC 76. The complete unit shall be impregnated under vacuum and over-pressure in impregnation resin and shall be suitable for temperature class H operation. The reactor coils shall be wound with high grade aluminium/ copper and termination shall be provided with suitably designed copper bars.

5.11 TESTING

The reactor shall be tested `using a separate source voltage test of 3 kV (coil to core) for one minute as per IEC 76/ 3. The reactor shall be fitted with a temperature sensitive micro-switch in the centre coil (normally open) for connection to trip circuit in case of high operating temperature.

5.12 SERIES REACTOR

Application

LV Harmonic Filters shall be used with harmonic filter duty power capacitors to mitigate harmonics, improve power factor and avoid electrical resonance in LV electrical networks.

Construction, Testing & Protection

The low voltage filter reactor shall be series type having a three phase, iron core construction suitable for indoor use (IP 00). The reactor shall be air cooled and the layout shall be in accordance with IEC 60076.

The complete unit shall be impregnated under vacuum and over-pressure in impregnation resin and shall be suitable for temperature Class H (T60/ H) operation.

The reactor shall be tested using a separate source voltage test of 3.0kV (coil to core) for 1 minute as per IEC 60076/ 3.

The permitted tolerance of inductance shall be + 3% of rated inductance value.

Reactor tuning factor shall be 7% and the current rating of the reactor shall include the effects of harmonics and other possible over-currents.

The limit of linearity of inductance of the filter reactor shall be as follows 1.2□∑□□ with L = 0.95 L_N

The reactor shall be fitted with a temperature sensitive micro-switch in the centre coil (normally open) for connection to trip circuits in case of high operating temperatures.

5.13 SWITCHGEAR & PROTECTION

Incomer switchgear shall be TP&N breaker appropriate rating (**minimum 1.8 times** the normal current to take care of inrush switching current). Suitable contactor for each step shall be used and must be capable of capacitor switching duty at each step for short circuit protection.

Bus-bars shall be suitably colour coded and must be mounted on appropriate insulator supports.

Power cables used shall have superior mechanical, electrical and thermal properties, and shall have the capability to continuously operate at very high temperatures upto 125 deg. C.

Internal wiring between main bus-bars, breaker, contactor and capacitors shall be made with 1100 V grade, PVC insulated, copper conductor cable of appropriate size, by using suitable copper crimping terminal ends etc.

Suitable bus links for input supply cable termination shall be provided.

5.14 CONTROL CIRCUIT & GENERAL PROTECTION

The control circuit shall be duly protected by using suitable rating MCB.

An emergency stop push button shall be provided to trip the entire system (22.5 mm dia, mushroom type, press to stop and turn to reset).

Wiring of the control circuit shall be done by using 1.5 sq.mm, 1100 V grade, PVC insulated, multi-stranded copper control wire.

Inspection terminal strip, number ferruling, labelling etc. shall be provided.

440 V caution board on the panel shall be provided.

5.15 TESTING

The capacitor bank shall be subject to tests as specified in relevant Indian Standards at the factory and the test certificates shall be furnished in quadruplicate.

5.16 INSTALLATION

i. Capacitors banks shall be installed as per installation manual of supplier and shall conform to relevant Indian Standards.
ii. All interconnections in the control panel shall be checked before commissioning.
iii. Cable end boxes shall be sealed after cable connections to prevent absorption of moisture.
iv. 15 mm thick rubber matting of an approved make over a 100 mm high Timber platform shall be provided in front of the full length of the capacitor bank and control panel.

5.17 TESTING & COMMISSIONING

i. Insulation resistance shall be tested with a 1000 volts megger between phases and phase to earth.
ii. Residual voltage shall be measured after switching of the capacitors and the same shall not be more than 50 volts after one minute.
iii. Each discharge resistor shall be tested for its working.

6.0 EARTHING SYSTEM

6.1 SCOPE

This section covers the requirements for providing "Earthing" connection to metal parts of equipment etc. The contractor shall supply all materials, labour, tools, plant etc., and everything necessary for the complete Earthing installation".

6.2 STANDARDS APPLICABLE

The following standards shall be applicable: IS 3043 - Code of practice for earthing, IEEE - 80:86, IEEE - 142:92.

6.3 GENERAL

(i) The electrical distribution system in the Department is with earth neutral (i.e. neutral earthed at the transformer/generator end).In addition to the neutral earthing, provision is made for earthing the metallic body of equipments and noncurrent carrying metallic components in the sub-station, as well as in the internal/external electrical installations.

(ii) Earthing system is also required for lighting protection, computer installations and hospital operation theatres etc. For functional reasons.

(iii) Earthing requirements are laid down in Indian Electricity Rules-1956, as amended from time to time, and in the Regulations of the Electricity Supply Authority Concerned. These shall be complied with.

(iv) Application for Internal Earthing

(a) Every sub-main will have earth continuity conductor to run along with sub-main wiring. In case of 3-phase sub main wiring two earth continuity conductors shall be provided.
(b) Every circuit will have its earth continuity conductor to run along with circuit wiring. In case of 3-phase circuit two earth continuity conductors shall be provided.
(c) Looping of earth is allowed only in case of point wiring.
(d) When 2/3 power outlets are looped to one circuit, earth looping of these outlets is permissible.

6.4 G.I.PIPE EARTH STATION:

Electrodes shall be made of G.I. pipe of internal diameter of 65mm dia. The pipe electrode shall be as far as practicable embedded below permanent moisture level. The length of the pipe electrode shall not be less than 2.5 m. Except where rock is encountered, pipes shall be driven to a depth of at least 3.0 mtr where rock is encountered at a depth of less than 3.0 mtr. The electrode may be buried inclined to the vertical and the inclinations not more than 30 deg from the vertical. The pipe electrode shall be made of one piece. Earth leads to the electrode shall be laid in a heavy duty GI pipe and connected to the pipe electrode with brass bolts, nuts and washers. GI pipe shall be terminated in a wire meshed funnel. The funnel shall be enclosed in a masonry chamber of 600mm x 600mm dimensions. The chamber shall be provided with C.I. frame and CI inspection cover. The earth station shall also be provided with a suitable permanent identifications label tag. The earth electrode shall conform to IS: 3043 latest edition. The soil around the earthing electrode shall be treated to reduce the resistivity of the soil by filling the complete depth of electrode with alternative layers of charcoal and salt.

