
E-TENDER DOCUMENT

NAME OF THE WORK:

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

TENDER INVITING AUTHORITY

Director
National Science Centre
(A unit of NCSM, Ministry of Culture Govt. of India)
Near gate No. 4, Pragati Maidan
Bhairon Marg, New Delhi – 110001



Ministry of Culture
Government of India



NATIONAL COUNCIL OF SCIENCE MUSEUMS

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INSTRUCTIONS TO THE TENDERERS/BIDDERS FOR E-SUBMISSION OF BIDS ONLINE THROUGH E-PROCUREMENT SITE <https://eprocure.gov.in/eprocure/app>

This tender document has been published on the Central Public Procurement (CPP) Portal (URL: <https://eprocure.gov.in/eprocure/app>). The tenderers/bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates (DSC). The instructions given below are meant to assist the tenderers/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) Tenderers/bidders are required to enrol 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 Enrol**” on the CPP Portal. Enrolment is free of Charge.
As part of the enrolment process, the tenderers/bidders will be required to choose a unique username and assign a password for their accounts.
Tenderers/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.
Upon enrolment, the tenderers/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.
Only one valid DSC should be registered by a tenderer/bidders. Please note that the tenderers/bidders are responsible to ensure that they do not lend their DSC's to others which may lead to misuse.
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

- (a) There are various search options built in the CPP Portal, to facilitate tenderers/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 tenderers/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.
- (b) Once the tenderers/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 tenderers/bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.
- (c) 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

- (a) Tenderer/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 contents of each of the documents that need to be submitted.
- (b) 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 as mentioned. **Bid documents may be scanned with 100 dpi with black and white option.**
- (c) To avoid the time and efforts 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 tenderers/bidders. Tenderers/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 the bid just by tagging 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

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc. at National Science Centre, Delhi

- 1) Tenderer/bidder should log into the site well in advance for bid submission so that he/she uploads the Bid in time i.e. on or before the bid submission time as per the system. Bidder will be responsible for any delay due to other issues.
- 2) Tenderer/bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.
- 3) 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 tenderers/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.
- 4) The tenderer should furnish duly signed Bid Securing Declaration as per the format given in Annexure "C" and upload along with technical bid of the tender.
- 5) Tenderers/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 **Rate Quote Sheet (Percentage BoQ Template)** in .xls format with the tender document, which is to be downloaded and to be filled by all the tenderers/bidders. Tenderers/bidders are required to download the **Rate Quote Sheet (Percentage BoQ Template)** file, open it and complete the **blue colored (unprotected)** cells with their respective financial quotes and other details (such as name of the Tenderer/bidder). No other cells should be changed. Once the details have been completed, the tenderer/bidder should save it and submit it online, without changing the filename. If the **Rate Quote Sheet (Percentage BoQ Template)** file is found to be modified by the tenderer/bidder, the bid will be rejected. In e-Tendering, intending tenderer/bidder can quote their rate in figures only. The total amount is generated automatically. Therefore, the rate quoted by the tenderer/bidder in figures shall be taken as correct. The Comparative Statement is also generated automatically by the system. The Comparative Statement and rate quoted by each tenderer/bidder shall be downloaded. **The manual calculation check of tenders/bids and Comparative Statement, shall be final. In case, any discrepancy is noticed, the decision of appropriate NCSM authority shall be final and binding.**
- 6) The server time (which is displayed on the tender's/bidder's dashboard) will be considered as the standard time for referring the deadlines for submission of the bids by the tenderers/bidders, opening of bids etc. The tenderers/bidders should follow this time during bid submission. The tenderers/bidders are requested to submit the tenders/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).
- 7) All the documents being submitted by the tenderers/bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons 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.
- 8) The uploaded tender documents become readable only after the tender opening by the authorized tender/bid openers.
- 9) Upon the successful and timely submission of tenders/bids, the portal will give a successful tender/bid submission message & a tender/bid summary will be displayed with the NIT/tender/bid no. or Name of Work and the date & time of submission of the tender/bid with all other relevant details.
- 10) The tender/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 tender/bid opening meetings.

ASSISTANCE TO TENDERERS/BIDDERS

- (a) Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the **Tender Inviting Authority (TIA), National Science Centre, Near Gate No. 04, Pragati Maidan, Bhairon Road, New Delhi- 110001 Ph. 011-7428693710-17 Fax- 011-23371263 Website: www.nscd.gov.in Email: nscdl01@gmail.com , nscdelhicivilsection@gmail.com**
- (b) Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed call to the 24x7 CPP Portal Helpdesk Ph. **1800-3070-2232.**

NOTICE INVITING E-TENDER (E-NIT)

No. NSCD/15014/01/e-tender/08/2025-26 (Civil)

Dated: 08.07.2025

1. The **National Science Centre, Delhi** is a constituent unit under the National Council of Science Museums, Kolkata* (*hereinafter referred to as the Museum/Centre).
2. Online e-tenders (Percentage Rate Bid) are hereby invited from reputed and experienced Engineering/Technical contractors who are also empanelled with Central Government / Central Autonomous Bodies/ State PWD/ Central Public Sector Undertakings and capable of carrying out the work of **“Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi”** having estimated cost of **Rs. 6.77 Cr.**, with excellent finishing quality.

3. Eligibility Criteria

3.1 General:

- 3.1.1 **Participation in the tender is invited only from appropriate class local contractors/agencies/ suppliers in conformity to Gol PPP-MII Order 2017 and Revision therein dated 19/07/2024. Bids of all other classes of vendors /agencies are not liable to be considered for evaluation and will be summarily rejected. The bid must be accompanied by a declaration and compliance certificate to this effect signed by competent /authorized person of the firm/suppliers in their letterhead without which the bids are liable to be rejected.**
- 3.1.2. A Bidder should be a registered as well as empanelled (as per clause No 3.5) company registered under company/shop registration act, private entity, government-owned entity of reputed having minimum experience of 5 years in the similar business.
- 3.1.3. A Bidder, and all parties constituting the Bidder, shall have the nationality of India.
- 3.1.4. The Centre considers a conflict of interest to be a situation in which a party has interests that could improperly influence that party's performance of official duties or responsibilities, contractual obligations, or compliance with applicable laws and regulations, and that such conflict of interest may contribute to or constitute a prohibited practice. Centre will take appropriate actions, which include not financing the contract, if it determines that a conflict of interest has flawed the integrity of any procurement process. Consequently, all Bidders found to have a conflict of interest shall be disqualified. A Bidder may be considered to be in a conflict of interest with one or more parties in this bidding process if, including but not limited to:
 - (a) they have controlling shareholders in common; or
 - (b) they receive or have received any direct or indirect subsidy from any of them; or
 - (c) they have the same legal representative for purposes of this bid; or
 - (d) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the Bid of another Bidder, or influence the decisions of the Employer regarding this bidding process; or
 - (e) a Bidder participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all Bids in which the party is involved. However, this does not limit the inclusion of the same subcontractor, not otherwise participating as a Bidder, in more than one bid; or
 - (f) a Bidder participated as a consultant in the preparation of the design or technical specifications

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of the contract that is the subject of the Bid; or

(g) a Bidder was affiliated with a firm or entity that has been hired (or is proposed to be hired) by the Employer as Engineer for the contract.

3.1.5. A firm shall not be eligible to participate in any procurement activities under a Government-financed project while under sanction imposed by any Government Authorities Central / State. A bid from a sanctioned firm will be rejected.

3.1.6. Government-owned enterprises shall be eligible only if they can establish that they are legally and financially autonomous and operate under commercial law, and that they are not a dependent agency of the Employer.

3.1.7. Bidders shall provide such evidence of their continued eligibility satisfactory to the Employer, as the Employer shall reasonably request

3.1.8. In case a prequalification process has been conducted prior to the bidding process, this bidding is open only to prequalified Bidders.

3.2 Financial:

3.2.2 Average Annual Turnover

Minimum average annual average turnover for the last **5 (Five) consecutive financial years** is to be **INR 6.77 Cr. (equal to the estimated cost of the work)**.

To assess the bidder's current financial position and prospective long-term profitability, it is essential, at a minimum, that the bidder's net worth—calculated as the difference between total assets and total liabilities—is positive

3.2.3. The Bidder shall be required to invest a minimum of 25% of the estimated project cost. An undertaking to this effect shall be submitted by the Bidder as part of the bid proposal.

3.3 Work Experience:

3.3.1 General Construction Experience-

The agency should have successfully executed **similar nature*** works with any of depts. as mentioned in clause 3.5 during the last **5 (Five)** years prior to the bid submission deadline as under:

- i. Three similar completed works, each costing not less than the amount equal to 40% of the estimated cost put to tender.
- ii. Two similar completed works, each costing not less than the amount equal to 50% of the estimated cost put to tender.
- iii. One similar completed works, each costing not less than the amount equal to 80% of the estimated cost put to tender.

***Definition of the similar nature of work: 'Similar works' means Construction/ complete renovation of an Auditorium and Conference room including civil, interior, acoustic treatment, seating (SITC of Aud. Chairs etc.), furnishing, stage furnishing, Audio Visuals equipment including LED walls, Electrical, Lighting, HVAC and Firefighting works etc. complete in all respect Under Single contract / Agreement.**

****NSCD** may inspect any of those works at its discretion to verify the credentials of the bidder for the qualifying works/ projects indicated above for which the Bidder shall provide references (including Referee names and contact details) in respect of the projects implemented.

3.4 Bidders should have adequate engineers in the company's roll and the bidder should also have own/lease/hiring arrangement for plants and machineries for execution of the work.

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3.5 Bidders should be able to abide by and handle statutory requirement related to labour licence, GST, PF, ESI, Insurance etc. during the tenure of the contract.

3.6 Bidders should have valid GST Registration, Income Tax PAN Number, PF and ESI registration number.

3.7 Joint Venture/consortium bid are not permitted to participate.

3.8 Agencies should be Empanelled with **CPWD/ State PWD/ Railways/ MES/ other Central Government / central & state PSUs / State Government Departments/ Listed private sector organizations** under appropriate class / category to take up the work of the estimated value.

3.9. The agency should also submit the detail of his banker with bank account detail supported with Bank authorization letter.

Note for clause 3.3.1 above:-

- i. If the qualifying work is completed in the Five (5) year period specified above, even if it has been started earlier, the same will also be considered as meeting the qualifying requirement.
- ii. The word “executed” means the bidder should have achieved the criteria specified in the above QR even if the total contract is not closed ie under execution and provided the work is not terminated by the client.

The bidder is liable to be disqualified, even though they meet the qualifying criteria, if they-

- Made misleading or false representations, statements and attachments submitted in proof of the qualification requirement, and / or
- **Indulge in unlawful and corrupt means for obtaining bids**
- Have record of poor performance such as abandoning the works, not properly completing the order, inordinate delays in completion or supply, litigation history with B& R/CAU, or financial failures etc.
- Blacklisted by the Competent Authority.
- If the tenderer deliberately gives wrong information /submit fake, false, fabricated, forged document in his offer/tender, B&R reserves the right to reject such offer/tender at any stage or to cancel the contract if awarded and forfeit the Earnest Money, Security Deposit any other money due.

The bidder should provide documentary proof to clearly substantiate each eligibility criteria, failing which the bid will be summarily rejected.

3.10. Proof of Concept (PoC)

- The bidders shall be advised to present a project implementation scheme i.e. scheme for implementing the proposed system as per site requirements by way of suitable presentation.
- The PoC should cover all aspects that are referred to in part 3.11 (i.e. technical presentation before the Technical Evaluation Committee) of clause 3.11(B).
- Further requirement if any regarding the presentation shall be communicated in due course.

Note:

- **Bidders are required to submit documents to support their claim as per format in Annexure-A**
- **The bidders should be ready for the demonstration of Proof of Concept (PoC) on short notice, say 3 days from the communication from NSCD.**

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- Bidders should submit the PDF file of the PoC along with the technical bid.
- Uploading unnecessary documents may lead to disqualification of bidders.

3.11. PROPOSAL EVALUATION / SELECTION CRITERIA

A three-stage procedure (two-bid system) based Selection Evaluation will be adopted in evaluating the proposals

1. **Eligibility Criteria Evaluation:** Any shortcoming of the documents will lead to rejection of the bid and other covers will not be opened.
2. **Technical Presentation Evaluation:** The agencies qualifying on the basis of their eligibility criteria will only be called for Thematic/Technical Presentations (may be arranged in online) which can be at a very short notice.
3. **Financial Evaluation:** Only the bidders/firms securing the minimum qualifying marks based on Eligibility Criteria Evaluation and Technical/Presentation Evaluation as described in details below will be eligible for their Financial Bid Opening & Financial Evaluation

A. Technical Evaluation

- i) The Evaluation Committee appointed by the Centre shall carry out its evaluation applying the evaluation criteria specified in the bid document. Evaluation of the application would be done as per the submitted documents. Bidders/Agencies, who are in the trade and are fulfilling the pre-qualification criteria as per the documents required would only be called for thematic presentation, which can be at a very short notice of even five days.
- ii) Each responsive proposal shall be attributed a technical score. Based on the technical assessment, agencies securing minimum **70 marks out of 100 will be** shortlisted and the financial bids of only the shortlisted agencies will be opened. The date and time of opening of the financial bids will be intimated to the selected/ shortlisted agencies through CPP portal.

Technical Evaluation Marking Scheme

The technical bid will be evaluated on the basis of the indicated parameters in the table below:

Evaluation of bids found eligible as per pre-qualification criteria would be undertaken by Technical Evaluation Committee Constituted by the competent authority as per parameters cited below:

Sl. No.	Parameter	Criteria	Sub Marks	Total Marks 100	Marks Obtained
01.	Credentials of applicant/ agency: The bidder should have minimum 05 year experience preceding the proposal due date, in the similar work* (Total Max. marks- 05)	More than 5 years upto 10 years – Bonus 3 marks	3	5	
		More than 10 years – Bonus 2 Marks	2		

Sl. No.	Parameter	Criteria	Sub Marks	Total Marks 100	Marks Obtained
02.	Financial Soundness: Firms / Companies should have average annual financial turnover of Rs. 677.00 lakhs during the last 5 financial years (AY 2024-25, 2023-24, 2022-23, 2021-22 and 2020-21) (Total Max. Marks- 10)	Turnover of Rs.677.00 lakhs to 800.00 lakhs – Bonus 5 marks	5	10	
		Turnover of Rs.800.00 lakhs to 900.00 lakhs – Bonus 3 marks	3		
		Turnover of more than 900.00 lakhs – Bonus 2 marks	2		
03.	Support from OEMs (Supporting documents based upon the certification in this respect from OEMs to establish the facts) The bidder must submit an authorization letter specific to this bid number.	For AV Equipment proposed in the tender from the approved OEM– 10 marks	25	25	
		For HVAC Equipment proposed in the tender from the approved OEM– 7.5 marks			
		For LIGHTING Fixtures proposed in the tender from the approved OEM– 7.5 marks			
04.	Technical presentation before the Technical Evaluation Committee (Total Max Marks- 50)	Technology adopted/ Offered Equipment / material/gadgets (OEM vetted compliance certificate is mandatory). for successful execution of the work as per the BoQ Drawings – 30 marks	30	50	
		Show execution capability using Suitable presentation with proof of pre-executed similar nature works of reputed auditorium - 10 marks	10		
		Project implementation plan for completion of the project within the schedule considering all the possible hindrances/ Challenges and plan to mitigate - 10 marks	10		

Note:

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- Bidders must get 70% in the technical for getting eligible for opening the financial bid.
- The bidder will have to enclose a presentation on the concept note along with the technical proposal. The presentation shall also cover the comprehensive details, approach & methodology, Organization structure, Work program, Implementation strategy, offered equipment list, technical brochures, OEM support letter and specification sheet, timeline etc. Vendors are requested to mention the hyperlink (youtube / other platform) with respect of offered films.
- All the criteria are to be substantiated with necessary valid documents wherever required.

B. Financial Evaluation

Financial Bid:

- i. The Financial Bids of the technically qualified bidders will be opened online through CPP Portal.
- ii. The lowest financial bid would be the best financial bid quoted exclusive of Labour cess and GST etc.
- iii. Only fixed percentage basis financial bids indicating above/ below / at PAR percentage for all the entire work/services specified in this bid document will be considered including LWC Custom duty and GST etc. which are to be paid by the client.
- iv. **Errors & Rectification:** Arithmetical errors will be rectified on the following basis: “If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected. If there is a discrepancy between words and figures, the amount in words will prevail”.

Note: Technical Bids will be evaluated on the basis of documents as detailed above & Presentations to be made by the eligible agencies before the constituted Technical Evaluation Committee. The date and time of the presentations (if organized) will be conveyed to the eligible agencies.

4.0. Time for completion of the project: 180 Days (6 months) (Including mobilization) from the date of Award of Contract (AoC). **However, since the project is a time bound one and the time is the essence of this contract, the agency will have to submit a comprehensive work plan showing methodology for completion of the work within the stipulated completion time and should strictly comply with the work plan.**

4.1. DEFECT LIABILITY PERIOD, OPERATION AND COMPREHENSIVE ANNUAL MAINTENANCE CONTRACT

- a. Defect Liability Period (DLP) shall be of **THREE YEARS** from the date of actual satisfactory completion & handling of the entire job as certified by the authorities of NSCD.
- b. During the Defect Liability Period, the successful bidder within their quoted rates shall service & maintain the entire work installations executed by them with all its control units & other accessories, rectify any or all the observe defects or any all the defects as pointed out to them within a reasonable time, as decided by the competent authorities of NSCD.
- c. Apart from the routine preventive maintenance, whenever the successful bidder is called for providing any kind of repairs/maintenance, they shall render all such services within a reasonable

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time, any number of times within the quoted rates and at no extra cost or expenses whether during the Defect Liability Period.

- d. A register of such visits during DLP as well as a logbook of services rendered/ major works done shall be maintained wherein counter signatures of the authorized NSCD representative shall be obtained from time to time.
- e. A penalty in the form of deduction as fit by NSCD authority shall be applied and be deductible from the Retention Money / Security Deposit of the bidder/ money payable to the agency for any lapse in providing services, rectifying defects or in case of an inordinate delay in attending the faults/defects or responding to the service/breakdown calls and lapse in operations.
- f. If the successful bidder fails to rectify the defects within the reasonable time of its reporting, such defects will be rectified by NSCD by engaging departmental staff or outside agencies at their discretion, and the cost thereof, as decided by NSCD will be deducted from the Retention Money / Security Deposit of the successful bidder retained by NSCD money payable to the agency.

In case of any requirement for replacement of any supplied spares by the bidder, NSCD shall not be responsible for re-export of the damaged components and that will be replaced by the successful bidder

4.2. TERMS OF PAYMENT:

Total Contract Payment shall be on progressive basis as per the breakup in the following table:

Sl. No.	On Completion of	Payment Admissible
1	Running Account Bills as per the Appendix of the NIT	As per the actual work done, measured and certified by the NSCD authority as per Clause No. 37 Of GCC
2	Secured Advance on supply of material to site	As per Clause No. 31 Of GCC
3	Final Bill	As per the actual work done, measured and certified by the NSCD authority after retaining Security deposit equivalent to the 10% of the final completed value of the work as per Clause No. 37 Of GCC
Refund of Security deposit Retention Money		
1.	After successful completion of 1st year of defect liability period (DLP)	Refund of 30% of Security Deposit/ Retention Money retained
2	After successful completion of 2 nd year of defect liability period (DLP)	Refund of 30% of Security Deposit/ Retention Money retained
3	After successful completion of 3rd year of defect liability period (DLP)	Refund of balance 40% of Security Deposit/ Retention money

Note:

All payments, as above, shall become payable within thirty days of submission of the respective invoices duly supported by documents such as completion certificate/ performance certificate etc. The payment shall be transferred to the bank account of the successful bidder through electronic transfer only, for which the bank details of the bidder has to be provided with each invoice. Statutory deductions/recoveries viz. TDS, TDS GST, Labour Cess, etc. shall be made as per the relevant provisions from the payment due to the bidder from time to time.

5. Important Information & Dates: -

i. Name of Work	Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.
ii. Estimated cost of work	Rs. 677 Lakhs
iii. EMD Amount	Rs. 16.93Lakhs
iv. Cost of tender document/tender fee	NIL
v. Period of completion of work	180 Days (6 months)
vi. Bid Document Publishing Date & Time	July 8, 2025(As per portal time)
vii. Bid Document Download Start Date & Time	July 8, 2025 (As per portal time)
viii. Seek Clarification Start Date & Time	July 8, 2025 (As per portal time)
ix. Seek Clarification End Date & Time	July 15, 2025 (As per portal time)
x. Bid Document Download End Date & Time	July 28, 2025 (12.30 PM)
xi. Pre-Bid Meeting Date & Time	July 14, 2025 at 11.30 AM at NSC, Delhi
xii. Bid submission Start Date & Time	July 16, 2025 (As per portal time)
xiii. Bid submission End Date & Time	July 28, 2025 (3.00 PM)
xiv. Bid Opening(Technical) Date & Time	July 29, 2025 (As per portal time)
xv. Technical Presentation	To be notified separately only to the eligible bidder

6. The intending tenderers/bidders must read the terms and conditions of the tender document published by NATIONAL SCIENCE CENTRE, DELHI carefully. They should only submit their bid if they consider themselves eligible and if they are in possession of all the documents required.
7. Information and Instructions for tenderers/bidders posted on website shall form a part of the bid document.
8. The bid document consisting of plans, specifications, 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 free of cost from <https://eprocure.gov.in/eprocure/app>.
9. Those tenderers/bidders not registered on the website mentioned above, are required to get themselves registered beforehand.
10. The intending tenderer/bidder must have valid Class II or Class III Certificates with signing key usage (DSC) to submit the bid.

11. Submission of tender:

The e-Tenders are invited under two envelopes system. The first electronic envelope will be named as Technical Envelope & will contain documents of tenderer's/bidder's satisfying the eligibility conditions (both Financial and work Experience), scanned copies of tender documents (NIT) duly signed and uploaded online as token of acceptance and the second electronic envelope will be named as Financial Envelope containing Rate Quote Sheet duly filled and uploaded with e-signature of the agency. The bidder shall submit TECHNICAL BID ENVELOPE and FINANCIAL BID ENVELOPE simultaneously. The technical bids will be evaluated first and thereafter financial bids of only the eligible tenderers/bidders shall be opened.

A Pre-Bid meeting will also to be organized on date specified in clause no 5 of NIT at National Science Centre, Pragati Maidan, New Delhi-110 001.

These envelopes shall contain one set of the following documents: -

a) TECHNICAL BID ENVELOPE shall contain the following documents:

- i) Scanned copy of Demand Draft/Pay order or Banker's Cheque of any Nationalised/ Scheduled Bank, Bank Guarantee or any other accepted instrument or RTGS/NEFT **(for direct transfer of EMD the Bank detail of NSCD is Given In Annexure-I)** transaction details as the case may be towards payment of EMD in favour of NATIONAL SCIENCE CENTRE payable at NEW DELHI in pdf format.

Note: - EMD deposited in other modes than online transfer, has to be drawn or duly pledged in favour of National Science Centre, Delhi.

- ii) Scanned copies of documents for proof of eligibility as per **Clause No. 3 (3.1 to 3.9)** of NIT including all its annexures, credentials, certificates and affidavits etc. for General, Financial, Work Experience, GST, PAN, PF, ESI and Enlistment eligibility etc.
- iii) Scanned copy of UNDERTAKING and Declarations as per Annexure – “II to XII and Annexure-XIV (checklist)” duly signed with company seal and uploaded electronically in pdf format.
- iv) Tender Document comprising of Conditions of contract, specification, Schedule of Quantities (Prized BOQ) and tender drawings etc. (NIT) along with all its Annexures in .pdf format digitally signed and uploaded as token of acceptance.
- v) List and technical specification and catalogues of Audio Visual Equipment being proposed to be used by the agency.

b) FINANCIAL BID ENVELOPE shall contain:

- i. Rate Quote Sheet (Percentage BOQ Template) in .XLS format. Bidders may quote their percentage rate online in this envelope

12. E-tenders which do not fulfil any of the above conditions or are incomplete in any respect are liable for summary rejection.

13. The Museum/Centre does not bind itself to accept the lowest e-tender/bid and the right to reject or accept any or all the e-tenders/bids; e-tendered items or schedules received without assigning any reason whatsoever.
14. Canvassing in connection with e-tenders/bids is strictly prohibited and the e-tenders/bids submitted by the tenderers/bidders who resort to canvassing will be liable for rejection on that ground alone.
15. E-tenders incorporating additional conditions are liable to be rejected.
16. The tenderer(s) must declare in writing that neither he nor any of them is in anyway related to any officer in the National Science Centre, Delhi (National Council of Science Museums, Kolkata), or any of its constituent units as per the format given in **Annexure – “II”**.
17. GST, Income tax and Labour Cess etc. or duties 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 or duties even if imposed or levied either before or after the e-tenders are opened or during currency of contract.
18. 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 (increase or decrease) to any extent before or during the execution of the work. The successful tenderer/bidder shall be paid at their net rate quoted.
19. For the purpose of opening of the e-tenders/bids, first the Technical Bid Envelope will be opened and after the authority is satisfied that the documents in the Technical Bid Envelope are in order, the FINANCIAL BID ENVELOPE may be opened, subsequently.
20. It may be noted that the Technical Bid Envelope which are not found in order as per National Science Centre, Delhi (NCSM) requirements may be summarily rejected.

Evaluation Criteria

21. The technical envelope containing EMD and other credentials comprising of documents related to eligibility (both financial as well as technical) and other relevant documents as per **clause 11** above, shall be opened online (on portal) first by the designated officials. Upon opening of the technical envelope a Technical Evaluation Committee (TEC) constituted by the competent authority shall scrutiny the credentials and submit its recommendation towards technically eligible bidders based on the eligibility criteria specified in the NIT, information submitted by the bidder and technical Presentation (**As per Clause of 3.11 A of The NIT**) . The financial bid of only those bidders who are technically qualified will be opened and evaluated (**As per Clause of 3.11 B of The NIT**). The decision of Museum / Centre in this regard shall be final and binding.
22. The selected tenderer will be issued a Letter of Intent by the Museum/Centre and given 15 days' time which shall be counted from the date of issue of the Letter of Intent. Within this 15 days' time, the contractor shall deposit requisite performance guarantee as per provision given in the appendix and sign an

Agreement with Museum/Centre in approved format on a non-judicial stamp paper of proper denomination. Upon signing of agreement the contractor shall be issued Award of Contract (AOC) by the Museum/Centre. The date of commencement of work shall be the date of issue of AOC.

23. The successful e-tenderer/bidder selected for the work has to deposit the prescribed **performance guarantee (i.e 3% of the award value)** and sign the formal agreement within 15 days from the date of issue of Letter of Intent to them by the Museum/Centre failing which their EMD, deposited with tender, is liable to be forfeited.
24. The validity period of the e-tender shall be at least **03 (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.

25. Computerized Measurement Book:

Engineer-in-Charge shall, except as otherwise provided, ascertain and determine by measurement the value of work done in accordance with the contract. All measurements of all items having financial value shall be entered by the contractor and compiled in the shape of the Computerized Measurement Book having pages of A-4 size as per the format of the department so that a complete record is obtained of all the items of works performed under the contract.

All such measurements and levels recorded by the contractor or his authorized representative from time to time, during the progress of the work, shall be got checked by the contractor from the Engineer-in-Charge or his authorized representative as per interval or program fixed in consultation with Engineer-in-Charge or his authorized representative. After the necessary corrections made by the Engineer-in-Charge, the measurement sheets shall be returned to the contractor for incorporating the corrections and for resubmission to the Engineer-in-Charge for the dated signatures by the Engineer-in-Charge and the contractor or their representatives in token of their acceptance. Whenever bill is due for payment, the contractor would initially submit draft computerized measurement sheets and these measurements would be got checked/test checked from the Engineer-in-Charge and/or his authorized representative. The contractor will, thereafter, incorporate such changes as may be done during these checks/test checks in his draft computerized measurements, and submit to the department a computerized measurement book, duly bound, and with its pages machine numbered. The Engineer-in-Charge and/or his authorized representative would thereafter check this MB, and record the necessary certificates for their checks/test checks.

The final, fair, computerized measurement book given by the contractor, duly bound, with its pages machine numbered, should be 100% correct, and no cutting or over-writing in the measurements would thereafter be allowed. If at all any error is noticed, the contractor shall have to submit a fresh computerized MB with its pages duly machine numbered and bound, after getting the earlier MB cancelled by the department. Thereafter, the MB shall be taken in the Divisional Office records, and allotted a number as per the Register of Computerised MBs. This should be done before the corresponding bill is submitted to the Division Office for payment. The contractor shall submit two spare copies of such computerized MB's for the purpose of reference and record by the various officers of the department. The contractor shall also submit to the department separately his computerized Abstract of Cost and the bill based on these measurements, duly bound, and its pages machine numbered along with two spare copies of the "bill. Thereafter, this bill will be processed by the Division Office and allotted a number as per the computerized record in the same way as done for the measurement book meant for measurements. The contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for checking of measurements/levels by the Engineer-in-Charge or his representative. Except where any

general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications notwithstanding any provision in the relevant Standard Method of measurement or any general or local custom. In the case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the Bureau of Indian Standards and if for any item no such standard is available then a mutually agreed method shall be followed. The contractor shall give not less than seven days' notice to the Engineer-in-Charge or his authorized representative in charge of the work before covering up or otherwise placing beyond the reach of checking and/or test checking the measurement of any work in order that the same may be checked and/or test checked and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of checking and/or test checking measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or his authorized representative in charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of checking and/or test checking measurements without such notice having been given or the Engineer-in-Charge's consent being obtained in writing the same shall be uncovered at the Contractor's expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed. Engineer-in-Charge or his authorized representative may cause either themselves or through another officer of the department to check the measurements recorded by contractor and all provisions stipulated herein above shall be applicable to such checking of measurements or levels. It is also a term of this contract that checking and/or test checking the measurements of any item of work in the measurement book and/or its payment in the interim, on account of final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the contractor from liabilities from any over measurement or defects noticed till completion of the defects liability period.

Appendix to NIT

1. SUMMARY CONDITIONS OF CONTRACT Defect Liability Period	:	Three year from the date of virtual completion as certified by the Museum/Centre or from the date of passing of final bill, whichever is later. (As per clause No. 4.1 of NIT)
Time for Completion	:	180 Days (6 months) from the date of Award of Contract (AOC) as per NIT Clause 4.0 and 5 (v).
Minimum value of work for Interim Certificate/Bill	:	10 % of the work award 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 e-tender	:	16.93 Lakhs In Case of online transaction in the account of NSCD as per <u>ANNEXURE-I</u>
Liquidated damages for non-completion of work in time (Clause 39 of the general conditions of contract).	:	One per cent 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 39 of the general conditions of Contract).	:	One per cent per week of the total cost of the work awarded or section of the work subject to a maximum of 10% of gross value of work done or cost of the work awarded whichever is greater.

2. RETENTION MONEY

Total : 10% as per the following detail-

- i. Performance 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 drawn on any Nationalised Bank/Certified Cheque from a Nationalised Bank or insurance surety bond or fixed deposit receipt or bank guarantee or online transaction in the account of NSCD as per **annexure-I**.

Note: - i. EMD and Performance Guarantee (PG) deposited in any modes other than online transfer has to be drawn or duly pledged in favour of National Science Centre, Delhi.

- ii. Security deposit : 7 % of the value of work done to be recovered from R.A. Bills.

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

3. Period of submitting final bill : 03 months from the date of virtual completion by the successful tenderer.

4. ESCALATION CLAUSE : Not applicable

5. MATERIALS TO BE ISSUED (for civil works only) : No material shall be issued departmentally,

6. REMARKS (for civil works only)

It shall be the responsibility of the successful e-tenderer to erect at site an appropriate shed for proper storage of cement with a capacity for three months consumption. The stored cement shall be under double lock-with one key in custody of the successful e-tenderer and the other key in custody of the Museum/Centre so that the storage shed can be opened only in presence of both together. It shall be the responsibility of the successful e-tenderer to arrange for electricity and water or any other service required for construction and to arrange for housing of their own staff outside the site.

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Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

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Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

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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 **National Science Centre, Delhi** under the National Council of Science Museums which shall include the persons for the time being in management of the Council and its assigns.

“Engineer” shall mean the Curator or Technical Officer authorized as such by the Museum/Centre or in the event of his ceasing to be Engineer for the work such other firm or persons 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(Name of Successful tenderer)..... and shall include his/their respective 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 persons include firms and corporation’s 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.

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

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 Authorized 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 persons engaged there upon.
- 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, the temporary cement godown within the mobilization time as described in NIT Clause 26, 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 & consumption.

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, eaves, 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.

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, Aluminium 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 upto-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 engaged 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 persons 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 their bills or 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.

(c) 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.

25. ACCESS

The Museum/Centre or its representatives shall at all reasonable time have free access to the works and/or to the workshops or 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 **three (3) year (refer Appendix sl. No. 1 to NIT)** 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/persons 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 or retention money. 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 SUB-SOIL 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 centering, 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 anti -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 discoloration 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 taxes like GST, Income tax, labour cess 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

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

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 —(Not Applicable)

Payments for variation in prices and wages (escalation) will be admissible as per following details.

(i) Material Escalation: The increase in price of all materials beyond quoted rates will be compensated by the department as per formula given below:

$$V_m = 70/100 \times (0.85V - (C+S) \times (W_I - W_{I0} / W_{I0}))$$

Where:

V_m	Variation in materials cost i.e. increase or decrease in the amount in rupees to be paid or recovered.
V	Value of work done excluding advances on material, if any during the period under reckoning.
C	Cost of Cement used in the work
S	Cost of Steel used in the Work
W_I	Average All India Wholesale Price Index for all commodities for the period under reckoning as published in the RBI Bulletin.
W_{I0}	Average All India Wholesale Price Index for all Commodities during the month of opening of the e tender as published in the RBI Bulletin.

(ii) Labour Escalation: Increase in the cost of labour beyond quoted rates will be compensated by the museum/centre as per formula given below:

$$V_L = 30/100 \times (0.85V - (C+S) \times (I - I_0 / I_0))$$

Where:

V_L — Variation in labour cost i.e. increase or decrease in the Amount in rupees to be paid or recovered.

$V, C \& S$ — As stated under (i) above.

I	Average All India Consumer Price Index Number for Industrial Workers declared by Labour Bureau, Government of India, as published in RBI Bulletin during the period under reckoning.
I_0	Average All India Consumer Price Index Number for Industrial Workers declared by Labour Bureau, Government of India, as published in RBI Bulletin during the month of opening of e tender.

*(Value of (C+S) shall be put in the formula if these materials are issued by the museum/centre). (Otherwise if cement and steel are not issued by the Museum/Centre, the value of (C+S) shall be taken as Zero).

No Claims for other escalation on any account whatsoever will be entertained.

The amount of escalation will be calculated monthly for the work done in that particular month and will be paid for quarterly. Escalation is not permissible on successful e tenderer's overhead and profit that explains the term 0.85V.

Ceiling on amount due to escalation — In no case total amount of escalation, to be paid for the entire work will exceed 20% of the total cost of the work based on the e tendered rate.

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.

(d) 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.

(e) 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.

(f) 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.

(g) 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 10% of the total gross value of the work as paid for against this contract including the performance guarantee and the amount which shall be recovered from the running bills. In case of termination of contract, this retention money shall be forfeited and amount necessary to make up this amount shall be recovered from

the money due to the successful tenderer under this contract, or any other contract. The successful tenderer can give retention money in the form of a Bank Guarantee from a Nationalised Bank in approved format to the extent of 10% of the total cost of work awarded valid for a period equal to completion period plus one year (which will have to be suitably extended to cover defect liability period and extended period of contract whichever is later). Tenderers who have deposited earnest money/performance guarantee in Bank Draft along with the tender could get refund of earnest money deposited in cheque or Bank Draft or wire/Bank transfer after the Bank Guarantee for the 10% of the total cost is received and accepted by the Museum/Centre. The retention money in the form of Bank Guarantee will not be accepted in parts.

The successful tenderer shall have to extend the Bank Guarantee period, from time to time at least three weeks before the expiry of a Bank Guarantee to cover the defects liability period, reckoned from the date of virtual completion. In case they fail to extend the Bank Guarantee at least three weeks before its expiry, it shall be considered a breach of contract on the part of the successful tenderer and hence, the Museum/Centre shall be free to demand or encash the Guarantee money from the Bank. The retention money will be refunded to the successful tenderer after successful completion of **defect liability period as per Point No 2 of the Appendix to NIT** or from the date of passing of final bill, whichever is later and after the successful tenderer has rectified all the defects pointed out to him.

Note: - EMD and Performance Guarantee deposited in other modes than online transfer, has to be drawn or duly pledged in favour of National Science Centre, Delhi.

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 authorize 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 authorization 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 authorized 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 15% of the award 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.

However, this Clause shall be read in conjunction with clause no 24 on NIT regarding computerized MB.

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, retention money shall be refunded after successful completion of defect liability period as per Appendix to NIT which will be from the date of virtual completion of the work or from the date on which 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 utilize 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 for Award of Contract (AOC). 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 one per cent of the total cost of work or section of the 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. The same will also be governed in conjunction with clause No. 4.9.3 of NIT

(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 not attributable to the successful e-tenderer as indicated above, then the escalation clause will remain in force and the successful e-tenderer will be entitled to receive extra payments for variation in prices and wages subject to the ceiling limit of 20% of the total value of work as indicated in Clause 30.

However, the museum/centre in the interest of work is, allows any extension of time for reasons of delay directly attributable to the successful e-tenderer, the escalation clause (Clause 30 of conditions of contract) will not remain in force during such extended period.

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 take 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 persons 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 observe 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, 2596 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 National holidays & notified holidays of the area of work 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 person/Foreman engaged by the successful e-tenderer shall be held to be given to the Successful e-tenderer.

48. DISENGAGEMENT OF WORKMEN ETC.

The Successful e-tenderer shall on the request of the Engineer immediately disengage 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/engaged 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 persons 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 ensue 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 PERSONS 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

1. 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 2570 and various rules framed thereunder by the Central Govt. / concerned 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".