6.5 PLATE EARTH STATION

Plate electrodes shall be made of copper (CU) plate of 3mmthickand 610 x 610mm size. The plate buried vertically in ground at a depth of not less than 2.5meters to the top of plate being encased in charcoal to a thickness of 300mmall-round. It is preferable to bury the electrode to a depth where subsoil water is present. Earth leads to electrode shall be laid in a heavy duty GI pipe and connected to the plate electrode with brass and washers. A GI pipe of not less than 19mm dia. shall be clamped with bolts the plate and terminated in a wire meshed funnel. The funnel shall be masonry chamber of 610mm x610mm dimensions. The chamber shall be GI frame and CI inspection cover. The earth station shall also be provided with a suitable permanent identifications label tag. The earth electrode shall conform to IS: 3043.

6.6 EARTHING CONDUCTORS

All earthing conductors shall be of high conductivity copper and shall be protected against mechanical damage and corrosion. The connection of earth electrodes shall be strong secure and sound and shall be easily accessible. The earth conductors shall be rigidly fixed to the walls, cable trenches, cable tunnel, conduits and cables by using suitable clamps.

Main earth bus shall be taken from the main medium voltage panel to the earth electrodes. The number of electrodes required shall be arrived at taking into consideration the anticipated fault on the medium voltage network.

Earthing conductors for equipment shall be run from the exposed metal surface of the equipment and connected to a suitable point on the sub main or main earthing bus. All switch boards, distribution boards and isolators disconnect switches shall be connected to the earth, bus. Earthing conductors shall be terminated at the equipment using suitable lugs, bolts, washers and nuts.

All conduits cable armouring etc., shall be connected to the earth all along their run by earthing conductors of suitable cross sectional area. The electrical resistance of earthing conductors shall be low enough to permit the passage of fault current necessary to operate a fuse/protective device or a circuit breaker and shall not exceed 2 ohms.

6.7 PRECAUTIONS

Earthing system shall be mechanically robust and the joints shall be capable of retaining low resistance even after subjection to fault currents.

Joints shall be tinned, soldered and/or double riveted. All the joints shall be mechanically and electrically continuous and effective. Joints shall be protected against corrosion.

6.8 TESTING

On the completion of the entire installation, the following tests shall be conducted:

i) Earth resistance of electrodes
ii) Impedance of earth continuity conductors as per is 3043.
iii) Effectiveness of earthing as per is 3043.

All meters, instruments and labour required for the tests shall be provided by the contractor. The test results shall be submitted in the prescribed tabulated form in triplicate to the consultants for approval.

6.9 MEASUREMENT

- Mode of measurement is as follows:
- Earth strips (GI/Cu), earth conductor are measured in linear metre (Rm).
- Earthing station with all associated works (G.I pipe or copper plate) is measured in number (No).

6.10 COMPLETION& TEST CERTIFICATE

- On satisfactory completion of the complete Electrical Installation Work, the Licensed Electrical Contractor MUST give the **COMPLETION & TEST REPORT in the format of the Local Electric Supply Authority** to whose network the installation is going to be connected for input power supply.

- In case when such format is not available, the Licensed Electrical Contractor MUST give the **TEST & COMPLETION REPORT in APPENDIX E: CPWD FORM OF COMPLETION CERTIFICATE**(attached herewith after the LIST OF APPROVED ACCEPTABLE MAKES) mentioning Contractor's License No., Supervisor's License No., Wireman& Electricians' License No. thereby attaching the copies of all the licenses.

-x-x-x-

PROTECTION OF BUILDING AGAINST LIGHTNING

Scope

This chapter covers the detailed requirements of installation of lightning conductor system for protection of buildings against lightning. The principles of this type of protection are outlined in Appendix H to these specifications. For details not covered in these specifications, reference may be made to IS 2309 : 1989.

Application

This system shall be provided where specified. The decision whether or not to provide this system should be taken by the competent authority considering all relevant factors as per Appendix H.

Principal Components

The principal components of a lightning protective system are :-

(a) Air terminations,

(b) Down conductors,

(c) Joint and bonds,

(d) Testing joints,

(e) Earth terminations, and

(f) Earth electrodes.

Materials

The materials of air terminations, down conductors, earth termination etc. of the protective system shall be reliably resistant to corrosion, or be adequately protected against corrosion. The material shall be one of the following, as specified.

(a) ***Copper:*** Solid or flat copper strip of at least 98% conductivity conforming to relevant I.S. Specifications shall be used.

(b) ***Copper Clad Steel:*** Copper clad steel with copper covering permanently and effectively welded to the steel core shall be used. The proportion of copper and steel shall be such that the conductance of the material is not less than 30% of conductance of the solid copper of the same total cross-sectional area.

(c) ***Galvanized Steel:*** Steel thoroughly protected against corrosion by a zinc coating shall be used.

(d) ***Aluminium:*** Aluminium, 99% pure, and with sufficient mechanical strength, and protected against corrosion shall be used.

Aluminium should not be used underground, or in direct contact with walls .

All air terminations shall be of GI and all down conductors shall be of GI or aluminium, except where the atmospheric conditions necessitate the use of copper or copper clad steel for air terminations and down conductors.

The recommended shape and minimum sizes of conductors for use above and below ground are given in Tables X and XI respectively.

Layout

The system design and layout shall be done in accordance with IS 2309 : 1989 and specified in the tender documents. The work shall be carried out accordingly satisfying at the same time, the requirements of clauses 8.4.2 to 8.4.3.

Air Terminations

(i) Air termination networks may consist of vertical or horizontal conductors, or combinations of both. For the purpose of lightning protection, the vertical and horizontal conductors are considered equivalent and the use of pointed air terminations, or vertical finial is, therefore, not regarded as essential.

(ii) A vertical air termination, where provided, need not have more than one point, and shall project at least 30 cm, above the object, salient point or network on which it is fixed.

(iii) For a flat roof, horizontal air termination along the outer perimeter of the roof shall be used. For a roof of larger area a network of parallel horizontal conductors shall be installed. No part of the roof should be more than 9 m from the nearest horizontal protective conductor.

(iv) Horizontal air terminations should be carried along the contours such as ridges, parapets and edges of flat roofs, and, where necessary, over flat surfaces, in such a way as to join each air termination to the rest, and should themselves form a closed network.

(v) All metallic projections including reinforcement, on or above the main surface of the roof which are connected to the general mass of the earth, should be bonded and form a part of the air termination network.

(vi) If portions of a structure vary considerably in height, any necessary air terminations or air termination network for the lower portions should be bonded to the down conductors of the taller portions, in addition to their own down conductors.

Down Conductors

(i) The number and spacing of down conductors shall be as specified, or as directed by the Engineer-in-charge.

(ii) *Routing*

(a) **A down conductor should follow the most direct path possible between the air terminal netwoc1c and the earth termination network. Where more than one down conductor is used, the conductors should be arranged as evenly as** practicable around the outside walls of **the** structures.

(b) **The** walls of light wells may be used for fixing down conductors, but lift shafts should not be used for this purpose.

(c) Metal pipes leading rainwater from thereof to the ground may be connected **to the down conductors, but cannot replace them, such connections should** have disconnecting joints.

(d) In deciding on the routing of the down conductor, Its accessibility for inspection, **testing and maintenance should be taken into consideration.**

(iii) *Provision when External Route* is *Not Available*

(a) **Where the provision of external routes for down conductors is impracticable, for example, inbuhdings of cantilever construction from the first floor upwards,** down conduct O<S should not follow the outside contours of the building. To do **so would create a hazard to persons standing under the over hang. In such** cases, the down conductors may be housed in an air space provided by a non-metallic and non-combustible internal duct and taken straight down to the ground.

(b) Any suitable covered recess, not smaller than 76mmx 13mm, or any suitable vertical service duct running the full height of the building may be used for **this purpose, provided it does not contain an unarmoured or a non-metal** sheathed cable.

(c) In cases where an unrestricted duct is used, seals at each floor level may be required for fire protection. As far as possible. access to the interior of the duct should be available.

The lightning protective system should be so installed that it does not spoil the architectural or aesthetic beauty of the building.

Installation

General

(i) The entire lightning protective system should be mechanically strong to withstand the mechanical forces produced In the event of a lightning strike.

(ii) Conduct O<S shall be securely attached to the building, or other object to be protected by fasleners, which shall be substantial in construction, not subject to breakage, and shall be of galvanized steel or other suitable materials, with suitable **precautions lo avoid corrosion.**

(iii) The lightning conductors shall be secured not more than 1.2 m apart for horizontal **run. and 1 m for vertical run.**

Air Terminations

All air terminals shall be effectively secured against overturning either by attachment to the object to be protected, or by means of substantial bracings and fixings which shall be permanently and rigidly attached to the building. The method and nature of the fixings should be simple, solid and permanent, due attention being given to thedimatic **conditions and possible corrosion.**

Down Conductors

(i) The down conductor system must, where practicable, be directly routed from **the air termination** 10 **the earth termination network, and as far as possible, be** symmetrically placed around the outside walls of the structure starting from the **comers. In all cases consideration** *to* **side flashing must always be given.**

(ii) (a) Practical reasons may not sometimes allow the most direct route to be followed. While sharp bends, such as arise at the end of roof are inescapable (and hence permissible), re-entrant loops in a conductor can produce high inductive voltage drops so that the lightning discharge may jump across the open side of a loop. As a rough guide, this risk may arise when the length of the conductor forming the loop exceeds 8 times the width of the open side of the loop.

(b) When large re-entrant loops as defined above cannot be avoided, such as in the case of some cornices or parapets, the conductors should be arranged in such a way that the distance across the open side of a loop complies with the **requirement indicated above. Alternatively, such cornices or parapets should** be provided with holes through which the conductor can pass freely.

(iii) *Bonding to Prevent Side Flashing*

Any metal In, Of forming a part of the structure, or any building services having metallic parts which are in contact with the general mass of the earth, should be either isolated from, or bonded to the down conductor. This also applies to all exposed large metal items having any dimension greater than 2 m whether **connected to the earth or not.**

Joints and Bonds

Joints

(i) A lightning protective system should have as few joints as possible.

(ii) Joints should be mechanically and electrically effective, for example, clamped, screwed. bolted, crimped. riveted or welded.

(iii) With overlapping joints, the length of the overlap should not be less than 20 mm for all types of conductors.

(iv) Contact surfaces should first bedeaned, and then inhibited from oxidation with a **suitable non •corrosive compound.**

(v) Joints of dissimilar metals should be protected against corrosion or erosion from the elements, or the environment and should present an adequate contact area.

Bonds

(i) Bonds have to join a variety of metallic parts of different shapes and composition, **and cannot therefore be of a standard form.**

(ii) There Is the constant problem of corrosion and careful attention must be given to the metals involved, I.e. the metal from which the bond Is made, **and** those of the items being bonded.

(iii) The bond must be mechanically and electrically effective, and protected from **corrosion in, and erosion by the operating environment.**

(iv) External metal on, or forming part of a structure, may have to discharge the full lightning current, and its bond to the lightning protective system should have a cross-sectional area not less than that employed for the main conductors.

(v) Structures supporting overhead electric supply, telephone and other lines must not be bonded to a lightning protecbve system without the permission of the appropriate authority.

(vi) Gas pipe in no case shall be bonded to the lightning protective earth termination system.

Test Joints

Eachd'1#nconductor should be provided with a test join tin such a position that, while **not inviting unauthorized interference, it is convenient for use when testing.**

Earth Termination Network

(i) An earth station comprising one or more earth electrodes as required, should be **connected to each down conductor. This shall be specified.**

(ii) Each of the earth stations should have a resistance not exceeding the product given by t0 ohms multiplied by the number of earth electrodes to be provided therein. The Whole of the lightning protective system, including **any ring earth, should have a combined resistance to earth not exceeding** 10 ohms without taking account of any bonding [as per 9.5.3 (iii)].