2. The successful e-tenderer shall ensure that all statutory wages and allied benefits like P.F., Bonus, ESI etc., as are prescribed by the Government of India from time to time, are paid to personnel deployed for the purpose of this contract. The successful e-tenderer shall remain liable to the authorities concerned for compliance of the respective existing rules and regulations of the Govt. of India and concerned State Govt. for this purpose and shall also remain liable for any contravention thereof. The successful e-tenderer shall have to abide by the minimum wage legislations and must pay minimum wage as per law to the personnel deployed by him at the worksite for the purpose of this contract. In case the minimum wage/wages of any personnel engaged by the successful e-tenderer cross `21,000/- per month, such person is exempted from the purview of the E.S.I Act and no contribution to be paid by the successful e- tenderer. In that case, insurance policy covering the risk under the Workmen Compensation Act, 2523 for the/these exempted person/personnel may be taken from nationalized insurance companies only (viz. National Insurance Co. Ltd., Oriental Insurance Co. Ltd., The New India Assurance Co. Ltd., United India Insurance Co. Ltd.). If the area of work site is not covered under the ESI Scheme/Act, the tenderer is required to take an insurance policy as per the Workmen Compensation Act,2523 for the personnel engaged at work site. Bonus shall be paid to the persons engaged by successful e-tenderer as per the Payment of Bonus Act, 2565.

3. The successful e-tenderer shall submit the proof of having deposited the amount of contributions on account of ESI and EPF towards the persons deployed at the work site for the purpose of this contract in their respective names each month while submitting his GST compliant R.A. bills. In order to substantiate the proof of payment, the successful e-tenderer must submit GST challan, ESI challan, EPF challan and copy of salary disbursement document with details of head of payment (wage & allowances) and all deductions (PF, ESI, etc.) of the personnel deployed by him along with their particulars and proof of transfer of wages into the respective bank accounts of the deployed personnel to MUSEUM/CENTRE/ENGINEER. In case EPF & ESI payment, one of the following documents shall be provided along with corresponding EPF & ESI challan:

(a) ECR challan along with scroll of the employees / EPFO TRRN query status with successful payment confirmation generated from official website of EPFO.

(b) EPF Account statement/ any authenticated document received from EPFO showing the entries of the amount credited.

(c) ECR challan along with scroll of the employees generated from the website of ESI. In case non-deposit of EPF / ESI by the successful e-tenderer, the amount equal to the share of EPF/ESI in respect of employer and employees shall be recovered from the successful e-tenderer from the R.A. Bill(s) or money payable. Copies of the quarterly, half-yearly & annual returns of GST, ESI, EPF and Professional Taxes shall be submitted after its submission to the concerned authorities.

4. The Successful e-tenderer shall pay wages to the personnel deployed by them through the respective Bank Account latest by the 7th of every month and shall produce copy of the Acquaintance Roll and bank statement of wages paid every month along with R.A. bills.

5. The Successful e-tenderer shall ensure compliance of all Acts, Rules and statutory orders in force with regard to deployment of his staff at the work site for the purpose of this contract and shall keep the Museum/Centre indemnified against any liabilities arising out of non-compliance of any of the Acts, Rules or Orders on his part.

6. The successful e-tenderer shall indemnify the Museum / Centre against all claims which may be made under the Minimum Wages Act, 2548, Abolition of Child Labour Act, 2586, Provident Fund Act, 2552, ESI Act 2548, Payment of Bonus Act 2565, Industrial Dispute Act 2547, Payment of Gratuity Act 2572, Payment of Wages Act, 2536 or any statutory modification thereof or Rules there-under or otherwise for in respect of any damage or compensation arising in-consequence of any dispute under these Acts. In case any dispute is lodged against

Museum/Centre under any Acts stated above, the successful e-tenderer shall implead himself in the case and counter the matter. If the successful e-tenderer does not do so and violate the same, it will be treated as violation of the terms of the contract, for which, the Museum/Centre may either unilaterally terminate the agreement without giving any notice or recover the cost/expenses involved in the process including the dues if any from the successful e-tenderer. The tenderer shall ensure that the personnel deployed by him at the work site for executing the works under this contract must adhere and follow the all the safely norms. For any violation/contravention on safety aspects, liquidated damage

to the extent the Museum/Centre suffer loss will be recovered from the successful e-tenderer's R.A./Final Bill(s) or/and the Security money besides the lawful action to be taken against the successful e-tenderer.

7. The Successful e-tenderer shall not deploy any unfit person (or persons having any contagious disease) or person below 18 years or above 60 years of age for execution of work. In this regard, the successful e-tenderer shall submit annual return to the Museum/Centre in respect of age/date of birth, medical fitness of his deployed personnel. The person(s) found medically unfit/physically deteriorated at any point of time will not be allowed to perform duties and the successful e-tenderer will be responsible to replace/substitute such person within 24 hours.

53. INSURANCE FOR DAMAGE TO PERSONS 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 therewith. 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 persons 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 2561 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

Brick Layer	: Minimum One apprentice for every 7 person engaged in this category
Building Construction	: Minimum One apprentice for every 7 persons engaged in this category
Carpenter	: Minimum One apprentice for every 7 persons engaged in this category
Surveyor	: Minimum One apprentice for every 14 persons engaged in this category

(b) In respect of Sanitary and Water Supply

Plumber	: Minimum One apprentice for every 2 persons engaged in this category

(c) In respect of Electrical Works

Wireman	: Minimum One apprentice for every 7 persons engaged in this category

The Successful e-tenderer shall comply with the provision of Apprentices Act 2561 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 or impose penalty as considered deemed proper. 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) – Not applicable as no materials shall be supplied departmentally.

~~Steel and Cement shall be supplied by the Museum/Centre to the Successful e tenderer as stated in appendix to the NIT. If for any reason cement and steel is not available, the Successful e tenderer shall procure the same and complete the work in time after due intimation of the same to the Engineer. The quantities brought by the Successful e tenderer would be replenished to the Successful e tenderer at issue rates given in appendix when received, during or after completion of work but before payment of final bill. It shall be the Successful e tenderer's sole responsibility to ensure that the quality of cement so brought conforms to required standard as specified and support this with Test Certificate for such consignments brought by him and allowed on the works by the Engineer. If steel of required diameters is not available but the Successful e tenderer could get substituted diameters by exchanging available diameters, in the interest of work, such an exchange would be authorised with the permission of the Engineer but without any extra cost to Museum/Centre. Successful e tenderer's rates shall be deemed to have been based on issue rates of cement and steel given in the appendix sheet of e tender and they shall have to use materials issued departmentally as per appendix. Successful e tenderer shall not refuse to receive marginal excess of cement and steel, quantities over and above as shown in the phased programme, if required so as and approved by the Engineer and such storage shall be without any extra cost to the Museum/Centre.~~

~~Receipt of cement and steel from the Museum/Centre's store should be carried out in quickest possible time by the Successful e tenderer as a bulk supply, once the issue of stores is commenced at site, and without hampering the progress of the work at site.~~

~~Receipt of stores will include submitting indent in duplicate to the Museum/Centre at least two days prior to intended date of receipt. No stores shall be issued on Sundays and Holidays.~~

57. REGARDING WEIGHT OF MATERIALS SUPPLIED BY THE MUSEUM/CENTRE (for civil works only)- Not applicable

~~When cement is issued in bags, 5% variation in its weight shall be deemed to have been allowed for loss in handling. Each bag shall be deemed to weigh 50 Kg. The successful e tenderer shall ensure that the correct quantity and only good quality cement is used on the works.~~

~~For reinforcement steel (mild or tor rounds, the weight for issue purpose and recoveries of cost thereof, shall be the actual weight i.e. R.R (Railway Receipt) weight or mill scale weight if supplied by wagon direct or truck weigh bridge weight recorded at producer's works or supplier's stockyard if delivery is by road.~~

~~If steel is issued from the Museum/Centre's store the successful e tenderer should arrange for necessary labour for weighment and shifting, loading etc. without any extra cost to the Museum/Centre. Steel may, alternatively, be issued~~

by measurement of lengths (for which labour will be arranged by the successful e tenderer, at his cost) multiplied by standard coefficients. However, the cost of issued steel will be recovered on the basis of weights indicated in the R.R. (Railway Receipt) or weigh bridge challans issued by the concerned authority owning the weigh bridge. Cost of recoveries of steel will be on the basis of weight recorded on the approved Weigh bridge challan irrespective of the method of measurement of steel on the works. It shall be the sole responsibility of the Successful e tenderer to use appropriate diameter of rods for reinforcement in different structural components in accordance with the drawings and any damage to the structural members for non conformation to specifications and drawings shall be made good by the successful e tenderer without any extra cost to the Museum/Centre. Since payment for steel would be made on basis of standard co-efficient on length, the successful e tenderer should ensure that each dia of rods issued conform to standard co-efficient, and in case it is not, he should at once report to the Engineer and get standard co-efficient established for specific diameter and specific quantity. Weight of steel shall be measured correct to three decimal places. Standard co-efficient will be established in presence of (a) Successful e tenderer's representative (b) stores officer or his representative (c) the Engineer.

Steel issued by the Museum/Centre as stated in appendix sheet shall mean mild steel rounds and tor steel to be used exclusively for RCC works. Steel for holdfasts, squares, flats, etc. are to be procured by the Successful e tenderer.

58. RETURN OF STEEL (for civil works only)- Not applicable

While receiving the surplus steel back from the successful e tenderer after the end of the project, the Museum/Centre shall not accept cut pieces less than 3 meters of length. The Successful e tenderer should take care while cutting rod that the wastage is minimum i.e. he should cut required lengths in such a way that maximum steel is used out of quantity supplied or as directed at site by the Engineer. Variation over 5% will be allowed by the Engineer, if he is satisfied about abnormal wastage.

59. CEMENT CONSUMPTION (for civil works only)- Not applicable

If the actual consumption of cement is more (upto 5% over theoretical consumption) or less (upto 5% below theoretical consumption) no additional recovery shall be made from the Successful e tenderer. If the actual consumption exceeds 5% over the theoretical consumption, successful e tenderer shall have to return the surplus cement issued over 5% allowable margin and if he fails to do so, recovery for excess cement shall be made at issue rate or market prevailing on completion date whichever is higher in lieu of issue rate. If however the Engineer is satisfied that excess cement over 5% has actually been used in the work including rectification and dismantled work, and that it has not been removed by the successful e tenderer from site nor used wastefully, he may allow excess over 5% by waiving recovery at higher rate and his decision in this regard shall be final and binding. If the cement used is less than 5% and the work is of acceptable standard, recovery for cement less used shall be made at issue rates + 15% successful e tenderer's overheads and profits after allowing 5% variation. C.P.W.D. Cement constants will be used for calculating theoretical cement consumption. 10% excess of cement consumption on hand mixed concrete, if hand mixing is permitted by the Engineer due to any reason, shall not be recovered from the successful e tenderer, unless such consumption is due to the successful e tenderer's faulty equipment.

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.

68. FORCE MAJEURE

In the event of either party being rendered made by Force Majeure to perform any obligation required to be performed by them under the contract, the relative obligation of the party affected by such Force Majeure shall be suspended for the period during which such cause lasts. The term “Force Majeure” as employed herein shall mean acts of God, War, Civil Riots, hostilities, revolution, strikes, lockouts, epidemic, explosion, flood, earthquake, fire directly affecting the performance of the contract, Flood and Acts and because of any law & other proclamation, regulations or ordinance of any Govt. or any other cause beyond the control of the two parties namely the successful e-tenderer and NCSM, which could not have been foreseen or avoided by the exercise of due diligence. Upon the occurrence of such cause and upon its termination, the party alleging that it has been rendered unable as aforesaid thereby, shall notify the other party in writing, the beginning of the causes amounting to Force Majeure as also the ending of the said clause by giving notice to the other party within 72 (Seventy-two) hours of the alleged beginning and ending of the cause respectively. If performance under this agreement is suspended by Force Majeure conditions lasting for more than two months, either party shall have the option of cancelling this agreement in whole or part at its discretion without any liability on its part. Time for performance of the relative obligation suspended by Force Majeure shall stand extended by period for which such cause lasts.

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 16 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 fulfillment 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 26 and 27 of the said NIT (including appendix) or the period stipulated under clause 28 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 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 16 of the Notice inviting E-tenderNo. 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 Earnest Money/Retention Money for the due fulfillment 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 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 Banks.)

3. We, ... further agree that the guarantee herein contained shall remain in full force and effect during the period as mentioned in Clause 26 & 27 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 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, 2561), 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 a sum of Rupees

.....
(exact amount in words)

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

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 Award of Contract (as defined under NIT clauses 4.9 and 5 (v)) 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 & Conciliation Act 2596 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.

7. The following documents will be part of this agreement for all purposes in connection with the execution of this contract:

- i. e-tender document along with all annexures etc. (NIT)
- ii. Schedule of the quantities
- iii. Drawing and notes thereon
- iv. PERT/ CPM Charts etc.
- v. Copies of correspondences exchanged / to be exchanged in future between the Museum/Centre/ Engineer and the successful e-tenderer.

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)

**FORMAT FOR
BOND FOR SECURED ADVANCES AGAINST
SUPPLY OF MATERIALS**

KNOW ALL MEN by these presents that I/WE
..... do hereby bind myself/ourselves, my/our respective heirs,
executors, administrators and assigns to pay to the.....
.....under the
National Council of Science Museums a Society registered under the Societies Registration Act, 2561
(hereinafter called 'The Museum/Centre') on demand a sum of Rs (Rupees
.....

only).

Dated this day of two thousand and
.....only).

WHEREAS by an agreement dated.....for work of
.....the
Museum/Centre has agreed in its discretion to allow advance on security of materials belonging to me/us and
brought by me/us to the site of the works undertaken by me/us for construction purposes.

AND WHEREAS the Museum/Centre has agreed to advance to me/us a sum of
Rs.....(Rupees.....

.....only).

on the security of materials shown in the schedule below and the said Museum/Centre has granted advance of
Rs.....

KNOW ALL MEN by these presents that I/WE
..... do hereby bind myself/ourselves, my/our respective heirs,
executors, administrators and assigns to pay to the.....
.....under the
National Council of Science Museums a Society registered under the Societies Registration Act, 2561
(hereinafter called 'The Museum/Centre') on demand a sum of Rs (Rupees
.....

only).

Dated this day of two thousand and
.....only).

WHEREAS by an agreement dated.....for work of
.....the Museum/Centre has agreed in its discretion to allow advance on security of
materials belonging to me/us and brought by me/us to the site of the works undertaken by me/us for
construction purposes.

AND WHEREAS the Museum/Centre has agreed to advance to me/us a sum of Rs.....(Rupees.....only).on the security of materials shown in the schedule below and the said Museum/Centre has granted advance of Rs.....NOW THE CONDITIONS OF THE SAID WRITTEN OBLIGATION IS THAT IN THE EVENT OF THE SAID BOUNDEN

- a) not using the sum advanced for expediting the execution of the works under the said contract.
- b) offering as security properly, not absolutely his own property or encumbered in any manner.
- c) not acting in accordance with the terms of the agreement for the execution of the work.
- d) failing to make at his own cost all necessary and adequate arrangements for the proper watch, safe custody and protection against all risks of the materials which shall remain in the site of the said works in his own custody and at his responsibility, open to inspection by the Museum/Centre or any officer authorised in that behalf.
- e) using the materials or any part thereof in such a manner as to be damaged or deteriorated in a greater degree than is due to usual wear and tear thereof.
- f) removing the said materials from the site of works except with the written permission of the Museum/Centre or any officer authorised in that behalf.
- g) failing to repay the advance in full before receiving payment of the price payable to him for the said work under the terms and the provision of the said agreement.
- h) defaulting in the performance or observance in any respect of any of the terms and the provisions of the agreement.
- i) or committing a breach in any manner whatsoever of any other terms of the contract or default in repayment of the money

AND upon his making such payment the above written obligation shall be void and of no effect, otherwise, it shall be and remain in full force and vital.

Provided always that it is hereby agreed and declared the decision of the Museum/Centre as to whether the said has or has not performed the obligations and observed the conditions hereinbefore recited shall be final and binding on the successful e-tenderer.

Signed by the above bounden

in the presence of

(1)

(2)

ANNEXURE -I**BANK DETAILS OF NATIONAL SCIENCE CENTRE, DELHI**

Name of the Account Holder	NATIONAL SCIENCE CENTRE, DELHI
Account No.	2417101004100
Bank Name	CANARA BANK
Bank Address	6, Bhagwan Das Road, New Delhi
IFSC Code	CNRB0002417
MICR Code	110015045
Type of Account	Saving Account
Branch Code	2417

(Format for Declarations & Undertaking to be typed on bidder agency's letter head 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:

Place:

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

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 drawings/specifications, etc. 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 also undertake that the physical EMD instrument shall be deposited by me/us with the office of NATIONAL SCIENCE CENTRE, DELHI inviting the e-tender before the bid opening date otherwise the NATIONAL SCIENCE CENTRE, DELHI 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.

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.

Date:

Place:

**(Signature of the tenderer/ bidder)
With company seal/rubber stamp**

(To be submitted on Agency's Letter head in the Portal as well as hard copy)

Ref:

Date:

DECLARATION

We, M/s., hereby solemnly declare as follows, in respect of the
Tender No. :-

- a) That, we have downloaded all the documents from CPP e-Procurement Portal of NIC and all the uploaded information / statements are true to the best of our knowledge.
- b) That, our firm is not involved in any Litigation or Arbitration with NCSM/ National Science Centre, Delhi during the last 05 (five) years.

Date:

Place:

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

TENDER ACCEPTANCE LETTER
(To be given on Company Letter Head)

*[Department User may ask for Tender Acceptance Letter instead of asking Signed Tender Document from the Bidders.
This is a sample format; User may revise it as per their Tender Conditions]*

Date:

Acceptance of Terms & Conditions of Tender.

Tender Reference No:

Name of Work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

To,

The Tender Inviting Authority
National Science Centre, Delhi

Dear Sir,

1. I / We have downloaded / obtained the tender document(s) for the above mentioned 'Tender/Work' from the web site(s)namely: _____
as per your advertisement, given in the above mentioned website(s).
2. I / We hereby certify that I / we have read the entire terms and conditions of the tender documents from Page No. _____ to _____ (including all documents like annexure(s), schedule(s), etc .), which form part of the contract agreement and I / we shall abide hereby by the terms / conditions / clauses contained therein.
3. The corrigendum(s) issued from time to time by your department/ organization too has also been taken into consideration, while submitting this acceptance letter.
4. I / We hereby unconditionally accept the tender conditions of above mentioned tender document(s) / corrigendum(s) in its totality / entirety.
5. I / We do hereby declare that our Firm has not been blacklisted/ debarred by any Govt. Department/Public sector undertaking.
6. I / We certify that all information furnished by our Firm is true & correct and in the event that the information is found to be incorrect/untrue or found violated, then your department/ organization shall without giving any notice or reason therefore or summarily reject the bid or terminate the contract, without prejudice to any other rights or remedy including the forfeiture of the full said earnest money deposit absolutely.

Yours faithfully,

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

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

Bidder's Information Sheet

Bidder's Information Sheet	
Bidder's legal name	
Name of each partner	
Bidder's country of constitution	
Bidder's year of constitution	
Bidder's legal address in country of constitution	
Bidder's authorized representative (name, address, telephone numbers, fax numbers, e-mail address)	
Attached are copies of the following original documents. 1. In case of single entity, articles of incorporation or constitution of the legal entity named above. 2. In case of a government-owned entity, any additional documents not covered under 1 above required.	

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

National Science Centre
(National Council of Science Museums)
Near gate No. 4, Pragati Maidan
Bhairon Marg, New Delhi – 110001
(A constituent unit of National Council of Science Museums)

Bid Securing Declaration Form

Date -----

Tender No.-----

I/We. The undersigned, declare that:

I/We undersigned that, according to your conditions, bids must be supported by a Bid Securing Declaration.