(iii) If the value obtained foe the whole of the lightning protection system exceeds 10 ohms, a reduction can be achieved by extending or adding to the electrodes, or by interconnecting the individual earth terminations of the d'1#n conductors by a conductor installed below ground, sometimes referred to as a ring conductor. Burledring conductors laid In this manner are considered to be an integral part of **the earth termination network, and should be taken into account when assessing the overall value of resistance to earth of the installation.**

(iv) A reduction of the resistance to the earth to a value below 10 ohms has the advantage of further reducing the potential gradient around the earth electrode when discharging lightning current. It also further reduces the risk of side flashing **to metal in, or of structure.**

(v) Earth electrodes should be capable of being isolated and a reference earth point should be provided foe testing purposes.

TABLE X

Shapes and Minimum Sizes of Conductors for Use Above Ground

[Clause 9.3.4/

Sl.No.	*Materia/s and Shape*	*Minimum Size*
1.	Round copper wire or copper clad steel wire	6 mm diameter
2.	Stranded copper wire	50 sq. mm or (7/3.00 mm dia)
3.	Copper strip	20mm x3 mm
4.	Galvanized iron strip	20mm x3 mm
5.	Round aluminium wire	8 mm diameter
6.	Aluminium strip	25mm x3 mm

TABLE XI

Shapes and Minimum Sizes of Conductors for Use Below Ground

(Clause 9.3.4/

SI.No.	*Material and Shape*	*Minimum Size*
1.	Round copper wire or coppered steel wire	8 mm diameter
2.	Copper strip	32mmx6mm
3.	Round galvanized iron wire	10mmx6mm
4.	Galvanized iron strip	32mmx6mm

LIST OF APPROVED / ACCEPTABLE / RECOMMENDED MAKES OF MATERIALS.

SR.NO.	DESCRIPTION	MAKE
1	Manufacturers of L.T. Panels	PCE Electro Controls / ABAK / Popular Switchgear / VIVID Electronics / C&S / MASTECH / Electro Allied Product / S.R.AUTOMATION
2	Power & Control Cables	RR Kabel / Finolex / RPG / Primecab / Havells / Universal / CCI / Nicco /Mescab /Capital / Incab / Polycab / RRKabel / KEI / KDK / Rajnigandha / Gloster /National /
3	Cable Sockets / Lugs & clip on terminals	Dowells / Lotus / Jainson / Elecon / Wego / Elmex / Connectwell
4	Copper wires	RR Kabel / Finolex / Havell's / Polycab / Nicco / Mescab / Capital / KDK / KEI / Gloster / RPG / ANCHOR-Panasonic
5	Telephone, CAT-6, Speaker, Fire Alarm Wires & Cables	RR Kable / Delton / Motwane / ITL / Havells / Finolex / Polycab
6	Telephone Krone Box	Henzel /
7	Fire Alarm Panel, Smoke Detectors	Bosch / Edward / Notifier
8	L.T. Switchgears & Accessories	GE / Siemens/ L & T/ ABB / Schneider / Indo-Asian / Havell's
9	HRC Fuse Base & Carriers	English Electric / Kaycee / Essen
10	Selector Switches	L&T(Salzer) / Kaycee / Siemens / Havells / Micron / GE / C&S / HPL
11	L.T. on load/ off load Change Over Switches	HH Elecon / C&S / L&T / HPL / Havellsn / Socomec / Standard / Siemens
12	SFUs / FSUs / Fuse-Gear (HRC) /HRC fuses	L & T / Siemens / GE / EE
13	MCB DBs / MCCBs / MCBs / ELCBs / RCCBs	Siemens / Schneider / MDS (Lexic) / Legrand / ABB / L&T (Hager) / Indo-Asian / Havell's / C&S
14	Ammeter/Voltmeter/P.F. Meter (Analog) Digital / Electronic Type	Automatic Electric / Rishabh / MECO /IMP L&T / SIEMENS / ENERECON / Neptune / HPL
15	LED Indicating Lamps / Push Buttons	Kaycee / Teknic / Siemens / L & T(ESBEE) / BCH / Binay / Essen Deinki / C&S / HPL / VASHINO / RISHABH
16	L.T. Power Capacitors & APFC Panel	Universal / Siemens / L&T / Crompton Greaves / Voltas / Ducati / Asian
17	APFC Panel & Relays	ABB / GE / Siemens / Enercon / L&T / Neptune-DUCATI / AVOMEC
18	Connectors/ Terminal Blocks	Elmex / Essen / APP
19	Moulded Case Circuit Breakers (MCCBs)	ABB / L & T / Siemens / Schneider / GE / Legrand / C&S /Havell's
20	PVC Insulated Cu. Wires (incl. Panel Wires) & Flexibles	Finolex / Rajnigandha / RPG / National / Polycab / RR Kable Nicco
21	PVC conduit and accessories	Precision / Circle Arc / AKG / Garware / Shakti / CPL / Polyplast / Universal / ANCHOR
22	PVC casing-capping(Trunking)	Precision / Presto-Plast / Kalinga / MK / ANCHOR
23	PVC Pipes for U/G laying for road crossings	Kisan / Supreme / Prince
24	Modular Switches / Sockets / Ceiling Roses / Batten Holders / other accessories	L&T / Siemens / MK / Anchor-Panasonic / LK India / North West / Crabtree / Legrand / Precision / Cona / Schneider / GE / HPL / C&S / Indo Asian
25	Industrial Sockets with MCBs	L&T / Neptune / Siemens / Indo Asian / HPL / BCH /
26	Intelligent Digital Panel Meters	L&T / Rishabh/ AE / Enercon / Secure / Krykard / Neptune Ducati / HPL
27	Hot Dip G.I. Conduit	BEC / VIMCO / AKG
28	MS conduit pipes & accessories	ICI / BEC / NIC / National / Swastic / AKG / Brnco / Supreme / ECW
29	Steel Structureal Membars	Jindal / Tata / Sail / Jindal
30	G. I. Pipes	Jindal / Tata / Zeneith
31	Light fittings incl. LED type	Philips / Crompton / GE / Bajaj / Havell's / VIN / Wipro / SYSKA / MESCAB /
32	Lamps, Tubelights & CFLs	Philips / Crompton / GE / Bajaj / Havell's / Osram / Surya
33	EXIT Signage	Prolite / Legrand
34	Ceiling/Bracket/Exhaust Fan	Crompton Greaves / Bajaj / GEC / Polar / Usha / Havell's /REMI
35	Air Circulators & Exhaust Fans	Crompton / Almonard / ACO / Alfa / Havell's / REMI / Usha
36	Black Enamelled M.S. Conduit	BEC / NIC/ VIMCO / AKG / BENCO / Supreme
37	Isolators	Siemens / HH Elcon / L&T /GE
38	Current Transformers & Potential Transformers	A.E./ Indcoil / Kappa / Power Pack / Perfect / Kapco /L&T / Premier / Advance / Pragati / Nippen / Cuppa
39	Cable Glands	Comet / Braco/ Jainco
40	Cable Tray	Profab / Indiana / Checkstorage / CITY STEELEDGE/ CABLOFIL(LEGRAND)
41	Fire Extinguishers	Firex / Cease Fire / Vijay
42	Hylam sheets	Bakelite Hylam
43	Speaker	Bosch / Toa / Ahuja
44	CCTV Camera / Network video Record	Orvito / Bosch
45	Telephone System / EPABX	TATA TELECOM / SIEMENS / LUCENT
46	Window / Split / Cassette Air-Conditioners	Daikin / Hitachi / Voltas / Carrier / Blue-Star / TOSHIBA / LG / O-General / Panasonic / Samsung

NOTE : *The above is only an indicative list and other equivalent makes with ISI mark may be used subject to prior approval of the competent authority. All other items not covered above shall be as per the makes & samples to be approved by the Engineer-in-charge.*

Notes on BoQ

The tenderers MUST carefully go through the drawings, various clauses of the tender, technical specifications; BoQ, etc. and should make his offer comprehensive to fulfil all of them and to complete the work in true sense.

1. Tenderers may **visit the site, if necessary,** before quoting their rates if they feel it necessary to understand the nature of work and condition of the site.

2. **The quantities shown in the BoQ are only probable & indicative and actual quantities of work may vary to any extent and** the successful tenderer will ascertain before procuring any material, especially light fittings & fans, ACs, etc. at site for execution. No change in accepted unit rates will be admissible on variation of quantities to any extent on either side.

3. The quoted rates shall be inclusive of all taxes & duties; cost of all material & accessories for erection, connections, testing, commissioning; required labour including skilled manpower for execution and supervision of the work; tools, tackles, plant & machineries required for the work including their transportation; etc. All contingencies, breakage, wastage, sundries, scaffolding, etc. complete shall also be taken care of in the quoted rates including **a comprehensive maintenance of the installation as mentioned for 1 year** from the date of satisfactory completion and handing over**.**

4. **The works shall be carried out as per the latest relevant CPWD specifications for electrical and air-conditioning works, all relevant IE rules & regulations & BIS recommendations.** The quoted rates shall include for carrying out all works as per relevant standards and specifications whether so is specifically mentioned or not.

5. All expenses towards mobilization & demobilization of site including workforce, material, clearing of site, etc. shall be deemed to be included in the quoted rates.

6. **All material to be/used in the work** incl. their makes apart from those mentioned in the 'List of Approved/Acceptable Makes of Material' shall be **subject to approval & acceptance of the Engineer-in-charge/competent authority.**

7. The contractor shall be responsible for protection of the existing underground electrical, telephone & other cables, water lines and other services while working at the site. Any damage whatsoever done to such services shall be mended good by the contractor at his cost.

8. **The contractor shall take all necessary precautions for the safety including in the electrical safety of all workers while working and their health as special protection & precautions are necessary in such works.**

9. Only the specified / acceptable makes of material shall be used in the work. For any kind of deviation from those mentioned in the tender in respect of makes of material and/or catalogue numbers as in the BoQ; **a prior approval of the Engineer-in-charge/competent authority MUST be taken.**

10. Duly endorsed **Warranty Certificates from the manufacturer/dealer MUST be handed over to NCSM** before submitting the FINAL BILL.

11. Defects reported to the tenderer during the **Defects Liability Period of 01 Year** MUST be attended to within 48 hours of reporting.