I/We accept that I/We may be disqualified from bidding for any contract with you for a period of one year from date of notification if I am/We are in a breach of any obligation under the bid conditions, because I/We

- a) have withdrawn/modified/amended, impairs or derogates from the tender, my/our Bid during the period of bid validity specified in the form of Bid; or
- b) having been notified of the acceptance of our Bid by the purchaser during the period of bid validity (i) fail or refuse to execute the contract , if required, or (ii) fail or refuse to furnish the performance Security, in accordance with the instructions to bidders.

I/We undersigned this Bid Securing Declaration shall cease to be valid if I am/ we are not the successful Bidder, upon the earlier of (i) the receipt of your notification of the name of the successful Bidder; or (ii) thirty days after the expiration of the validity of my /our Bid.

Signed : (insert signature of person whose name and capacity are shown)

In the capacity of (insert legal capacity of person signing the Bid Securing Declaration)

Name: (insert complete name of person signing the Bid Securing Declaration)

Duly authorized to sign the bid for an on behalf of (insert complete name of Bidder)

Dated on-----day of ----- (insert date of signing)

Corporate Seal (where appropriate)

(Note: In case of a Joint Venture, the Bid Securing Declaration must be in the name of all partners to the Joint Venture that submits the bid)

Average Annual Turnover

Bidder must fill in this form

Annual Turnover Data for the Last 5 Years	
Year	Amount INR
2024-2025	
2023-2024	
2022-2023	
2021-2022	
2020-2021	
Average Annual Turnover	

The information supplied should be the Annual Turnover of the Bidder.

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

Authentication by certified by Chartered
accountant/Auditor with company seal/rubber stamp

General construction Experience

Executed similar nature work details during the last 5 years.

In order to fulfill the criteria under 3.3.1 of NIT, bidders must give detail of Experience under construction contracts in the role of contractor for at least the last 5 **(Five)** years prior to the bid submission deadline and should have successfully completed similar civil works as under with any of depts. as mentioned in clause **3.8**:

- i. three similar completed works, each costing not less than the amount equal to 40% of the estimated cost put to tender.
- ii. two similar completed works, each costing not less than the amount equal to 50% of the estimated cost put to tender.
- iii. one similar completed works, each costing not less than the amount equal to 80% of the estimated cost put to tender.

Bidder should provide information indicated below:-

Executed similar work details (last 5 Years)									
No.	Name of the work/ Contract	Employer's Name and Contact Details (Address, Tel, Fax)	Date of start	Date of completion	Award value	Status of work (Completed or in Progress)	Remaining Contract Period in months(if any)	Work completed value as on date.	REMARK
1									Detail of specific construction experience to be submitted in separate sheet for each work as per the format given below.
2									
3									
4									

Attach:

An undertaking certifying that information on all current contract commitments has been provided and the information provided is correct. Further the Physical and financial status of the ongoing Project duly signed by concerned authorized personnel of the Department to be mandatorily attached

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

Signature by concerned authorized personnel of the Department to be mandatorily attached with company seal/rubber stamp

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

Specific Construction Experience

Fill up one (1) form per contract.

Contract of Similar Size and Nature		
Contract No of	Contract Identification	
Award Date	Completion Date	
Role in Contract	☐ Contractor ☐ Subcontractor	
Total Contract Amount	INR	
If partner in a JV or subcontractor, specify participation of total contract amount	Percent of Total	Amount
Employer's Name Address Telephone/Fax NumberE-mail		
Description of the similarity in accordance with Criteria 3.3.2 of NIT		
Attached are copies of certificates of accreditation and completion certificate issued by the concerned Department for the project listed above.		

(Signature of the tenderer/ bidders/JV Partners)
with company seal/rubber stamp

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

**National Science Centre
Near gate No. 4, Pragati Maidan
Bhairon Marg, New Delhi – 110001
(A unit of National Council of Science Museums)**

Undertaking for Certification of Quoted Rates and Quality Assurance by Tenderer.

Date -----

Tender No.-----

To,

The Tender Inviting Authority
National Science Centre, Delhi

I/We, the undersigned, hereby declare and certify that the rates quoted in this tender are based on an in-depth estimation and a thorough cost analysis of each item listed in the scope of work.

I/We have conducted a comprehensive review of the requirements, specifications, and conditions of the tender and confirm that all factors have been accounted for in our pricing. I/We assure that there shall be no compromise in the quality of materials, workmanship, or any aspect of the work being tendered.

I/We further declare that the proposed rates are fair, reasonable, and we will execute & complete the work to the highest standards expected, as per the tender documents and specifications provided.

Signature of the tenderer/ bidder

With company seal/rubber stamp: _____

Date: _____

Place: _____

CHECK LIST for the Tenderer**(to be signed, stamped and digitally uploaded in the technical bid cover (envelope -1))**

Sl. No	Nomenclature	YES/NO
1.	Whether the Tender documents have been completely read, understood and accepted	
2.	Whether soft copy of EMD of Rs. 16.93Lakhs. has been uploaded in the technical Bid cover (Envelope -1).	
3.	Whether original EMD Instrument has been submitted to NSCD before due date. or Whether fund transfer details such as UTR Number, date etc. have been uploaded in the technical Bid cover (Envelope -1).	
4.	Whether all the declarations and undertakings have been duly filled, signed with official stamp (i.e. Annexures –II to Annexure-XIV) and digitally uploaded in the technical Bid cover (Envelope -1).	
5.	Whether the scanned copies of documents in support of eligibility criteria as per clause 3(3.1 to 3.9) such as Enlistment, Financial eligibility, Work Experience certificates, specific construction experience certificate, copies of PAN, GST, PF, ESI registration, etc. have been uploaded in the technical Bid cover (Envelope -1).	
6.	Whether the NIT, Bill of Quantities along with all its annexures, General Terms & Conditions etc. has been digitally signed and uploaded in the technical Bid cover (Envelope -1) as a token of acceptance.	
7.	Whether the RATE QUOTE SHEET has been duly filled up as percentage below/above/at par as per the format given and uploaded in Digitally in the Financial Bid Cover (Envelope-2).	
8.	Whether the tenderer have visited the work site and conducted market survey before quoting the rate and understand the nature/scope of work and condition of the site.	
9.	Whether the tenderer have understood that the work is to be executed at National Science center Delhi situated on the Bhairon Marg Near gate No 5 of Bharat Mandapam which is No entry area during day hours and is visited by thousands of visitor everyday	
10.	Whether the tenderer have understood that the rates quoted will be considered inclusive of all materials, wastage, labour, transportation, carriage, shifting charges, GST, other taxes & duties etc. required for	

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc. at National Science Centre, Delhi

	this job and no additional payment shall be made for this purpose other than quoted rate.	
11.	Whether the tenderer agrees that all the materials to be used for this work should strictly be as per the specifications prescribed in the tender and of approved make and no deviation from the same will be allowed.	
12.	Whether the tenderer understood that the work has to be carried out following all safety and precautionary measure as prescribed under safety norms and all statutory provisions have to be complied by the tenderer to this effect.	
13.	Whether the tenderer understood that work has be carried out following all rules and regulations under minimum wages act of both the Central and State Govt. and all statutory provisions under the same have to be complied by the tenderer .	
14.	Whether the tenderer have gone through the tender drawings attached with the tender NIT and have understood the nature of work and type of structure to be constructed before quoting their rates.	
15.	Whether the tenderer have understood that the time is the essence of this contract and he agrees to complete the work well within the stipulated time as prescribed in the tender document.	

Signature of the tenderer/ bidder)with company
seal/rubber stamp

NATIONAL SCIENCE CENTRE, NEW DELHI

(A Unit NATIONAL COUNCIL OF SCIENCE MUSEUMS)

Estimated Bill of Quantity

Name of work:- "Complete renovation of NSCD Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc."

S.No	Description	Unit	Qty	Rate	Amount i/c GST
A	Dismantling & Demolishing				
A1	Dismantling aluminium, wooden , gypsum partitions, doors, windows, fixed glazing, false ceiling, wooden flooring and like including disposal of unserviceable material and stacking of serviceable material within 50 meters lead as directed by Engineer in-charge.	Sqm	1030	54.83	56474.90
A2	Demolishing brick work manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-charge.				
	In cement mortar	Cum	45	2004.57	90205.65
A3	Removing white or colour wash by scrapping and sand papering and preparing the surface smooth including necessary repairs to scratches etc. complete	Sqm	1225	19.22	23544.50
A4	Dismantling doors, windows and clerestory windows (steel or wood) shutter including chowkhats, architrave, holdfasts etc. complete and stacking within 50 metres lead :				
i	Of area 3 sq. metres and below		15	357.29	5359.35
ii	Of area beyond 3 sq. metres each	Each	10	489.18	4891.80
A5	Taking out doors, windows and clerestory window shutters (steel or wood) including stacking within 50 metres lead :				
i	Of area 3 sq. metres and below	Each	5	139.63	698.15
ii	Of area beyond 3 sq. metres	Each	5	183.80	919.00
A6	Demolishing cement concrete manually/ by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in - charge.				
i	Nominal concrete 1:3:6 or richer mix (including equivalent design mix)	Cum	10	2368.53	23685.30
ii	Nominal concrete 1:4:8 or leaner mix (including equivalent design mix)	Cum	15	1463.00	21945.00
A7	Dismantling tile work in floors/ Wall and roofs laid in cement mortar including stacking material within 50 metres lead.				
i	For thickness of tiles 10 mm to 25 mm	Sqm	300	71.42	21426.00

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

ii	For thickness of tiles above 25 mm and up to 40 mm	Sqm	50	110.29	5514.50
A8	Dismantling stone slab flooring laid in cement mortar including stacking of serviceable material and disposal of unserviceable material within 50 metres lead.	Sqm	50	259.26	12963.00
A9	Dismantling old plaster or skirting raking out joints and cleaning the surface for plaster including disposal of rubbish to the dumping ground within 50 metres lead.	Sqm	100	53.17	5317.00
A10	Demolishing R.C.C. work by mechanical means and stockpiling at designated locations and disposal of dismantled materials up to a lead of 1 kilometre, stacking serviceable and unserviceable material separately including cutting reinforcement bars.	Cum	10	2742.79	27427.90
A11	Carefully dismantling approx. 300 existing auditorium chairs fixed with anchor fasteners on concrete flooring at NSCD auditorium, including unscrewing/removal of fasteners, safe handling, and shifting to designated storage location in NSCD campus as directed by Engineer-in-Charge. After chair removal, making good the floor surface where anchor fasteners were removed, including removing debris, cleaning the surface, repairing damaged portions (if any) with approved cement concrete flooring of mix 1:2:4 or equivalent using ready-mix instant-setting concrete with integral self-curing and surface hardener compounds to restore to original level and finish. The work shall be carried out strictly as per direction of Engineer-in-Charge.	1 Job	1	55000.00	55000.00
A12	Carefully removing the existing loop pile carpet along with 6 mm thick PU (Polyurethane) foam underlay from the concrete floor of the auditorium seating area (approx. 280 sqm), including cutting, peeling, removal of adhesive residues, stacking reusable material at the designated location, and disposing of unserviceable material as directed by Engineer-in-Charge. The rate shall include all labour, tools, safety measures, site clearance, and debris disposal.	1 Job	1	17500.00	17500.00
A13	Carefully dismantling all existing electrical and fire safety installations, including but not limited to conduiting and wiring (including circuit mains of all types), speakers, audio-visual (AV) equipment along with their fixed bases/stands/racks, LED light fittings (recessed and surface-mounted), wall lights, emergency lights, ceiling-mounted spotlights, projector, public address (PA) system, control panels, podium connection cables, and connections from the control room. The scope also includes removal of fire sprinkler systems, fire fighting equipment, and all associated accessories. The work shall involve safe disconnection from the power source, proper insulation and labeling of all supply lines for future reconnection, and ensuring the system is made electrically and mechanically safe. All dismantled	1 Job	1	25500.00	25500.00

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

	components shall be carefully transported within the campus and neatly stacked/stored at the designated location as directed by the Engineer-in-Charge.				
A14	Toilet areas :- Dismantling of existing toilets fixtures including wash basins, W.C. pans (Indian/European), urinals, flushing cisterns, health faucets, angle valves, CP fittings, waste pipes, GI/CI/PVC water supply, soil and drainage pipes, brackets, clamps, etc., complete in all respects. The work shall include careful removal without causing damage to adjacent structures, stacking of all serviceable materials within 50 metres lead, and disposal of unserviceable materials as directed by the Engineer-in-Charge.				
i	Auditorium toilets ladies and gents	LS	2	3300.00	6600.00
ii	Conference room pantry area	LS	1	2500.00	2500.00
iii	Back side of stage	LS	1	1000.00	1000.00
A15	Providing and fixing double scaffolding system (cup lock type) on the exterior side, up to seven story height made with 40 mm dia M.S. tube 1.5 m centre to centre, horizontal & vertical tubes joining with cup & lock system with M.S. tubes, M.S. tube challies, M.S. clamps and M.S. staircase system in the scaffolding for working platform etc. and maintaining it in a serviceable condition for the required duration as approved and removing it thereafter. The scaffolding system shall be stiffened with bracings, runners, connection with the building etc wherever required for inspection of work at required locations with essential safety features for the workmen etc. complete as per directions and approval of Engineer-in-charge. The elevational area of the scaffolding shall be measured for payment purpose. The payment will be made once irrespective of duration of scaffolding.	Sqm	50	329.12	16456.00

A16	Renewal of Existing Acoustic Wall Panelling: Carefully Removing and dismantling the existing acoustic wall panelling comprising of wooden frame structure with design patterns, acoustic glass wool insulation covered with cloth fabric, including careful removal and stacking of existing wooden panels and cloth-covered acoustic material, refilling/replacing damaged or missing acoustic glass wool as required, repairing and replacing damaged wood components of the panelling design, polishing all wooden surfaces with lacquer polish after necessary repairs, and re-fixing of repaired panels in position to match the original design, making openings as directed, including all labour, tools, materials, hardware, scaffolding, polishing material, and minor civil work etc., complete in all respects..	Sqm	355	1200.00	426000.00
A17	Disposal of moorum/building rubbish/ malba/ similar unserviceable, dismantled or waste material by mechanical transport including loading, transporting, unloading to approved municipal dumping ground for lead up-to 10 km for all lifts, complete as per directions of Engineer-in-charge.	Cum	110	480.76	52883.60
	Note - item to be applicable in urban areas having directions for restricted hours for movement/ plying of load carrying motor vehicle of 3.5 cum or more.				
	TOTAL OF PART A= Rs				903811.65
B	New Civil Work.				
B1	Repair to plaster of thickness 12 mm to 20 mm in patches of area 2.5 sqm and under, including cutting the patch in proper shape, raking out joints and preparing plastering the wall surface with white cement based polymer modified self-curing mortar, including disposal of rubbish, all complete as per the direction of Engineer-In-Charge.	Sqm	50	652.83	32641.50
B2	Rust Removal: Providing and applying approved alkaline chemical rust remover of approved brand (By EIC) with paint brush and removing loose particles after 24 hours of its application.	Sqm	10	92.80	928.00
B3	Anticorrosive Treatment to Steel: Providing and applying single coat of zinc rich anti corrosive coating such as nit zinc. primer in 40 micron thickness to the exposed Ms sheet dome and Wire mesh after application of alkaline rust remover all complete as directed by EIC.	Sqm	50	131.00	6550.00

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B4	Providing and injecting approved grout in proportion recommended by the manufacturer into cracks/honey-comb area of concrete/masonry by suitable gun/pump at required pressure including cutting of nipples after curing etc. complete as per directions of Engineer-in-Charge. (The payment shall be made on the basis of actual weight of approved grout injected.)				
i	Stirrer mixed Acrylic Polymer of approved make @ 2% of weight of cement used) modified Cement slurry made with non-shrink compound in concrete/RCC work	Kg	50	116.08	5804.00
ii	Stirrer mixed SBR Polymer (of approved make) modified Cement slurry made with Shrinkage Compensating Cement in concrete/RCC work.	Kg	100	120.65	12065.00
B5	Providing and laying water proofing treatment in sunken portion of WCs, bathroom etc., by applying cement slurry mixed with water proofing cement compound consisting of applying :				
	(a) First layer of slurry of cement @ 0.488 kg/sqm mixed with water proofing cement compound @ 0.253 kg/ sqm. This layer will be allowed to air cure for 4 hours. (b) Second layer of slurry of cement @ 0.242 kg/sqm mixed with water proofing cement compound @ 0.126 kg/sqm. This layer will be allowed to air cure for 4 hours followed with water curing for 48 hours. The rate includes preparation of surface, treatment and sealing of all joints, corners, junctions of pipes and masonry				
	with polymer mixed slurry.		75	600.39	45029.25
B6	Brick work with common burnt clay F.P.S. (non-modular) bricks of class designation 7.5 in foundation and plinth in: Cement mortar 1:4 (1 cement : 4 coarse sand)	Cum	5	7171.64	35858.20
B7	Providing and laying Autoclaved Aerated concrete (AAC) blocks masonry with 150 mm to 300 mm thick with Grade-1 AAC blocks of density 551 to 650 kg/cum conforming to IS:2185 (Part 3) in super structure above plinth level up to floor V level with RCC band at sill level and lintel level with approved block laying polymer modified adhesive mortar all complete as per direction of Engineer-in-Charge. (The payment of RCC band and reinforcement shall be made for separately).	Cum	20	8108.64	162172.80
B8	12 mm cement plaster on smooth side of single or half brick wall of mix:1:6 (1 cement: 6 coarse sand).	Sqm	300	334.37	100311.00
B9	15 mm cement plaster on rough side of single or half brick wall of mix:				
	1:6 (1 cement: 6 coarse sand)	Sqm	300	384.68	115404.00

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

B10	Providing and laying reinforced cement concrete in kerbs, steps and the like at or near ground level excluding the cost of centering, shuttering, finishing and reinforcement with 1:1.5:3 (1 cement : 1.5 coarse sand (zone-III) derived from natural sources : 3 graded stone aggregate 20 mm nominal size derived from natural sources).	Cum	7	8583.47	60084.29
B11	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete above plinth level.				
	Cold twisted bars	Kg	300	104.94	31482
B12	Centering and shuttering including strutting, propping etc. and removal of form for				
i	Suspended floors, roofs, landings, balconies and access platform	Sqm	10	902.21	9022.1
ii	Lintels, beams, plinth beams, girders, bressumers and cantilevers	Sqm	50	716.52	35826
iii	Weather shade, Chajjas, corbels, shelves, kitchen/platform etc., including edges	Sqm	50	925.42	46271
B13	Providing and laying Vitrified tiles in floor and Walls cladding in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS:15622, of approved brand & manufacturer, in all colours and shade, laid on 20 mm thick cement mortar 1:4 (1 cement: 4 coarse sand) jointing with grey cement slurry @3.3 kg/sqm including grouting the joints with white cement and matching pigments etc. The tiles must be cut with the zero chipping diamond cutters only. Lying of tiles will be done with the notch trowel, plier, and wedge, clips of required thickness, levelling system and rubber mallet for placing the tiles gently and easily.				
	Glazed Vitrified tiles Matt/Antiskid finish of size				
i)	Size of Tile 1200 x 600 mm in floor	Sqm	55	1425.30	78391.50
ii)	Size of Tile 1200 x 600 mm in wall cladding.	Sqm	150	1550.00	232500.00
B14	Providing and fixing 1st quality ceramic glazed wall tiles conforming to IS: 15622 (thickness to be specified by the manufacturer), of approved make, in all colours, shades except burgundy, bottle green, black of any size as approved by Engineer-in-Charge, in skirting, risers of steps and dados, over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @ 3.3kg per sqm, including pointing in white cement mixed with pigment of matching shade complete.	Sqm	55	1233.72	67854.60
B15	Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	KG	200	114.18	22836.00

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B16	Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete. kg	KG	375	130.09	48783.75
B17	Steel work in built up tubular (round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete.				
	Hot finished welded type tubes	KG	7500	189.15	1418625.00
B18	Steel work welded in built up sections/ framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.				
i	In stringers, treads, landings etc. of stair cases, including use of chequered plate wherever required, all complete.	KG	300	120.26	36078.00
ii	In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works	KG	150	167.94	25191.00
B19	Providing and fixing a top cover made of 18mm thick BWR-grade plywood of approved make such as Greenply, Duroply, Century Ply, or equivalent, suitable for single-side application and capable of achieving a bend radius as tight as 100mm, ideal for curved or contoured work with edge profiles. The plywood shall be fixed over an MS tubular structural framework (to be paid separately) using all necessary hardware, screws, and adhesives. The plywood shall be treated with a preventive anti-termite coating on both sides before installation. The work shall be completed as per approved drawings and as directed by the Engineer-in-Charge.	Sqm	350	2651.00	927850.00
	Sanitary and Plumbing works				
B20	<u>TOILET CUBICLES:</u> Supply and installation of modular toilet cubicles of MERINO-BESCO make 'TITAN 12MM BOX-UP SERIES' series as per manufacturer's standard specifications or equivalent approved make and their relevant specifications as per requirement of engineer-in-charge. All intermediate panels, pilasters, doors shall be made up of Solid Compact Laminate (Phenolic Core Board) as per IS 2046 based on thermosetting resins, homogeneously reinforced with cellulose fibres making cubicles impervious to Water, resistant to Fire, etc. Compact laminate should be Greenguard and IGBC certified				
	Hardware and Fixing				

	All accessories shall be of Merino's Grade 6 polyamide Thermoplastics material & all hardware/fittings shall be of extruded anodized or Epoxy powered coated Aluminium . The pilaster are anchored to the flooring using adjustable nylon legs. Its top rail & door stopper channels shall be extruded anodized or Epoxy powered coated grade 6063 T5-15 micron Aluminium. The top rail shall be fixed on the top of the pilasters for stability and alignment purpose.				
	Accessories				
	Standard – Merino Make Stainless Steel - 304 Grade accessories which includes SS “U” Channel & SS Door Stopper Channel b) SS "F" Channel (Only Corner Unit) c) SS Top Rail d) SS Coat Hook e) SS Privacy Thumb turn c/w Occupancy Indicator f) SS Door Knob g) SS Hinges with Cover h) SS Sheo Box 12mm - 316 Grade i) Rubber				
	Lining for Groove j) S.S. Screws 304 G & P.V.C Wall Plugs SPECIAL NOTE – War page Criteria is 3.0 mm/1000mm for MRS panels as per EN standard- 438				
A)	TITAN 12MM BOX-UP SERIES: Std Sizes: (W x D x H)- 1000 mm x 1550 mm x 2100 mm, (Height is including 150 mm gap from bottom) Door Size- 610 mm				
	Complete as above.	Each	4	40505.00	162020.00
B21	Providing and fixing water closet squatting pan (Indian type W.C. pan) with 100 mm sand cast Iron P or S trap, 10 litre low level white P.V.C. flushing cistern, including flush pipe, with manually controlled device (handle lever) conforming to IS : 7231, with all fittings and fixtures complete, including cutting and making good the walls and floors wherever required:				
	White Vitreous china Orissa pattern W.C. pan of size 580x440 mm with integral type foot rests	Each	1	6584.68	6584.68
B22	Providing and fixing Rimless Wall Hung WC With PP Soft Close Slim Seat Cover, Hinges, Accessories Set, Size: 355x555x370 mm (Jaquar model no : FLS-WHT-5953)PPSM				
	and P type drain pipe connection set for wall hung WC with control plate Jaquar model no : JCP--CHR 852415		7	20500.00	143500.00
B23	Providing and fixing white vitreous china flat back half stall urinal of make Perryware New magnum Ref. No. C0583 or approved equivalent make with CP spreader and cap, waste coupling of required size , PTMT bottle trap and other couplings in C.P. brass, including painting of fittings and cutting and making good the walls and floors wherever required as per direction of engineer-in-charge.	Each	4	5120.00	20480.00

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B24	Providing and fixing automatic urinal flush of makes Robo/ Jaquar or equivalent approved makes Auto flush system for urinals 220V main power supply including electronic sensor control system and motorized valve as per direction of engineer-in-charge.	Each	4	10687.00	42748.00
B25	Providing and fixing Urinal partition with 8 mm thick frosted toughened glass of approved make and shape fixed with stainless steel patch/angle fitting from both side to the wall with necessary fasteners of size 900 mm x 450 mm cut to size and shape as per approved design including making holes, frosting, toughening and rounding off edges etc all complete of make jaquar model no. JSE-CHR-810UC450X (Curved shaped urinal partition with frosted glass) or equivalent approved by engineer-in-charge.	Each	4	6193.00	24772.00
B26	Providing and fixing counter bottom type circular/oval wash basin (make Hindware catalogue No. 10017 or 10065 or approved equivalent make) with necessary C.I bracket and 32 mm C.P. brass waste coupling of standard pattern (make Hindware Cat. No. F850001 or approved equivalent make)and PTMT Bottle trap of make PRAYAG or approved make including painting of fittings and brackets, cutting and making good the walls wherever required as complete as per direction of engineer-in-charge.	Each	6	3403.00	20418.00
B27	Providing and fixing automatic tap for washbasin of makes Doppler/ Jaquar Automatic water tap including tap body of CP Brass or approved equivalent make with electronic control system and motorized valve single 220V mains power supply as per direction of engineer-in-charge.	Each	6	11250.00	67500.00
B28	Providing and fixing rectangular wash basin of size 495 X 395 X150 vitreous china counter top (Jaquar model no : JDS-WHT-25909 or equivalent) with CP waste coupling Jaquar, CP bottle trap (Jaquar) including single lever basin pillar cock Jaquar make model no VGP-CHR-81005NB Single Lever Tall Boy with necessary CP connections of etc. on Granite counter complete. (cost of Granite for counter will be paid separately)	Each	1	11210.00	11210.00
B29	Providing and fixing Stainless Steel A ISI 304 (18/8) kitchen sink as per IS:13983 with C.I. brackets and stainless steel plug 40 mm, including painting of fittings and brackets, cutting and making good the walls wherever required :				
i	Kitchen sink with drain board				
	510x1040 mm bowl depth 250 mm	Each	1	6758.07	6758.07

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B30	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings and fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge. Concealed work, including cutting chases and making good the walls etc.				
i	20 mm nominal dia Pipes	Mtr	6	523.08	3138.48
ii	25 mm nominal dia Pipes	Mtr	6	610.31	3661.86
iii	32 mm nominal dia Pipes	Mtr	6	504.74	3028.44
iv	40 mm nominal dia Pipes	Mtr	6	683.97	4103.82
B31	Providing and fixing CPVC/ PPR Unions				
i	PPR Union 20mm	Each	1	306.98	306.98
ii	PPR Union 25mm	Each	1	324.98	324.98
iii	PPR Union 32mm	Each	1	392.80	392.80
iv	PPR Union 40mm	Each	1	528.44	528.44
B32	Providing and fixing G.I. pipes complete with G.I. fittings and clamps, including cutting and making good the walls etc. Internal work - Exposed on wall				
i	20 mm dia nominal bore	metre	12	425.49	5105.88
ii	25 mm dia nominal bore	metre	84	536.80	45091.20
iii	32 mm dia nominal bore	metre	12	648.99	7787.88
B33	Providing and fixing G.I. Pipes complete with G.I. fittings and clamps, i/c making good the walls etc. concealed pipe, including painting with anti-corrosive bitumastic paint, cutting chases and making good the wall : (makes Jindal Hisar, TATA or equivalent approved make)				
i	15 mm dia nominal bore	Mtr	120	564.78	67773.60
ii	20 mm dia nominal bore	Mtr	80	618.05	49444.00
B34	Providing and fixing G.I. Union in G.I. pipe including cutting and threading the pipe and making long screws etc. complete (New work) : (makes Jindal Hisar, TATA or equivalent approved make)				
i	15 mm nominal bore	Each	6	309.75	1858.50
ii	20 mm nominal bore	Each	6	337.44	2024.64
iii	25 mm nominal bore	Each	6	427.39	2564.34
iv	32 mm nominal bore	Each	6	475.85	2855.10
v	50 mm nominal bore	Each	1	801.56	801.56
B35	Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) : (MAKES: LEADER, NETA, NMV, SANT, JOLATO)				
i	50 mm nominal bore	Each	1	998.93	998.93

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ii	40 mm nominal bore	Each	1	803.80	803.80
iii	32 mm nominal bore	Each	2	670.98	1341.96
iv	25 mm nominal bore	Each	4	605.60	2422.40
v	20 mm nominal bore	Each	2	525.37	1050.74
vi	15 mm nominal bore (Ball Valve)	Each	2	395.87	791.74
B36	Providing and fixing rigid PVC pipe 6 Kg/cm ² of approved make for drainage lines in laid in floor with necessary fittings etc. complete including MS clamps for support of pipe as per instruction of Engineer-in-charge.				
i	40mm diameter	Rmt	15	120.00	1800.00
ii	75 mm diameter	Rmt	60	240.00	14400.00
iii	110 mm diameter	Rmt	80	342.00	27360.00
iv	160mm diameter	Rmt	12	804.00	9648.00
B37	Providing and fixing Rigid PVC moulded fittings/ accessories 6 Kg/cm ² of approved make for drainage lines.				
A)	Coupler				
i	75 mm	Each	6	64.00	384.00
ii	110 mm	Each	6	180.00	1080.00
iii	160mm	Each	6	245.00	1470.00
B)	Single tee with door				0.00
i	75x75x75 mm	Each	6	170.00	1020.00
ii	110x110x110 mm	Each	8	250.00	2000.00
iii	160mm	Each	4	865.00	3460.00
C)	Single tee without door				
i	75x75x75 mm	Each	12	73.00	876.00
ii	110x110x110 mm	Each	12	178.00	2136.00
iii	160mm	Each	6	522.00	3132.00
D)	Elbow				
i	40 mm	Each	24	45.00	1080.00
ii	75 mm	Each	12	77.00	924.00
iii	110 mm	Each	12	178.00	2136.00
iv	160mm	Each	6	245.00	1470.00
E)	Y Tee				
i	75 mm	Each	4	180.00	720.00
ii	110 mm	Each	4	226.00	904.00
iii	160mm	Each	3	605.00	1815.00
F)	Half set				
i	40mm	Each	2	90.00	180.00
ii	75 mm	Each	6	150.00	900.00
iii	110 mm	Each	6	190.00	1140.00
iv	160mm	Each	2	480.00	960.00
B38	Providing and fixing soil, waste and vent pipes :				

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	100 mm dia				
	Hubless centrifugally cast (spun) iron pipes epoxy coated inside & outside IS:15905	Mtr	60	1137.73	68263.80
B39	Providing and fixing plain bend of required degree.				
	100 mm				
	Hubless centrifugally cast (spun) iron pipe epoxy inside & outside IS: 15905	Each	15	358.06	5370.90
B40	Providing and fixing M.S. holder-bat clamps of approved design to Sand Cast iron/cast iron (spun) pipe embedded in and including cement concrete blocks 10x10x10 cm of 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), including cost of cutting holes and making good the walls etc. :				
	For 100 mm dia pipe	Each	10	353.05	3530.50
B41	Providing lead caulked joints to sand cast iron/centrifugally cast (spun) iron pipes and fittings of diameter :				
	100 mm	Each	25	605.69	15142.25
B42	Providing and fixing 100 mm dia PVC connector for EWC including necessary 'O' rubber rings.	Each	8	205.00	1640.00
B43	Providing and fixing PVC height riser two/three way for floor trap and bootle trap or of required outlets.	Each	12	210.00	2520.00
B44	Providing and fixing C.P. brass long body bib cock of approved quality conforming to IS standards and weighing not less than 690 gms including cost of CP extension nipple of required size, if required. :15 mm nominal bore (Make: Parko/ Essco/ Kingston/ Plumber/ Jaquar or equivalent approved make)	Each	2	777.38	1554.76
B45	Providing and fixing 8 mm dia C.P. / S.S. Jet with flexible tube upto 1 metre long with S.S. triangular plate to European type W.C. of quality and make as approved by Engineer - in - charge.	Each	7	339.72	2378.04
B46	Providing and fixing Toilet Roll Holder of jaquar make product Code: ACN-CHR-1151N or equivalent approved by engineer-in-charge. Toilet Paper Holder - C. P. Brass	Each	7	782.00	5474.00
B47	Providing and fixing C.P. brass bib cock of approved quality conforming to IS:8931 including cost of CP extension nipple of required size, if required. :15 mm nominal bore (Make: Cataloge NO. CON-047 KN of Jaquar or equivalent approved make)	Each	10	1208.00	12080.00

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B48	Providing and fixing C.P. brass angle valve for basin mixer and geyser points of approved quality conforming to IS:8931 including cost of CP extension nipple of required size, if required. :15 mm nominal bore ((Make:Cataloge NO. CON-059KN of Jaquar or equivalent approved make))	Each	35	1009.00	35315.00
B49	Providing and fixing C.P. brass two-way angle valve for basin mixer and geyser points of an approved quality conforming to IS:8931 including the cost of CP extension nipple of required size, if required. :15mm nominal bore ((Make: Parko/ Essco/ Kingston/ Plumber/ Jaquar or equivalent approved make)	Each	2	790.00	1580.00
B50	Providing and fixing toilet fittings as listed and of given make :				
i	Providing and fixing 125 mm Stainless steel floor jali of square design as per direction of engineer-in-charge	Each	25	150.00	3750.00
ii	Stainless Steel Towel rod 600 mm long of approved quality. of make Jaquar AQN 7711	Each	5	1750.00	8750.00
iii	Providing and fixing soap dish holder of Jaquar Make (CAN -1131N)	Each	5	809.00	4045.00
B51	Providing and fixing Hand Shower (Health Faucet) with minimum 1.2 Meter Long Flexible Tube and Wall Hook of jaquar make Product Code: Jaquare - ALD-CHR-573 or equivalent approved makes as per direction of engineer in charge.	Each	7	1840.00	12880.00
B52	Providing and fixing towel ring square with round flange Jaquar make (ACN -1121N)	Each	2	1375.00	2750.00
B53	Providing and fixing 600x450 mm bevelled edge mirror of superior glass (of approved quality) complete with 6 mm thick hard board ground fixed to wooden cleats with C.P. brass screws and washers complete.	Each	3	1607.95	4823.85
B54	Providing and fixing 5/ 5.5 mm thick mirror Modi Guard/ Saint Gobain with stainless steel patch fittings including grinding the edges round complete.	Sqm	2.5	1816.00	4540.00
B55	Stainless Steel Towel rack 600 mm long with lower hangers of make Jaquar (Model no-AKP 35781P)	Each	1	5283.00	5283.00
B56	Providing and fixing un-plasticised PVC connection pipe with brass unions : 30 cm/ 45 cm/ 60 cm length as per requirement : 15 mm nominal bore	Each	35	95.75	3351.25
B57	Providing and fixing Grab Bar Jaquar model no : WAC-WHT-BR0600N or equivalent approved by engineer-in-charge.	Each	1	1515.00	1515.00
B58	Providing and fixing Grab Bar Jaquar model no : WAC-WHT-BBG0800N or equivalent approved by engineer-in-charge.	Each	1	4509.00	4509.00

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B59	Providing and fixing Automatic Liquid Soap Dispensers ABS White of make KENT 12017 Touch less 1000 ml Soap Dispenser (White) or equivalent approved make having minimum capacity 1.00 ltrs or more suitable for installation and fixing in toilet wall as per manufacturers specification etc. all complete as per direction of engineer-in-charge.	Each	5	2176.00	10880.00
B60	Providing and fixing 75 mm PVC Naini floor trap of required design.	Each	25	180.00	4500.00
B61	Providing and fixing 100 mm PVC floor 'P' trap of required design.	Each	5	220.00	1100.00
B62	supply and fixing automatic electric hand dryer in ABS body Dolphy DAHD0012 or approved equivalent make/model	Each	5	4208.00	21040.00
B63	Supply, installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular/round ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports etc. as per approved drawings and specifications of following sheet thickness complete as required. :Thickness 0.63 mm sheet	Sqm	30	1058.00	31740.00
B64	Supplying & fixing of powder coated extruded aluminium Return Air Grills with louvers but without volume control dampers complete as required.	Sqm	5	5910.00	29550.00
B65	Providing and fixing approved make duct-able type toilet ventilation fans 230 V, 50Hz, minimum 800 CFM capacity. (makes Ostberg or equivalent)	Each	2	11000.00	22000.00
B66	Providing and fixing square-mouth S.W. gully trap class SP-1 complete with C.I. grating brick masonry chamber with water tight C.I. cover with frame of 300 x 300 mm size (inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70 kg as per standard design:100x100 mm size P type				
	With common burnt clay F.P.S. (non-modular) bricks of class designation 7.5	Each	2	2634.54	5269.08
B67	Constructing brick masonry manhole in cement mortar 1:4 (1 cement :4 coarse sand) with RCC top slab with 1:2:4 mix (1 cement : 2 coarse sand : 4 stone aggregate 20 mm nominal size) , foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 stone aggregate 40 mm nominal size) inside plastering 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement, foundation concrete 1:3:6 mix (1 cement :3 coarse sand : 6 graded stone aggregate 40 mm nominal size),and making necessary channel in cement concrete 1:2:4 (1 cement :2 coarse sand :4 graded stone aggregate 20 mm nominal size) finished with a floating coat of neat cement complete as per standard design .				