12. **Beyond the unit prices, no extra amount will be payable on any ground.**

-x-x-x-

	Façade Lighting for BLOCK - B at Nehru Science Centre Mumbai					
SL No.	Items	Unit	Qty	Unit rate	Amount	Remarks
1	SITC of high quality long through multi color wash light, Protection Rating : IP66, complying to BIS standard "IS 10322 (Part 5/Sec 1): 2012" and having CE certification against standard "Low Voltage Directive & Protective Equipment - EN 60598-1:2015", and "Electromagnetic Compatibility Directive - EN 61547: 2009", Mounting Structure : Adjustable surface mount yoke arrangements for fixing the lights having the rotation degrees embosed in the die cast. Power consumption : 150W, CCT : RGBW(6000-7000K), (as per the design approval), Optics : PMMA with holder, Beam Angle : 25º/45º/60º, Control : DmX512 Channel : 4 CH, Body : Die casted / extruded aluminium with embossed manufacturer logo, Seperate compartment for keeping the decoder/driver in the housing which can be easily removable for service without disturbing the LEDs/Optics, Hot spot and light distribution : Optics Designed to minimize hot spots & fringing in color mixing applications. Power Input : Constant DC 24V with external driver to the constant current decoder, Surge Protection : Inbuilt surge protection in the driver 2KV-4KV(Additional if required will be added as per the requirement), Toughened transparent glass having the IK protection up to IK08, Painting : Chemical 3/7 tank processed treatment before the powder coat black/ash/approved color coat. Fixture will be suitable to operate in a temperature range of 0°C to 50°C, The light fixtures are having IP68 air vent made of stainless steel which helps to desiccate & prevent from forming moisture inside the light fixture at worst environmental condition. LED life should be at least 50,000 burning hours at L70 at 35 degree centigrade. Luminaire is inclusive of Integral male/female waterproof connectors with structures in pre wired conditions as per IS standard. PCB thickness must be 1.6mm, 35 micron Copper, 2W TC with Black or White masking, Copper /OSP finish. LM79, IK07, IP66, HV Certificates from NABL Acrediated laboratory. LED Makes should be CREE, LumilLED, Osram, Seoul, Nichia or equivalent with the engineer or 3rd party testing laboratory approval. Power & DMX Loop In/Out along	Nos	7	₹ 45,866.00	₹ 3,21,062.00	
2	SITC of high quality long through multi color wash light, Protection Rating : IP66, complying to BIS standard "IS 10322 (Part 5/Sec 1): 2012" and having CE certification against standard "Low Voltage Directive & Protective Equipment - EN 60598-1:2015", and "Electromagnetic Compatibility Directive - EN 61547: 2009", Mounting Structure : Adjustable surface mount yoke arrangements for fixing the lights having the rotation degrees embosed in the die cast. Power consumption : 180W, CCT : RGBW(6000-7000K), (as per the design approval), Optics : PMMA with holder, Beam Angle : 25º/45º/60º, Control : DmX512 Channel : 4 CH, Body : Die casted / extruded aluminium with embossed manufacturer logo, Seperate compartment for keeping the decoder/driver in the housing which can be easily removable for service without disturbing the LEDs/Optics, Hot spot and light distribution : Optics Designed to minimize hot spots & fringing in color mixing applications. Power Input : Constant DC 24V with external driver to the constant current decoder, Surge Protection : Inbuilt surge protection in the driver 2KV-4KV(Additional if required will be added as per the requirement), Toughened transparent glass having the IK protection up to IK08, Painting : Chemical 3/7 tank processed treatment before the powder coat black/ash/approved color coat. Fixture will be suitable to operate in a temperature range of 0°C to 50°C, The light fixtures are having IP68 air vent made of stainless steel which helps to desiccate & prevent from forming moisture inside the light fixture at worst environmental condition. LED life should be at least 50,000 burning hours at L70 at 35 degree centigrade. Luminaire is inclusive of Integral male/female waterproof connectors with structures in pre wired conditions as per IS standard. PCB thickness must be 1.6mm, 35 micron Copper, 2W TC with Black or White masking, Copper /OSP finish. LM79, IK07, IP66, HV Certificates from NABL Acrediated laboratory. LED Makes should be CREE, LumilLED, Osram, Seoul, Nichia or equivalent with the engineer or 3rd party testing laboratory approval. Power & DMX Loop In/Out along	Nos	4	₹ 87,323.00	₹ 3,49,292.00	

3	SITC of high quality long through multi color wash light, Protection Rating : IP66, complying to BIS standard "IS 10322 (Part 5/Sec 1): 2012" and having CE certification against standard "Low Voltage Directive & Protective Equipment - EN 60598-1:2015", and "Electromagnetic Compatibility Directive - EN 61547: 2009", Mounting Structure : Adjustable surface mount yoke arrangements for fixing the lights having the rotation degrees embosed in the die cast. Power consumption : 100W, CCT : RGBW(6000-7000K), (as per the design approval), Optics : PMMA with holder, Beam Angle : 25º/45º/60º, Control : DmX512 Channel : 4 CH, Body : Die casted / extruded aluminium with embossed manufacturer logo, Seperate compartment for keeping the decoder/driver in the housing which can be easily removable for service without disturbing the LEDs/Optics, Hot spot and light distribution : Optics Designed to minimize hot spots & fringing in color mixing applications. Power Input : Constant DC 24V with external driver to the constant current decoder, Surge Protection : Inbuilt surge protection in the driver 2KV-4KV(Additional if required will be added as per the requirement), Toughened transparent glass having the IK protection up to IK08, Painting : Chemical 3/7 tank processed treatment before the powder coat black/ash/approved color coat. Fixture will be suitable to operate in a temperature range of 0°C to 50°C, The light fixtures are having IP68 air vent made of stainless steel which helps to desiccate & prevent from forming moisture inside the light fixture at worst environmental condition. LED life should be at least 50,000 burning hours at L70 at 35 degree centigrade. Luminaire is inclusive of Integral male/female waterproof connectors with structures in pre wired conditions as per IS standard. PCB thickness must be 1.6mm, 35 micron Copper, 2W TC with Black or White masking, Copper /OSP finish. LM79, IK07, IP66, HV Certificates from NABL Acrediated laboratory. LED Makes should be CREE, LumilLED, Osram, Seoul, Nichia or equivalent with the engineer or 3rd party testing laboratory approval. Power & DMX Loop In/Out along	Nos	8	₹ 34,501.00	₹ 2,76,008.00	
4	SITC of DC power driver for the above Lights, Power : 200W, Input : AC 110-240V AC, 50Hz, Output : DC 12/24V, Protection rating, IP67, Surge protection : LL 4KV, LE 6KV	Nos	19	₹ 7,235.00	₹ 1,37,465.00	
5	SITC of PVC insulated multi core electrical un armoured flexible 3C x 1.5Sq mm power cable having less electrical losses. This PVC insulated and round sheathed wire features a bright multi strands copper conductors and it supports voltage grade up to 1100V. (As per actuals depending upon the site condition)	Mtr	500	₹ 220.00	₹ 1,10,000.00	
6	SITC of PVC insulated multi core electrical un armoured flexible 3C x 2.5Sq mm power cable having less electrical losses. This PVC insulated and round sheathed wire features a bright multi strands copper conductors and it supports voltage grade up to 1100V. (As per actuals depending upon the site condition)	Mtr	400	₹ 284.00	₹ 1,13,600.00	
7	SITC of 5 core DMX cable comprises twisted pairs with shield support for carrying of data. DMX512 cable is used for connecting all light consoles that use DMX 512 standard data transmission. (As per actuals depending upon the site condition)	Mtr	500	₹ 181.00	₹ 90,500.00	
8	SITC of IP65 "I" power connectors having 3/4 pole cable connector, chuck type strain relief, Current rating 20 A rms continuous, Easy and extremely precise locking system "Quick Lock" High impact materials - long-lasting and reliable	Nos	19	₹ 1,464.00	₹ 27,816.00	
9	SITC of IP65 "I" DMX connectors having 3/5 pole cable connector, Male/Female connector with improved latch, cage type contacts, "solder stop" for easy soldering, and additional ground contact for best contact integrity between chassis and cable connector. More durable housing for maximum reliability.	Nos	19	₹ 1,703.00	₹ 32,357.00	
10	SITC of 5 pin XLR Male connectors having 5 pole cable connector, Male/Female connector with improved latch, cage type contacts, "solder stop" for easy soldering, and additional ground contact for best contact integrity between chassis and cable connector. More durable housing for maximum reliability.	Nos	8	₹ 916.00	₹ 7,328.00	
11	SITC of 5 pin XLR Female connectors having 5 pole cable connector, Male/Female connector with improved latch, cage type contacts, "solder stop" for easy soldering, and additional ground contact for best contact integrity between chassis and cable connector. More durable housing for maximum reliability.	Nos	2	₹ 916.00	₹ 1,832.00	