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	inside size 90x80 cm and 45 cm deep including CI cover with frame (light duty) 455x610 mm internal dimensions total weight of cover & frame to be not less than 38 kg (weight of cover 23 kg & weight of frame 15 kg)				
	with common burnt clay FPS (non-modular) bricks of class designation 7.5	Each	2	12425.75	24851.50
B68	Making connection of drain or sewer line with existing manhole including breaking into and making good the walls, floors with cement concrete 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) cement plastered on both sides with cement mortar 1:3 (1 cement : 3 coarse sand), finished with a floating coat of neat cement and making necessary channels for the drain etc. complete :				
i	For pipes 100 to 250 mm diameter	Each	5	788.57	3942.85
B69	Providing & Fixing water cooler with stainless steel having storage capacity of 80 litre & cooling capacity 60 litre / hour with Reverse osmosis system & ultra violet membrane TDS reduction 90% having automatic back wash system with filtration unit & all other required accessories complete in all respect as per direction of the engineer in charge .	Each	1	58351.00	58351.00
B70	Providing and fixing 18 mm thick gang saw cut, mirror polished, pre-moulded and pre-polished, machine cut for flooring, vanity counters, window sills, facia and similar locations of required size, approved shade, colour and texture laid over 20 mm thick base cement mortar 1:4 (1 cement: 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edges to give high gloss finish etc. complete at all levels. - Granite of any colour and shade: Area of slab over 0.50 sqm	Sqm	30	4997.62	149928.60
B71	Providing edge moulding to 18 mm thick marble stone counters, Vanities etc., including machine polishing to edge to give high gloss finish etc. complete as per design approved by Engineer-in-Charge.: Granite work	Mtr	20	497.15	9943.00
B72	Extra for providing opening of required size & shape for wash basin/ kitchen sink in kitchen platform, vanity counter and similar location in marble/ Granite/ stone work, including necessary holes for pillar taps etc. including moulding, rubbing and polishing of cut edges etc. complete.	Each	7	952.28	6665.96

B73	Supply and installation of modular Urinal Partitions of MERINO make or equivalent approved make, comprising 12mm thick high-pressure compact laminate (HPL) panels with anti-bacterial, water-resistant, and fire-retardant properties. Each partition panel shall be fixed using stainless steel (SS 304 grade) U-channels, wall brackets, and floor supports (if required), all as per manufacturer's standard specifications and installation guidelines. The height of the urinal partition shall typically be 900mm X 450mm X 12 mm (standard). All edges of the panel shall be machine-finished and chamfered for smoothness. Complete in all respects, including necessary hardware, fasteners, accessories, labour, transportation, handling, and installation at site to the satisfaction of Engineer-in-Charge.	Each	4	4776.00	19104.00
DOORS , WINDOWS, PARTITIONS & PANELLING					
B74	Frameless Glass Doors:- Supply, installation, and fixing of frameless glass door, including all necessary hardware, accessories, and fittings, as per specifications and drawings, 12mm thick toughened glass (or as specified), clear or frosted, with polished edges, High-quality stainless steel patch fittings, including top and bottom pivots, floor spring, door handle, and locks (if required), approved by the client, Glass edges polished and hardware in satin/brushed finish, Rubber gaskets, weather stripping (if required), and screws/fasteners for proper fixing, of make Geze/Dorma/Ozone).	SQM.	5	17190.30	85951.50
B75	Providing and fixing ISI marked flush door shutters conforming to IS :2202 (Part I) decorative type, core of block board construction with frame of 1st class hard wood and well matched teak 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters.				
i	35 mm thick including ISI marked Stainless Steel butt hinges with necessary screws.	SQM.	40	3380.06	135202.40
B76	Providing wood work in frames of doors, windows, clerestory windows and other frames, wrought framed and fixed in position with hold fast lugs or with dash fasteners of required dia & length (hold fast lugs or dash fastener shall be paid for separately).				
i	Second class teak wood	Cum	0.85	139090.06	118226.55
B77	Providing and fixing acoustic panel door as per the drawing including glass wool and French spirit polishing	SQM.	10	6978.46	69784.59

B78	Fire/Acoustic door:- Fire doors : Providing and fixing of fire exit door of varying sizes, one side openable with hinges, long click handles as per approved design DOOR FRAME : Wooden Door Frame of hard wood/teak wood section 150mm x 95mm with heat activated intumescent fire seal strip of size 15mm x 4mm and finished with one coat of anti-termite fire retardant primer or paint and fitted with acoustic seal on all three sides.				
	b) DOOR SHUTTER :Door Shutter: 65mm thick acoustic cum fire/smoke check Shutter of 38 db acoustic cum of 120 minutes rating confirming to BS 476 Part-22 & IS: 3614 part-2 comprising of sandwiching 29mm thick fire resistance insulation material between two 12mm thick calcium silicate board faced with 6mm thick commercial/teak ply with heat activated intumescent fire seal strip of size 15mm x 4mm mounted in the grooves of hardwood lipping on all three sides except bottom along with acoustic seal make Dhonaadhi Hitec Innovations (wooden fire rated door)	SQM.	6	6803.00	40818.00
B79	Solid Flush Doors with Laqured Glass On One side:- Provision, supply, and fixing of solid laminated flush doors, 40 mm thick door frameless with Laqured Glass On One side . Shutter with one sides 0.8mm SF laminate having Plain door design. All four sides matching polished edges. all required materials, hardware, labor, and finishing, as per specifications, High-quality solid core flush door made from block board core , as approved by the client/consultant. of make :-durio (with base rate of solid wood with laminate as/design approval 3766 sq/mt)) with lacquered glass on one side	SQM.	6	21108.91	126653.44
B80	Windows (Aluminium) :- Windows (Aluminium):- Supply and installation of aluminum windows, complete with all necessary fittings and accessories, Aluminum frame, powder-coated, minimum thickness 2 mm, Glass: Clear float glass of make Saint gobain , 12 mm thick, Include handles, locking mechanisms, and hinges of stainless steel or equivalent durable material with necessary fittings and hardware, of make Ozone .	SQM.	3.5	5000.00	17500.00

B81	Roller Blinds :- Provision and installation of roller blinds for windows/curtains, including all necessary materials, labor, and accessories, as per specifications High-quality, durable fabric or PVC/Polyester/Polypropylene, fire-retardant and UV-resistant, suitable for use in the specified environment Roller blinds with manual Operations (as specified) Plain/Patterned design, colour and texture as per client's choice. The fabric shall be light filtering or blackout as required Smooth operation with a spring-loaded/chain-operated system. Make: Vista levelor /Hunter dougla/eqv. <i>(base rate of carpet to be consider as 1988 sqmt)</i>	SQM.	25	2476.65	61916.25
B82	Glass Partition :- Supply and installation of 12 mm thick clear toughened Glass of approved make and desired size in aluminium glazing profile/ U section of desired size fixed to the ceiling and floor with necessary screws, hardware's, fixtures, Silicone adhesives etc all complete. The cost is also inclusive of installing the glass panel to the aluminium section with extra clear silicone adhesives in the as per the satisfaction of engineer in charge. Make: Saint Gobain/ ASAHI/ MODI.	SQM.	15	6502.00	97530.00
B83	Lacquered Glass Panelling: - Providing and fixing of 8 mm thick toughened glass of make Saint Gobain with highly resistant lacquer to one side of the glass of approved make and shade as per colour in specified in detail drawings and as approved by consultant. Rate quoted shall be inclusive of bevelling all the edges at specified angle as per requirement. The rate is inclusive of fixing properly with all necessary silicone adhesives, fittings, arrangement and making necessary holes wherever required etc. all complete as per direction of Engineer in charge.	SQM.	80	7130.57	570445.74
B84	Providing and fixing 68 mm overall thickness wall paneling up to 3 meter height consisting of ms hollow section 50X50mm of make Jindal/Tata as per site requirement of 2mm thickness in a grid pattern with 600mm c/c spacing bothways (horizontal and vertical) or at required spacing near opening, with necessary welding at junctions and fixing the frame to wall/ ceiling/ floors with ms base plate of desired size and thickness with steel dash fasteners of 8 mm dia, 75 mm long bolt, including making provision for opening for doors, windows, electrical conduits, switch boards etc. wherever required. The cost to be inclusive of applying one coat of steel primer of approved quality on the framework. The rate to be also inclusive of providing and installing top cover of 18mm ply of BWR grade of Greenply/ Duroply/ Century ply or similar makes on ONE sides having bend radius as				

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	little as 100mm, ideal for tight radius work with				
	profiles, including the cost of necessary hardware, screws etc all complete as per approved drawings and the direction of engineer in charge.	SQM.	50	6113.26	305662.78
B85	Providing and fixing 136 mm overall thickness free standing partition up to 3 meter height consisting of ms hollow section 50X50mm of make Jindal/Tata as per site requirement of 2mm thickness in a grid pattern with 600mm c/c spacing both ways (horizontal and vertical) or at required spacing near opening, with necessary welding at junctions and fixing the frame to wall/ ceiling/ floors with ms base plate of desired size and thickness with steel dash fasteners of 8 mm dia, 75 mm long bolt, including making provision for opening for doors, windows, electrical conduits, switch boards etc. wherever required. The cost to be inclusive of applying one coat of steel primer of approved quality on the framework. The rate to be also inclusive of providing and installing top cover of 18mm ply of BWR grade of Greenply/ Duroply/ Century ply or similar makes on both sides having bend radius as little as 100mm, ideal for tight radius work with edge profiles, including the cost of necessary hardware, screws etc. all complete as per approved drawings and the direction of engineer in charge.	SQM.	40	10783.53	431341.01

B86	Providing and fixing 325 mm overall thickness free standing partition up to 3 meter height consisting of ms hollow section 50X50mm of make Jindal/Tata as per site requirement of 2mm thickness in a grid pattern with 600mm c/c spacing both ways (horizontal and vertical) or at required spacing near opening, with necessary welding at junctions and fixing the frame to wall/ ceiling/ floors with ms base plate of desired size and thickness with steel dash fasteners of 8 mm dia, 75 mm long bolt, including making provision for opening for doors, windows, electrical conduits, switch boards etc. wherever required. The cost to be inclusive of applying one coat of steel primer of approved quality on the framework. The rate to be also inclusive of providing and installing top cover of 18mm ply of BWR grade of Greenply/ Duroply/ Century ply or similar makes on both sides having bend radius as little as 100mm, ideal for tight radius work with edge profiles, including the cost of necessary hardware, screws etc. all complete as per approved drawings and the direction of engineer in charge.	SQM.	21	11195.89	235113.59
	TOTAL OF PART B= Rs				7258805.00
C	Finishing Painting				
C1	Providing and applying white cement based putty of average thickness 1 mm, of approved brand and manufacturer, over the plastered wall surface to prepare the surface even and smooth complete.	Sqm	600	151.84	91104.00
C2	Providing and applying plaster of paris putty of 2 mm thickness over plastered surface to prepare the surface even and smooth complete.	Sqm	200	255.61	51122.00
C3	Wall painting with acrylic emulsion paint, having VOC (Volatile Organic Compound) content less than 50 grams/ litre, of approved brand and manufacture, including applying additional coats wherever required, to achieve even shade and colour.				
i	Two coats	Sqm	600	133.74	80244.00
C4	Painting with synthetic enamel paint of approved brand and manufacture to give an even shade :				
i	Two or more coats on new work.	Sqm	250	151.69	37922.50
C5	Painting (two or more coats) on rain water, soil waste and vent pipes and fittings with black anticorrosive bitumastic paint of approved brand and manufacture, over and including a priming of ready mixed zinc chromate yellow primer on new work:				
i	100 mm diameter pipes	Metre	5	74.29	371.45
ii	150 mm diameter pipes	Metre	5	110.73	553.65

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C6	Providing and applying two coats of fire retardant paint on cleaned wood / ply surface @ 3.5 sqm per litre per coat including preparation of base surface as per recommendations of manufacturer to make the surface fire retardant.	Sqm	200	325.47	65094.00
C7	Painting with oil type wood preservative of approved brand and manufacture:				
i	New work (two or more coats)	Sqm	100	52.93	5293.00
C8	French spirit polishing :				
i	Two or more coats on new works including a coat of wood filler	Sqm	50	434.20	21710.00
C9	Polishing in high gloss/matt finish melamine clear polish on wood work in required color/wooden shade texture with following process in the sequence as detailed below: 1. The surface to be polished is rubbed with sand paper 80/120 no. and then with sand paper of 160/180 nos. 2. Applying two coats of sealer with spray gun and allowing sufficient drying time for 1st coat and 2nd coat is allowed to dry for 8 to 12 hrs. 3. On drying of sealer coat, wet rubbing with emery cloth of finer grading with ample water to remove excess sealer layer and make the surface further smooth after this wet rubbing, then surface is applied with special grade melamine fillers to fill all the small and big holes/grooves etc. Filler coat to be allowed to dry for 4 to 6 hrs on which again a light wet rubbing is done this surface is further allowed to dry for 12 hrs.				
	4. On this, 1st coat of melamine polish is applied with spray gun using melamine clear polish and melamine thinner in required proportion. This 1st coat is allowed to dry for 24 hrs then this dry surface is again fine wet rubbed smooth, which is further allowed to dry for 12 hrs. The final melamine polish is applied with compressor pressure spray gun using melamine clear polish and melamine thinner mixed in required proportion complete as per direction of Engineer-in-Charge. (Final coat to be done in 1 or 2 layers without gap of time.)	Sqm	20	1323.72	26474.40
	TOTAL OF PART C= Rs				379889.00
D	False ceiling work.				
D1	Providing and fixing false ceiling at all heights including providing and fixing of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50 mm long with 6 mm dia bolts,				

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	other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other				
	end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to wall/partition with the help of rawl plugs at 450 mm centre, with 25 mm long				
	Dry-wall screws @ 230 mm interval, including fixing of gypsum board to ceiling section and perimeter channel with the help of dry-wall screws of size 3.5 x 25 mm at 230 mm c/c, including jointing and finishing to a flush finish of tapered and square edges of the board with recommended jointing compound , jointing tapes , finishing with jointing compound in 3 layers covering upto 150 mm on both sides of joint and two coats of primer suitable for board, all as per manufacturer's specification and also including the cost of making openings for light fittings, grills, diffusers, cutouts made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in Charge but excluding the cost of painting with :				
i	12.5 mm thick tapered edge gypsum plain board conforming to IS: 2095- (Part I) :2011 (Board with BIS certification marks)	Sqm	175	1319.19	230858.25
D2	Providing and fixing grid ceiling at all heights with Tegular Framework, a high-performance suspended ceiling system designed for both aesthetic appeal and acoustic properties. The fine-textured panels shall be non-directional, durable, and offer standard acoustical performance. Panels shall be fixed with a precision-engineered metal grid system as per approved design. The ceiling tiles shall have Tegular edge details creating a stepped and dimensional appearance. The tiles shall drop slightly below the grid, forming a clean, shadowed reveal for enhanced visual depth, while allowing easy access to the plenum for maintenance and services. The grid and tile system shall be installed complete with main tees, cross tees, wall angles, suspension system, and all necessary fittings and accessories as per manufacturer's specifications. Make: Armstrong or equivalent. Model/Specification: Dune with Tegular Framework Supreme	Sqm	140	2745.00	384300.00

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D3	Providing & fixing false ceiling at all height including providing & fixing of framework made of special section, power pressed from M.S. sheets and galvanised with zinc coating of 120 gms/ sqm (both side inclusive) as per IS : 277 and consisting of angle cleat of size 25 mm wide x 1.6 mm				
	thick with flanges of 27 mm and 37mm, at 1200 mm c/c, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50 mm long with 6 mm dia bolts, other flange of cleat fixed to the angle hangers of 25 x10 x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I channels 45 x15 x 0.90 mm running at the spacing of 1200 mm c/c, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5mm, at 450 mm c/c, shall be fixed in a direction				
	perpendicular to G.I intermediate channel with connecting clip made out of 2.64 mm dia x 230 mm long G.I wire at every junction, including fixing perimeter channels 0.50 mm thick 27 mm high having flanges of 20 mm and 30mm long, the perimeter of ceiling fixed to wall/ partitions with the help of Rawl plugs at 450 mm centre, with 25 mm long dry wall screws @ 230 mm interval, including fixing of Calcium Silicate Board to ceiling section and perimeter channels with the help of dry wall screws of size 3.5 x25 mm at 230 mm c/c, including jointing & finishing to a flush finish of tapered and square edges of the board with recommended jointing compounds, jointing tapes, finishing with jointing compounds in three layers covering up to 150 mm on both sides of joints and two coats of primer suitable for boards, all as per manufacture's specification and also including the cost of making opening for light fittings, grills, diffusers, cut outs made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in charge but excluding the cost of painting with:				
i	8 mm thick Calcium Silicate Board made with Calcareous & Siliceous materials reinforced with cellulose fiber manufactured through autoclaving process.	Sqm	50	1529.85	76492.50
D4	Providing and fixing Saint-Gobain Ecophon Advantage™ E ceiling tiles of size 600x600x15mm / 1200x600x15mm, Microlook tegular edge with concealed grid, manufactured from high-density glass wool, finished with batch-painted glass tissue on the visible surface (white), and glass tissue backing. Tiles shall be easily demountable and modular. The panels shall have the following acoustic and environmental properties: Alpha W = 0.95 and Sound Absorption Class A (as per EN				

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	ISO 11654) NRC = 0.90 as per ASTM C 423 Articulation Class = 180 (ASTM E1111 / ASTM E1110) Fire classification: Class A2-s1, d0 (non-combustible) as per EN 13501-1 Humidity Resistance Class C, 95% RH at 30°C (EN 13964:2014) Light reflectance = 83%				
	Certified for VOC Emissions A+ (France), M1 (RTS Finland), GRIHA Green Rating, REACH SVHC-free Recycled content ≥ 70%, fully recyclable Environmental Product Declaration (EPD) as per ISO 14025 / EN 15804 CE-marked (EN 13964:2014 compliant)				
	Fixing & Framing System: Tiles shall be laid on a T-15 exposed GI grid system (white powder coated) from Saint-Gobain Gyproc, including: Main Tee: 0.3x32x15x3660 mm Cross Tee: 0.3x32x15x600 mm and 1200 mm Wall Angle: 3000 mm (for 32 mm height) Framing system shall be suspended from soffit using soffit cleats, rawl plugs, GI wire hangers and leveling spring clips at maximum 1200mm c/c. The grid shall form a 600x600mm module. All Cross Tees >600mm shall be independently supported. Wall angles to be fixed using nylon sleeves and wooden screws at 300mm c/c. Installation shall be completed in line with manufacturer's instructions, ensuring level finish, proper grid support and tight fitting panels. Make: Saint-Gobain Ecophon Model: Advantage™ E 15 mm	Sqm	350	2083.00	729050.00
D5	Providing and fixing Saint-Gobain Ecophon Focus™ Ds (Dark diamond) ceiling tiles of size 600x600x20mm, edge type Ds (concealed grid, symmetrical bevelled edge), manufactured from high-density glass wool and finished with batch-painted glass tissue in white on the visible side, and covered with glass tissue on the rear side. The panels shall have a Noise Reduction Coefficient (NRC) of 0.9 as per ASTM C 423, Alpha W = 0.90, and Sound Absorption Class A per EN ISO 11654 (tested at 200mm o.d.s). The system shall meet high indoor air quality standards complying with French VOC regulations (A level) and certified by RTS M1 label, Eurofins Indoor Air Comfort®, GRIHA, IGBC Green Pro, and EUCB, and shall be REACH regulation compliant. Product must carry an Environmental Product Declaration (EPD) as per ISO 14025 & EN 15804 and have 57% post-consumer recycled content, fully recyclable.				

	Tiles must be fire rated as Class A2-s1, d0 (non-combustible) as per EN 13501-1, with Class C humidity resistance (RH 95% at 30°C) per EN 13964:2014, and light reflectance of 85%. The tiles shall be easily demountable, CE-marked, and shall meet Articulation Class 180 per ASTM E1111/E1110. Installation: Tiles shall be fixed using a black powder-coated GI T-24 grid system from Saint-Gobain Gyproc, comprising: Main Tee: 0.3x32x24x3000mm Cross Tee: 0.3x24x25x600mm & 0.3x24x25x1200mm Wall Angle: 3000mm length (for 32mm thickness) The system shall be suspended from the soffit using soffit cleats, rawl plugs, GI wire hangers, and spring clips at 1200mm c/c. Cross Tees of 1200mm and 600mm shall be locked into Main Tees to form a modular grid of 600x600mm, ensuring perfect levelling and alignment. Cross Tees longer than 600mm must be independently supported. Wall angles shall be fixed at 300mm intervals using nylon sleeves and wooden screws. All work shall be completed in line with the manufacturer's installation guidelines, ensuring flush and even finish.	Sqm	280	6506.00	1821680.00
	TOTAL OF PART D= Rs				3242380.75
E	Acoustic Work				
E1	Providing and fixing demountable acoustic wall panels of size 600x600x20 mm / 1200x600x20 mm, made from high-density glass wool core, wrapped with standard approved acoustic fabric, mounted on a concealed system using 12mm high PVC grippers and treated wooden battens for proper alignment and stability. The panels shall be factory-fabricated with square natural edges, having minimum 51% post-consumer recycled content and shall be fully recyclable. The system shall have the following properties: Noise Reduction Coefficient (NRC): Minimum 0.70, as per ASTM C 423 Fire Classification: Class A2-s1-d0 (EN 13501-1), Non-combustible (EN ISO 1182) Humidity Resistance: Class C (RH up to 95% at 30°C) as per EN 13964:2014 Light Reflectance: 85% Air Quality Compliance: A level per French VOC regulation Certified with M1 label (Finland), Eurofins Indoor Air Comfort®, and GRIHA Council of India Environmental Certification: EPD as per ISO 14025 & EN 15804 Make: Saint Gobain Ecophon Focus A or equivalent (approved by the architect/engineer)	Sqm	280	2845.00	796600.00

E2	Providing and supplying Saint-Gobain Ecophon Akusto™ Wall A Tech acoustic fabric wall panels, 40mm thick with square natural edges, manufactured from high-density glass wool. The panels are demountable and wrapped in standard fabric approved by the architect. Available sizes include 600x600mm and 1200x600mm. These panels deliver superior acoustic performance with a Noise Reduction Coefficient (NRC) of 0.7 as per ASTM C 423. They comply with French VOC emission regulations (A level) and hold certifications from the Finnish Building Information Group (M1 label), Eurofins Indoor Air Comfort®, and the GRIHA Council of India for Green Ratings. The product carries an Environmental Product Declaration (EPD) as per ISO 14025 and EN 15804, contains a minimum of 51% post-consumer recycled content, and is fully recyclable. Fire safety classification is non-combustible per EN ISO 1182, with a reaction to fire rating of Class A2-s1,d0 according to EN 13501-1. Panels also provide high humidity resistance (Class C, 95% RH at 30°C) per EN 13964:2014 and have 85% light reflectance. The installation involves securely fixing and leveling wooden battens on the wall or ceiling in accordance with the approved layout. Next, 12mm high PVC grippers are attached to the wooden battens, ensuring precise alignment to hold the panel edges securely. The acoustic panels are then carefully inserted into the PVC grippers, maintaining a snug fit, uniform gaps, and correct alignment throughout the installation. Upon completion, the installed panels are inspected for any gaps or misalignments and cleaned to remove dust or debris, ensuring a neat, professional finish as per the manufacturer's specifications	Sqm	280	5507.00	1541960.00
	TOTAL OF PART E= Rs				2338560.00
F	Flooring				
F1	Providing and laying of 9 mm (Overall) thick Nylon carpet of following specification in conference room including under layer of 6 mm thick PU foam at the base and pasting with suitable adhesive as per the recommendation of the manufacturer in desired/approved colour/shade/design- Construction: Tufted High & Low LoopFace Yarn: 100% Solution Dyed Universal Thrive matter Nylon 6Gauge: 1/10 InchStiches: 8 per inchPile Weight: 815 g/m2 (24 oz/yd2)Pile Thickness: 4.5 mm – 7.5 mm (±0.5 mm)Total Thickness: 9 mm (±0.5 mm)Backing: PVC with fiberglassTile Size: 25 cm x 100 cmFlammability: Passes (ASTM E648-10) CLASS 1Smoke Density: Passes (ASTM 662)Static Propensity: Passes AATCC-134 Make:-Bliss Series by Harrington(Euronics) or Approved Equivalent make.	Sqm	140	2422.00	339080.00

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F2	Providing and laying tufted high and low loop modular carpet tiles of overall thickness 8 mm, made of 100% solution-dyed Universal Nylon 6 and Aquafil Nylon 6 with PVC + fiberglass backing, suitable for high-traffic indoor spaces. The carpet shall meet the following specifications: Construction: Tufted High & Low Loop Face Yarn: 100% Solution Dyed Universal Nylon 6 & Aquafil Nylon 6 Gauge: 1/10 Inch Stitches: 10 per inch Pile Weight: 645 g/m² (19 oz/yd²) Pile Thickness: 2.5 mm – 6.5 mm (±0.5 mm) Total Thickness: 8 mm (±0.5 mm) Backing: PVC with fiberglass Tile Size: 25 cm x 100 cm Flammability: ASTM E648-10, Class 1 Smoke Density: ASTM 662 Static Propensity: AATCC-134 Including adhesive (as recommended by manufacturer), edge trimming, layout marking, cleaning, proper installation over stepped flooring, and finishing, complete in all respects as per direction of Engineer-in-Charge. Make: Aura Series by Harrington (Euronics) or approved equivalent.	Sqm	180	2388.00	429840.00
F3	Providing and fixing in position 12 mm thick laminated wooden flooring using planks of approved colour, texture, and finish, conforming to relevant specifications and having a valid Performance Appraisal Certificate (PAC) issued by BMTPC. The flooring shall be installed using a tongue and groove interlocking system over a 4 mm thick expanded polyethylene (EPE) foam underlay. The work shall include: Flooring planks EPE foam underlay Skirting, edge profiles, spacers Adhesives/accessories if applicable All necessary tools, fixing arrangements Finishing, cleaning, and protection after installation Make: Action Tesa / Royal Touch / equivalent approved	Sqm	25	2213.00	55325.00
F4	Providing and laying stain-resistant metal carpet tiles/flooring of approved shade and quality, having waterproof backing and a total thickness of up to 25 mm, including proper leveling of the floor surface to match the recommended recess depth. The tiles shall be installed as per detailed drawings and manufacturer's specifications, and as approved by the museum design consultant. Make: Euronic or equivalent Model No.: 5014 Aluminium Dust Buster Mat Profile Height: 14.5 mm Profile Width: 31.5 mm Total Height: 19.5 mm Carpet Thickness: 12 mm Interconnection:				

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	Circle link systemCrush Resistance: 1000 Kg/sqmRecommended Recess Depth: 19 mm ±2 mmColour Options: Brown (Code 5014 B) / Grey (Code 5014 G)	Sqm	15	9610.00	144150.00
F5	Providing and fixing 4mm thick foam-backed vinyl flooring of approved shade and quality, featuring anti-skid properties, excellent sound insulation, and shock absorption, and requiring minimal maintenance. The scope includes surface preparation with a polymer-based self-levelling compound (up to 2mm thickness) to achieve a smooth and even sub-floor. The vinyl flooring shall be laid as per the area demarcated in the approved drawings and as per the instructions of the Engineer-in-Charge. Approved Makes: Euronics, Gerflor, Jeoflor, Alpthahs, Armstrong, wonder floor or equivalent.	Sqm.	127	2206.00	280162.00
F6	Providing, supplying, and fixing 4.3 mm thick Flotex Sheet Carpet of approved make (e.g., Forbo Flooring Systems or equivalent), in roll form of 2.0 m width, with 100% polyamide 6.6 pile construction, total weight 1800 g/m ² , conforming to EN 1307 and classified under Class 33 for heavy commercial use (EN-ISO 10874). The carpet shall meet the following minimum performance standards: dimensional stability ≤ 0.2%, abrasion resistance > 1000 cycles, castor chair continuous use r ≥ 2.4 (ISO 4918), colour fastness to light ≥ 6, slip resistance (dry and wet) – low risk (BS 7976-2), acoustic impact noise reduction ΔLw ≥ 21 dB, sound absorption αw = 0.10 (H), water impermeability as per EN 1307 Annex G, fire classification Bfl-s1, L, CS (EN 13501-1), static slip resistance μ ≥ 0.30, body voltage ≤ 2.0 kV, and thermal conductivity 0.06 W/mK. The carpet shall be installed using Eurostar 640 Special adhesive or equivalent, as per manufacturer's recommendations, including trimming, joint sealing, and finishing. The product must be compliant with EN 14041:2004, made with up to 20% recycled content and manufactured using 100% renewable electricity. The product shall have ISO 9001 and ISO 14001 certified production and documented Environmental Product Declaration (EPD). The item includes all labour, materials, tools, equipment, adhesives, transportation, taxes, and complete installation over prepared surfaces as directed by Engineer-in-Charge.	Sqm.	235	5649.00	1327515.00
F7	Providing and fixing false flooring up to a height of 600 mm using MS box section (make: Jindal/Tata) of size 50 mm x 50 mm x 2 mm thick, spaced at 300 mm center-to-center or as per design, including welding at all junctions and intersections. The frame structure shall be given two coats of red oxide primer. A 12 mm thick BWR-grade				

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	plywood sheet (make: Greenply/Century or equivalent) shall be fixed over the frame using 2 mm thick MS plates (size as per requirement), properly welded and secured using				
	appropriate fasteners and hardware. The plywood shall be treated with one to two coats of anti-termite oil finish. The joints between the wooden panels and other surfaces shall be finished with 37 mm x 18 mm (finished size) teak wood mouldings of approved design, fixed using adhesive and headless pins. The mouldings shall be polished with ready-mix wax polish for a smooth, decorative finish. The scope also includes the provision of a cove detail along the periphery, as per the approved design from the consultant. All required edge profiles, beadings, hardware, and fixtures shall be included to complete the work in all respects.	Sqm.	20	8124.36	162487.28
	TOTAL OF PART F= Rs				2738559.28
G	FURNITURE.				
G1	Auditorium chairs:- Providing and Fixing including transportation Auditorium chair (Push back) with Auto Tip- Up Mechanism, ergonomic design, comfortable & aesthetically appealing of following specifications: Auditorium Chair with the seat rest assembly 1.5±0.1 cm thk. Flat plywood measured and in-situ moulded with polyurethane foam & upholstered with polyester fabric (of approved colour) and enclosed by an injection moulded cover. The Seat has to be an auto-tip up feature making it stay in upright position when not in use enabling clear row passage. The seat profile should have a large waterfall edge to help the users get necessary comfort in popliteal region. *SEAT SIZE: 45.0 cm. (W) x 50.5 cm (D) x 13.8 cm (T) Approx.. The backrest assembly is to be made up of 1.2±0.1cm thk flat plywood measured and upholstered with polyester fabric and enclosed by an injection moulded back cover. The back foam is designed with contoured back support for extra comfort. *HIGH BACK SIZE: 48.7 cm. (W) x 76.9 cm (H) x 12.5 cm (T) Approx. The HR polyurethane foam for Seat and Back is moulded with Density = 45 +/- 2kgs/m³. The leg frame assly is fabricated from M.S. tube 6.0±0.03cm x 4.0±0.03cm x 0.2±0.016cm thk. welded with grouting member. It is black powder coated (DFT 40-60 microns) & grouted to the floor using anchors. The armrest is made up of black integral skin polyurethane with 65+/-10 Shore 'A' hardness and reinforced with M.S. insert fixed with leg frame. The armrests are scratch and weather resistant. The armrest is available in two options- with and without cup holder. The armrest cladding is made up				

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	of 0.9±0.1 cm thk Plywood & upholstered with polyster fabric. The cladding is fixed to Aisle Side panel Only. All in between panels will not have armrest cladding. All steel components are Epoxy Polyester Powder Coated (DFT 40-60 microns).The auditorium chair is to be designed to get mounted/grouted on floors with flooring specification as per site condition. (Godrej/ model				
	no. GLAMOUR NXT(GAC) - High Back Main without Cupholder in desired coloured Fabric)/ Featherlite (model no:-Venus Model,)/eqv. preapproved make.	Nos	265	21968.500	5821652.50

G2	Reception chairs + Green room chair:- Providing, supplying and placing of stool with back. The seat should be made up of 1.2±0.1cm thick flat plywood and with moulded Polyurethane foam and should be upholstered with replaceable synthetic leather covers. SEAT SIZE: Diameter 40.0 cm with 360° Revolving type adjustment. The back foam should be designed with contoured Lumbar support for extra comfort. The upholstery should be available in synthetic leather. BACK SIZE: 45.0 cm (W) covered with polyurethane foam .The HIGH RESILIENCE (HR) polyurethane foam should be _moulded with density = 45 +1-2 kg/m3 and Hardness load 16 ± 2 kgf for 25% compression. The manual height adjustment should be very easy to operate with a help of a knob.. It can be easily locked at the most comfortable position. The five-prong pedestal should be fabricated from 0.2 ± 0.02 cm thick HR sheet (should be : DD 10791 HR), powder coated (OFT 40-60 microns)and fitted with an injection moulded black Polypropylene Hub Cap and 5 nos. twin wheel castors. The pedestal should be 55.0±0.5cm pitch-circle diameter (65.0±1.0cm with castors). The twin wheel castors should be injection moulded in Black Nylon. Width- 65.0cm, Depth- 65.0 cm, Height- 66.0cm to 77.5cm & Seat Height- 45.0 to 56.5cm/Make-Godrej/Model no.-: STOOLS -Mch Ht Adj + Back/Featherlite/eqv. Preapproved make.	Nos	6	7336.70	44020.20
G3	Conference Room chairs: - Providing and supplying of High Back Leatherette chair. The seat assembly is made up of 15mm thick moulded plywood layered with assembly of P.U foam of 45 kg/m3 density and slab stock foam of 28 kg/m3 density and whole sub-assembly is then upholstered with leatherette cover. The back assembly is made up of 12 mm thick moulded plywood layered with P.U foam of 45 kg/m3 density and U-foam of 28 kg/m3 density. A 200 GSM recron sheet is placed over the P.U foam and whole sub-assembly is upholstered with leatherette cover. The armrest is fixed and made of die-cast aluminium with buffing finish. Provided with CENTER TILT WITH MULTI POSITION LOCK MECHANISM: The mechanism is designed with the following features: 360° revolving type, 3 position locking, Tilt tension adjustment. The pneumatic height adjustment should have a stroke of 10.0±0.3cm. The pedestal is made of high-pressure die-cast polished aluminum with a buffed outside surface and black color coated internal surface. It is fitted with 5 castors and should have a pitch-center diameter of 67.5±0.5 cm. The twin wheel castors are injection moulded in black polyamide. W 75 D 79 H 115.0- 125.0 & Seat Height 45.0- 55.5cm.				

	This product should be certified by GREENGUARD (UL)./Make-Godrej/ Model no. :-Quartz HB LC Of Godrej/Featherlite/eqv. Preapproved make.	Nos.	24	35852.70	860464.80
G4	Conference Room Training chairs (2nd row):- Providing and supplying of Full Back Leatherette Chair. The seat assembly is made up of 15mm thick moulded plywood layered with assembly of P.U foam of 45 kg/m3 density and slab stock foam of 28 kg/m3 density and whole sub-assembly is then upholstered with leatherette cover. The back assembly is made up of 12 mm thick moulded plywood layered with P.U foam of 45 kg/m3 density and U-foam of 28 kg/m3 density. A 200 GSM recron sheet is placed over the P.U foam and whole sub-assembly is upholstered with leatherette cover. The armrest is fixed and made of die-cast aluminium with buffing finish. Provided with CENTER TILT WITH MULTI POSITION LOCK MECHANISM: The mechanism is designed with the following features: 360° revolving type, 3 position locking, Tilt tension adjustment. The pneumatic height adjustment should have a stroke of 10.0±0.3cm.The pedestal is made of high-pressure die-cast polished aluminum with a buffed outside surface and black color coated internal surface. It is fitted with 5 castors and should have a pitch-center diameter of 67.5±0.5 cm. The twin wheel castors are injection moulded in black polyamide. W 75 D 79 H 99.0-109.0 & Seat Height 45.0-55.5cmThis product should be certified by GREENGUARD (UL).Make - Godrej/ Model:-Quartz Full Back Chair/Featherlite/eqv. Preapproved make.	Nos.	22	34330.00	755260.00
G5	Translator/Tech. room chairs;- Providing, supplying and placing of Mid Back Chair with The seat & back is made up of 1.2 ± 0.1cm thk. Hot pressed plywood measured. upholstered with knitted fabric, over moulded High Resilience Polyurethane foam. MID BACK SIZE : 51.6 cm(W) x 65.7 cm. (H). SEAT SIZE : 49.0 cm. (W) x 48.8 cm. (D).The HIGH RESILIENCE (HR) polyurethane foam is moulded with density =45+/-2 kg/m3 and hardness 13 ± 1 kgf as per IS:7888 for 25% compression. Fixed type Armrest is made of plastic injection moulded nylon with textured top. Provided with FRONT PIVOT SYNCHRO MECHANISM: The adjustable tilting mechanism is designed with the following features. • 360° revolving type. • Single point control. • Front-pivot for tilt with feet resting-on ground ensuring more comfort. • Tilt tension adjustment. • 4-position locking with anti-shock feature. The pneumatic height adjustment should have an adjustment stroke of 9.0 ±0.3 cm. The pedestal is fabricated from 0.2 ± 0.02 cm thick HR sheet (IS : DD 1079 / HR skin pass), chrome plated and assembled with injection moulded				

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	black polypropylene hub cap and 5 nos. twin wheel castors. The pedestal is 66.0±0.5cm. Pitch-center dia. (76.0±1.0 cm with castors).The twin wheel castors are injection moulded in black. This product should be certified by GREENGUARD (UL) & Indoor Advantage Gold/Make - Godrej/ Model no:-BEAT Mid Back Conference/Featherlite/eqv. Preapproved make.	Nos.	5	19518.30	97591.50
G6	Stage Podium:- Providing wood stage podium, with approved finish as per design consultant made with 19 mm thick commercial ply board 10 mm thick acrylic solid surface on top and over the surface as approved by design consultant. Inclusive of all the necessary hardware's and fixtures, required for the stability of the structure. The structure should be stable for bearing the load as per the functioning of the same. The podium to also have the provision of electrical points and other necessary accessories for supporting the usage of electrical equipment's, such as podium microphone, screen and other various equipment's. The hardware and fitting to be hettich/haffele/equivalent. The rate are inclusive of artwork/design in etchig/laser cutting/cnc in acrylic solid surface/wood/metl/glass as per approved by museum design consultant. As per the given reference drawing No NSC-A05-07 Podium.	Nos.	1	104175.68	104175.68
G7	Reception table:- Providing and fixing of 2000x1050x500mm of reception table partially straight and partially curved made in special square pipe sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 of size 50X50mmX2mm MS square pipe frame with 18mm thick commercial ply board 12mm thk acrylic solid surface on top/ micro topping/vinyl finish as approved by the deisgn consultant. Inclusive of 2 no's drawer unit 600mm x 450mm made in 18mm thk Block Board finished (outside) with 2 nos. drawer and 1 nos. file storage space with shutter finished (both inside and outside) with 1mm thick laminate inside with face finished in acrylic solid surface or any other necessary finish as per drawing and as approved by consultant. The hardware and fittings to be hettich /haffele/ equivalent. All shelves, drawers, designer handles, lockable drawers with necessary first class hardware and adhesive approved by Consultants. The rates are inclusive of artwork/deisgn in etching/laser cutting/cnc in acrylic solid surface/wood/metal/glass as per approved by design consultant. With Print ready designed graphics, illustrations / artwork and Copywriting and editing of bilingual textual content as per conceptual design provided by design consultant. Under special conditions, the size of the table may vary, and the cost will be	Nos	1	213347.00	213347.00

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	considered on a pro-rata basis proportionately.				
G8	Sofa (VIP LOUNGE) -1 Seater:- Providing, supplying and placing of 1 Seater SOFA with Dimensions W x H x D (cm)- 97 x 97.5 x 89.Seat Height (cm):- 45.5 and Upholstery Material:- Synthetic Leather + Warranty:- 3 Years Primary Material:- Leatherette. Under structure of seat is made up of combination of pinewood members and 12mm thick Plywood. Pinewoods are of cross sections 34x64mm, and 16x30mm without having major knots & defects on the surface. Complete under structure of Seat is made by gluing, nailing & stapling, Non-woven fabric of 100GSM is stapled on the top surface after attaching Zig-Zag spring to cover the structure. Foaming of seat is done with and 28kg/m* PU foam. A top layer of supemoft PU foam with density 32 kg/m^ is used to provide softness. Under structure of armrest is made up of combination of pinewood members, 12mm thick Plywood. Pinewoods are of cross sections 16X35mm without having major knots & defects on the surface. Complete under structure of Armrest is made by gluing, nailing & stapling. Rubber wood panel 18mm to be fitted just after the upholstery is done or before assembling the armrest. Foaming of Armrest is done with density 60kg/m^ and 28kg/m^ on all the outer surfaces in order to give definition to the form of armrest. Foam of 28kg/m* is used on the top surface of armrest. Facia panel is having wood-stain matt finish. It is fitted to the armrest with the help of Velcro-strip.				