12	SITC of Power Distribution Board made up of MS Sheet metal fabricated housing black powder coated and ivery connectors for the internal terminations and external outgoing connecting points, fibre / brass glands of suitable size fitted MCB control for outgoing circuits. Timer with required contactor for auto switching. Power panel suitable for indoor/outdoor applicable and floor mount / wall mount options. - 9 Nos of 6/10A SP Outgoing MCB's. - 1No of 16A TPN Incoming MCB.	Nos	1	₹ 40,656.00	₹ 40,656.00	
13	SITC of PVC insulated multi core electrical armored flexible 4C x 2.5Sq mm power cable having less electrical losses. This PVC insulated and round sheathed wire features a bright multi strands aluminium conductors and it supports voltage grade up to 1100V. (As per actuals depending upon the site condition)	Mtr	300	₹ 280.00	₹ 84,000.00	
14	SITC of 50 mm outside dia. double wall corrugated pipes (DWC) for enclosing cable below ground/road surface, to required depth complete for both power and Dmx. (As per actuals depending upon the site condition)	Mtr	300	₹ 472.00	₹ 1,41,600.00	
15	SITC and fixing of PVC conduit pipe on surface 25 mm Dia (Medium) with accessories, junction box etc. including clamping etc	Mtr	250	₹ 277.00	₹ 69,250.00	
16	Providing earthing with galvanised iron earth plate, Earthing pipe, GI earthing wire, complete with all materials, testing and recording.	Nos	2	₹ 23,931.00	₹ 47,862.00	
17	SITC of IP driver box made up of PVC / UPVC and ivory connectors for the internal terminations and external outgoing connecting points, fiber / brass glands of suitable size fitted MCB control for outgoing circuits.	Nos	5	₹ 6,443.00	₹ 32,215.00	
18	SITC of DMX isolator or splitter provides Isolated optical DMX splitter provides 8 outputs from a 1 input and Input voltage: AC 110 to 220 V, 50 Hz, Product features: Group 1 & group 8 DMX signal change.	Nos	1	₹ 42,085.00	₹ 42,085.00	
19	SITC of DMX controller can be used to control a wide variety of different DMX systems- from RGB/RGBW to more advanced moving and color mixing luminaires, 128 DmX channels in live mode (computer), stand alone mode with 1 area and 20 scenes, Mac OSx 10.6/10.7/10.8 - Windows XP/VISTA/SEVEN/8 32/64 bits and USB 2.0, XLR3, mini USB, Power From 5V to 5.5V DC (AC/DC adapter in option) With External Button for Scene change/Selection scenes.	Nos	1	₹ 52,279.00	₹ 52,279.00	
20	SITC of Programming charges	Job	1	₹ 39,545.00	₹ 39,545.00	
21	SITC of additional accessories for installing the lights as per the final drawing/site condition consisting of clamps, brackets, angles, conduits, joints, hardware's like fasteners, nut & bolts etc.,	Lot	1	₹ 80,671.00	₹ 80,671.00	
	Sum Includes LC 1%				₹ 20,97,423.00	
	GST @ 18%				₹ 3,77,537.00	
	Grand Total				**₹ 24,74,960.00**	
	Terms & Conditions as per annexture					

Annexure-E

TENDER No. फ़ाइल संख्या: NSCM//Elec/B-ब्लॉक-फेकेड/2025–26

TECHNICAL (TECHNO-COMMERCIAL) BID

NOTE: All Particulars / Informations should be given in the following format with complete details :

1	Name & Address of the Firm/Bidder	
2	Telephone No. Mobile No.(to be available 24 Hrs) Office (Local) : E-mail ID : Website :	
3	Manpower set up of the Firm	
4	Qualification of Professionals	
5	Past experience in such business for the last 7 years as mentioned at Sr. No.7.2.3 of the NIT Submit certificate issued by such clients / Government Offices for satisfactory executing of orders. One similar work of aggregate cost not less than 80% of the estimated cost.. **Or** Two similar works each costing not less than 60% of the estimated cost.. **Or** Three similar works each costing not less than 40% of estimated cost.	
6	(i) Whether capable to carry out all the tendered work strictly as per enclosed Technical Specification and Drawings as per prior approval ? (Please mention 'YES' or 'NO')	
	(ii) If it is mentioned 'NO' above, submit detailed deviation to be made from the enclosed Technical Specification. (Extra sheet may be attached, if required). (iii) If it is mentioned 'YES' above, inform number of days/months required for completion of the job.	
	(iv) State whether the Tendered work to be offered by the Firm shall either	

	come with/or in compliance with all the features as detailed in enclosed Technical Specification. (State 'YES' or 'NO')	
7	Proof of financial status of the company/audited Balance Sheet for last 3 years indicating total turnover as well. (Submit documentary evidence)	
8	Minimum time required for the tendered work at Nehru Science Centre, Mumbai	
9	State whether registered under GST. (Enclose photocopy of certificates)	
10	Whether agree to complete the tendered work as per enclosed Drawings and Technical Specifications positively by T**HREE months** and failing which ready to absorb penalty as per clause, if any order is placed on the Bidder after observing tender procedure? (Please mention 'YES' or 'NO')	

I/We hereby declare that the above statements are true. I/We also declare that the decision of Nehru Science Centre, Mumbai, regarding selection of eligible firms for opening of Financial Bid (Part-II) shall be final and binding on me/us.

Dated :

Official Seal

Signature of the Tenderer/Constituted Attorney

(Special Technical terms and conditions include with Clause No.7.2 for ELIGIBILITY CRITERIA)
ELIGIBILITY CERTIFICATES TO BE ENCLOSED BY THE COMPANY/FIRM/AGENCY/CONTRACTOR
The tendering for execution of work Company/Firm/Agency/Contractor should submit the following documents (self-attested or company proprietor sign).

SI. NO.	REQUIREMENT	RELEVENT DOCUMENT TO BE PROVIDED	Enclosed Yes/No
1	The firm/Agency should have registration inany any State PWD or central Government department OR the firm/company should be registered under the Companies Act, 2013, or be a proprietorship concern registered with the appropriate authority.	Copy of Registration certificate/Cerificate of Incorporation Certificate to be provided	Yes/No
2	The Firm/ Agency/ Contractor should be registered with GST.	Copy of Registration Certificate to be provided	Yes/No
3	The Firm/Agency should have Income Tax Return for three financial year 2022-2023, 2023-2024 and 2024-2025 (A.Y. 2023-2024, 2024-2025 and 2025-2026).	Copy of I.T.R to be provided	Yes/No
4	Pan Card	Copy of Pan Card should be provided	Yes/No
5	The firm/agency should have average annual financial turnover for three financial year (2022-2023, 2023-2024 and 2024-2025), should be at least 50 % of the tender cost. A certificate in this regard issued by the CA has to be submitted.	Copy of Turnover certificate be provided	Yes/No
6	The firm/agency should have experience in completion of similar nature of work, i.e., Supply, Installation, Testing, and Commissioning of Façade illumination system at Heritage Monuments/buildings/garden in the central government departments or state government departments or any Public Sector Units [PSUs]. Work completion certificate and work order copy must be submitted along with the bid. -Three similar nature of works Each costing not less than 40% of the tender cost OR -Two Similar Nature of works each Costing not less than 60% of the tender cost OR -One Similar Nature of work costing not less than 80% of the tender cost Note:-That/those work/works should have been completed during the last seven years for	Copy of work order and its completion certificate to be provided	Yes/No
Special OEM Terms and Conditions:-			
7	OEM should have minimum existence of 7 years in Indian Market	Certificate of Incorporation OR Registration Certificate.	Yes/No
8	Have their own manufacturing facility in their name in India. [Tender Inviting Authority may visit the factory for verification]	Registration Certificate of Factory	Yes/No
9	OEM should submit turnover of the agency more than the contract value, CA Audited turnover certificate to be uploaded along with the bid	Copy of Turnover certificate to be provided	Yes/No
10	OEM Must be ISO 9001 & 2015, ISO 14001:2015 & ISO 45001:2018. A Copy to be submitted along with the bid	Copy to ISO certificate to be provided	Yes/No
11	OEM should submit In-house photometry lab having calibrated automated mirror C type gonio meter, HV test equipment's, Sphere test etc. IP Testing Facility for Dust & Water, IK Testing facility. OEM should provide the declaration with list of photometric equipment with invoice proofs to be submitted with the technical bid submission. (EVALUATION COMMITTEE WILL REVIEW THE DETAILS)	List of photometric equipment with Invoice proofs	Yes/No
12	Façade lighting fixtures being supplied for this project should have a brand embossed logo on the light fixture body to ensure genuine fixtures. Engraved or sticker branding will not be accepted. A notarized confirmation by the manufacturer to be uploaded with the tender technical bid.	Notarized affidavit/ UNDERTAKING to be provided	Yes/No
13	OEM Authorization Letter for Electrical Contractors Licence Holders is mandatory	The bidders should provide the OEM Authorization letter. Not applicable if OEM participating in the tender	Yes/No
Material Certificate & Design			
14	Technical Data Sheet along with necessary test report should be from NABL Accredited Lab for line Item No 1-5 (BOQ).	TDS and Test Certificates to be provided	Yes/No
a.	BIS Certificates		
b.	CE Certificates		
c.	ROHS Certificates		
d.	LM79 Certificates		
e.	LM80 Certificates		
f	All Type test reports(IP,IK and HV certificates) from NABL accredited lab		
g	Eye Safety Photobiological test reports from LED manufacturer		
h	Polar curve diagram & Luminance diagram	Polar curve diagram & Luminance diagram to be	
15	Trade Mark Registartion Certificate	Copy to be provided	Yes/No
16	The bidder shall visit the site, prepare the design presentation in accordance with the BOQ can be uploaded for committee evalution, and submit the same along with the technical bid; failing which, the bid is liable to be disqualified.	Design presentation for tender purpose , after LoI conceptual design should be approved by the competent authourity	Yes/No

List of Approved makes:

1. Make of LED: CREE/OSRAM/NICHIA/SEOUL/LUMILED
2. Make of Luminaires: Leksa Lighting/ Philips / Color Kinetics / iGuzzini / Griven /Lytmaster
3. Make of DMX Controller: Leksa Lighting / Philips / Pharos
4. Make of DMX Cable: D-link/Belden/LL/Hengle/Falcon
5. Power Cables & Wire: Polycab/Finolex/RR/KEI
6. MCB/MCCB/D.B& Electrical Accessories: SIEMENS/ABB/LEGRAND/Schneider/L&T/Hage

OEM Authorization is mandatory for Makes of the luminaires and controllers.
Above all makeare reference and indicative any equilent make to be need prior approval with samples.