	Back Under structure is made up of combination of pinewood members, 12mm THK Plywood, HDPE sheet at the rear side of the backrest at the bottom side of the backrest ear Pinewood are of cross sections 16x35, 22x64mm, 22x40mm without having major knots and defects on the surface. HDPE sheet is to be stapled on the rear side of backrest. Backrest is made of PU foam with density 60kg/m [^] and 28kg/m* and 32kg/m3. Backrest Lumber foam is of 32kg/m covered with layer's of recron sheet of 200gsm. Backrest neck cushion are in the form of detachable pillows which are connected with the help of Velcro strip of (2 inch). Backrest cushion consist of 50mm thk 32density PU foam and wrapped with layer of 200gsm recron sheet. Upholstery: ABS injection molded legs with (wood stain finish) sublimation process are fitted at the bottom surface of the sofa. Upholstered seat ,backrest and armrest are integral part of each other and are connected to each other with MB baits, nuts & washer./Make - Godrej/Model no:-Bayflow 1str sofa SLthr Tof Be	Nos	2	48449.60	96899.20
G9	Sofa (VIP LOUNGE) -3 seater: - Providing, supplying and placing of 3 Seater SOFA with Dimensions W x H x D (cm)- 202 x 97.5 x 89. Seat Height (cm):- 45.5 and Upholstery Material:- Synthetic Leather + Warranty:- 3 Years Primary Material:- Leatherette. Under structure of seat is made up of combination of pinewood members and 12mm thick Plywood. Pinewoods are of cross sections 34x64mm, and 16x30mm without having major knots & defects on the surface. Complete under structure of Seat is made by gluing, nailing & stapling, Non-woven fabric of 100GSM is stapled on the top surface after attaching Zig-Zag spring to cover the structure. Foaming of seat is done with and 28kg/m* PU foam. A top layer of supemoft PU foam with density 32 kg/m [^] is used to provide softness. Under structure of armrest is made up of combination of pinewood members, 12mm thick Plywood. Pinewoods are of cross sections 16X35mm without having major knots & defects on the surface. Complete under structure of Armrest is made by gluing, nailing & stapling. Rubber wood panel 18mm to be fitted just after the upholstery is done or before assembling the armrest. Foaming of Armrest is done with density 60kg/m [^] and 28kg/m [^] on all the outer surfaces in order to give definition to the form of armrest. Foam of 28kg/m* is used on the top surface of armrest. Facia panel is having wood-stain matt finish. It is fitted to the armrest with the help of Velcro-strip.				

	Back Under structure is made up of combination of pinewood members, 12mm THK Plywood, HDPE sheet at the rear side of the backrest at the bottom side of the backrest ear Pinewood are of cross sections 16x35, 22x64mm, 22x40mm without having major knots and defects on the surface. HDPE sheet is to be stapled on the rear side of backrest. Backrest is made of PU foam with density 60kg/m ³ and 28kg/m ³ and 32kg/m ³ . Backrest Lumber foam is of 32kg/m covered with layer's of recron sheet of 200gsm. Backrest neck cushion are in the form of detachable pillows which are connected with the help of Velcro strip of (2 inch). Backrest cushion consist of 50mm thk 32density PU foam and wrapped with layer of 200gsm recron sheet. Upholstery: ABS injection molded legs with (wood stain finish) sublimation process are fitted at the bottom surface of the sofa. Upholstered seat ,backrest and armrest are integral part of each other and are connected to each other with MB baits, nuts & washer./Make - Godrej/ Model no:-Bayflow 3str sofa SLthr Tof Be	Nos.	1	78834.50	78834.50
G10	Centre table (VIP LOUNGE):- Providing, supplying and placing of Coffee Table with Overall Size : Width : 120cm Depth : 60cm Height : 36.7cm Materials : All carcass panel are made of 18 mm pre-laminated particle board with edge banding 1.5 mm thickness. Drawer bottom is made of .9 mm thick pre-laminated particle board .Drawer front is made of 18 mm thick PU painted MDF. Legs: Rubber wood . Hardware: Hettich . Construction: Knock down .Finish: All 18 mm pre-laminated particle board panels are Noce Versaillies with walnut edge band. PU lamination is high gloss in Ecr shade .Packets: 1 nos . Materials : All carcass panel are made of 18 mm pre-laminated particle board with edge banding 1.5 mm thickness. Hardware : Hettich . Construction: Knock down .Finish : • All 18 mm pre-laminated particle board panels are Noce Versaillies with walnut edge band . PU lamination is high gloss in Ecr shade./Make - Godrej/ Model no:-Meraki coffee table Brow/Beige/eqv	Nos.	1	24363.30	24363.30

G11	Side table (VIP LOUNGE):- Providing, supplying and placing of Corner Table with Overall Size : Width : 60cm Depth : 60cm Height : 49.8cm Materials : All carcass panel are made of 18 mm pre-laminated particle board with edge banding 1.5 mm thickness. Drawer bottom is made of .9 mm thick pre-laminated particle board .Drawer front is made of 18 mm thick PU painted MDF. Legs: Rubber wood. Hardware: Hettich . Construction: Knock down .Finish: All 18 mm pre-laminated particle board panels are Noce Versailles with walnut edge band. PU lamination is high gloss in Ecu shade .Packets: 1 no's. Materials: All carcass panel are made of 18 mm pre-laminated particle board with edge banding 1.5 mm thickness. Hardware: Hettich . Construction: Knock down .Finish: • All 18 mm pre-laminated particle board panels are Noce Versailles with walnut edge band. PU lamination is high gloss in Ecu shade./Make - Godrej/Model no:-Merakicornertable Brown	Nos.	2	7751.90	15503.80
G12	TV Display Podium:- Supply, installation, and alignment of a 55" LED/LCD TV display, made up of 18 mm thick HDMR BOARD of High-quality HDMR OF (Green/Century) mounted at a fixed angle such that the top edge is at 700mm and the bottom edge at 450mm above finished floor level. The TV shall be securely fixed using a custom or adjustable tilt-mount bracket and aligned as per architectural and AV coordination drawings. Specifications: Display Size: 55-inch Mounting: Tilted wall-mount or frame-supported bracket system Tilt Angle: As per site conditions to maintain top at 700mm and bottom at 450mm from FFL Bracket: Heavy-duty steel/aluminum mount, black powder-				
	coated, designed to support weight and maintain desired tilt Cable Management: Concealed cabling through wall or floor conduit for HDMI, power, and data finish :-All visible components to be painted or finished to match interior aesthetics with PU paint . Power/Data Requirements: 230V power supply point and network point provided near mounting area (AS/ specified) all as per given reference drawing No NSC-A05-05. (Only top finish surface area measured for payment.)	Nos	5.5	53952.00	296736.00

G13	Storage in pantry area;- Provision and installation of storage cabinets and sink unit in the pantry area, including all required materials, labour, and accessories, as per specifications, 18 mm thick High-quality BWR plywood(Green /Century) with 1 mm thick laminate (Green lam./merino) on both inner as well as outer side. Modular cabinets with shelves, drawers, and compartments for storage, ensuring efficient use of space, Smooth edges with durable hardware fittings (handles, hinges, and soft-close mechanisms), Stainless steel sink, single/double bowl, with integrated drain board (size as specified) OF MAKE Anupam/Nirali/ eqv. Granite/Quartz/Marble countertop, polished and water-resistant). (Only top finish surface area measured for payment.)	SQM.	2.4	16140.00	38736.00
G14	Overhead Storage area in pantry:- Provision and installation of overhead storage cabinets in the pantry area, including all required materials, labour, and accessories, as per specifications, 18 mm thick High-quality BWR plywood(Green /Century) with 1 mm thick laminate (Green lam./merino) on both inner as well as outer side. Modular cabinets with shelves, drawers, and compartments for storage, ensuring efficient use of space, Smooth edges with durable hardware fittings (handles, hinges, and soft-close mechanisms), Ozone/Dorma/Hettich/Hafele) (Only top finish surface area measured for payment.)	SQM.	1.7	12912.00	21950.40
G15	GREEN ROOM-DRESSING:- Providing. Fabricating and Installation of Green room dressing for male and female green room area made out of 18mm thick ply board of make green/ Century, finished with 1mm thick laminate of approved colour (Make Greenlam/Merino/Foremica) including fixing of 6 mm thick mirror (Make -Modi/saint-gobine), all fitting, fixture, sliders, handles, knobs, hinges etc. of Ozone/Dorma/Hattich make. Inner surface to be finished with 0.8 mm thick laminate of same make as describe above all complete as per the given reference drawing No NSC-A05-04.				
i)	For Male green room (As per Drawing)	SET	1	32000.00	32000.00
ii)	For Female green room (As per Drawing)	SET	1	25000.00	25000.00

G16	Providing and fixing a vanity unit for the washroom, including a countertop, cabinet, fittings, and accessories, as per approved design and specifications(Given Drawing), the countertop shall be made of 18 mm thick polished granite, quartz stone, or engineered stone, conforming to IS: 1124 or as specified, Edges shall be bevelled or bull-nosed, finished smooth, and polished for aesthetics and safety, Provision for a cut-out to accommodate the washbasin, with edges treated to prevent chipping, The cabinet shall be made of 18 mm thick BWP (Boiling Water Proof) plywood conforming to IS: 710, finished with 1 mm thick laminate of approved colour and texture, Back panel to be made of 12 mm BWP plywood as specified, Cabinet edges to be finished with PVC edge banding or matching laminate for durability, Drawers and shutters shall be fitted with soft-close hinges and channels of approved make (Hettich, Hafele, or equivalent), Handles and knobs to be of stainless steel or brass, with a satin or chrome finish, Provision for a countertop or under mount ceramic/porcelain washbasin conforming to IS: 2556,(Only top finish surface area measured for payment.)	SqM	1.62	27000.00	43740.00
G17	Supply, installation, testing, and commissioning of motorized stage curtain system, including heavy-duty tracks, high-quality motor (Dooya or equivalent) with remote control operation, control panel, limit setting, wiring, and all required fittings and accessories, complete as per site requirements and Engineer-in-Charge directions. Curtain fabric shall be stitched with 100% gathering (double width), having inner blackout lining and back lining, made of linen-cotton blend (minimum 280 GSM, 54-inch width), fire-retardant, wrinkle-resistant, and acoustically absorbent. The curtain shall be of approved colour and texture and capable of smooth, silent operation with seamless closing/opening. The entire system shall be fully functional with RF remote and optional wall switch control. Installation shall be complete in all respects including fixing hardware, wall/floor anchoring supports, pelmet cover if required and testing/commissioning at site. Payment shall be made based on actual area of curtain installed (in sqm).	Sqm	50	24225.00	1211250.00
	TOTAL OF PART G= Rs				9781524.88
H	HVAC WORK				
HA	Air conditioning work of Auditorium				
	AIR DISTRIBUTION (FOR AIRCONDITIONING)				
	GSS DUCTING				

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

HA1	Supply, installation, balancing and commissioning of factory fabricated GSS sheet metal rectangular ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports etc. as per approved drawings and specifications of following sheet thickness complete as required.				
i	0.63 MM (24 gauge) Galvanized Sheet Steel Ducting	Sqm.	100	1080.00	108000.00
ii	0.80 MM (22 gauge) Galvanized Sheet Steel Ducting	Sqm.	150	1263.00	189450.00
iii	1.0 MM (20 gauge) Galvanized Sheet Steel Ducting	Sqm.	50	1381.00	69050.00
iv	1.25 MM (18 gauge) Galvanized Sheet Steel Ducting	Sqm.	50	1836.00	91800.00
HA2	Supply, installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, hangers, supports etc. as per approved drawings and specifications of following sheet thickness complete as required.				
i	0.63 MM (24 gauge) Galvanized Sheet Steel Ducting	Sqm.	20	1058.00	21160.00
ii	0.80 MM (22 gauge) Galvanized Sheet Steel Ducting	Sqm.	20	1229.00	24580.00
iii	1.0 MM (20 gauge) Galvanized Sheet Steel Ducting	Sqm.	50	1629.00	81450.00
iv	1.25 MM (18 gauge) Galvanized Sheet Steel Ducting	Sqm.	20	1793.00	35860.00
HA3	Supply, installation, testing and commissioning of GI volume control duct damper complete with neoprene rubber gaskets, nuts, bolts, screws linkages, flanges etc, as per specifications.	Sqm.	5	7046.00	35230.00
	SUPPLY / RETURN AIR GRILLES				
HA4	Supplying & fixing of powder coated extruded aluminium Supply Air Grills with aluminium volume control dampers as per specifications.	Sqm.	5	9105.00	45525.00
	INSULATION				
HA5	Supplying and fixing of following thickness duly laminated aluminum foil of mat finish closed cell Nitrile rubber (class“O”) insulation on existing duct after applying Suitable adhesive for nitrile rubber. The joints shall sealed with 50 mm wide and 3 mm thick self adhesive nitrile rubber tape insulation complete as per specifications and as required.				
	19 mm thick (In Condition Space)	Sqm.	500	754.00	377000.00
HA6	Supply, Installation, testing and commissioning of FLEXIBLE CANVAS CONNECTION	EACH	4	2836.00	11344.00
HA7	Refnet joints (in pair) for Indoor units	No.	4	9632.10	38528.40
	DUCTABLE TYPE				

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

HA8	Supply ,installation, testing and commissioning of following minimum capacity and external static pressure VRF/VRV ceiling mounted duct-able type Indoor unit equipped with washable synthetic media pre-filter, fan section with low noise fan /dynamically balanced blower ,multi speed motor, coil section with DX copper coil, electronic expansion valve ,corded remote control, outer cabinet, vibration isolators, drain pan ,other necessary supports etc., suitable for operation on single phase AC supply 230V±10%,50Hz complete as required. The unit shall have automatic force shutdown provision in case of fire on receiving signal from BMS System. The cooling capacity of indoor unit will be at air inlet conditions of 27 Degree C DB and 19 Degree C WB temperature.				
	1.4 Tr Ceiling mounted	No.	4	34650.00	138600.00
HA9	Dismantling & Reinstallation of existing 1.5 TR VRV/VRF Hi wall unit and reconditioning of entire VRV/VRF Air conditioning system including requirement of copper piping with insulation , wiring, drain pipe, vaccumizing & gas charging up-to good cooling effect tec.	Nos	4	25000.00	100000.00
HA10	Dismantling of existing G.I ducts in the conference room and inside the Auditorium including taking away of the dismantled materials both serviceable as well as unserviceable and rebate for solvage value of G.I duct of 22 and 24 gauge.	Lumps um	1	-30000.00	-30000.00
	Total HA				1337577.4 0
HC	VRV/VRF Air conditioning work of Conference Room				

HC1	Supplying, Installation, Testing and Commissioning of modular type Variable Refrigerant Flow/ Variable Refrigerant Volume Air cooled outdoor unit suitable for cooling and heating by using 100% inverter driven capacity control having all highly efficient Hermetically Sealed inverter type Scroll compressor(s) minimum two compressors for above 14 HP modules microprocessor based controller, top discharge the condensing units all vibration isolation pad etc. including fully charging of R410 A refrigerant, all Inverter compressors special acrylic coated heat exchanger, Y-branch as required, out door unit support, auto check function for connection error, auto address setting Refrigerant temperature control and capacity as mentioned below. The unit shall deliver the rated capacity at AHRI conditions and work even at 50°C ambient temperature with out tripping ,cooling /heating operation, The out door units must have variable Evaporating temperature function to automatically modulate the refrigerant temperature from 6 Deg C to 11 Deg for energy efficiency . The unit price shall be inclusive of full charge of Refrigerant gas & oil , weather-proof MCCB with ELCB for each out door unit and refrigerant piping housed in compact housing duly powder coated complete as required for trouble free operation, as per specification. Internal wiring having interconnected control wiring, sub cooling circuit, low noise condenser fan,This shall include the with lifting, shifting and positining along with proper RCC foundation .Providing fabrication and balancing of MS channel base frame for outdoor unit. The COP at AHRI conditions shall not be less than 3.1and IEER not less than 6.5 including loading, unloading , shifting and foundation with M.S Channel base frame. cement concrete, rubber pads as per manufacturer standard and suitable for operation with 415+- 10% ,50 Hz 3 phase power supply etc as required.				
	(Note: 1. The quoted rate should include the complete cost of installation for the outdoor unit at the terrace, regardless of the height. This includes making all necessary arrangements for lifting and placing the unit, as well as any civil foundation works required. The agency is advised to inspect the site before submitting a quote, in order to familiarize themselves with the site conditions and the specific area where the outdoor units will be installed.)				
	(Note:- Bidder has to provide OEM'S authorization letter pertaining to this work at the time of bid submission)				
(i)	Outdoor Unit 26 HP(14HP+12HP) Note;- Above out door unit can be used in individually as per site requirement	Nos	1	609649.50	609649.50

HC2	Supplying, Installation, Testing & commissioning of 3.0 Tr capacity 4 way flow VRV/VRF Cassette type indoor ceiling mounted unit equipped with synthetic washable media pre-filter, fan section with low noise fan / dynamically balanced be lower ,multispeed motor, coil section with DXCopper coil electronic expensing valve, outer cabinet drain pump, griil, necessary supports, vibration isolation, cord less remote control etc. suitable for operation on single phase 230v+- 10% 50 HZ AC supply complete as required. The unit shall have automatic force shut down provision in case of fire alarm so that the unit automatically stop in case of fire. The Cassette type indoor units are to be installed on a ceiling where grid false ceiling is already in place. The bidder has to include the cost of necessary work involved in the existing false ceiling like removal of ceiling tiles and other members and re-fixing of the same after AC installation and piping work and making good the damage etc. all complete as may be necessary for this the agency is advised to inspect the site before submitting a quote, in order to familiarize themselves with the site conditions. The cooling capacity of indoor unit will be at air inlet conditions of 27 degree C DB and19 degree C WB temperature.	Nos	7	48800.25	341601.75
HC3	Refnut joints (in pair) for Indoor units	Nos	5	4964.90	24824.50
HC4	Supply and installation of copper Refrigerant piping for VRV/VRF system complete with fittings, supports, jointing, insulation with class O-Nitrile rubber ,gas charging & commissioning as per specifications ,all accessories as per specifications and any other item required to make the system complete, all external piping with UV coating and glass cloth faced protection at expose side with as per specification etc complete as required Nominal dia in mm OD as indicated below.(Payment will be made as per actual execution). The bidder has to include the cost of necessary work involved in the existing false ceiling for laying of piping like removal of ceiling tiles and other members and re-fixing of the same after piping work and making good the damage etc. All complete as may be necessary for this the agency is advised to inspect the site before submitting a quote, in order to familiarize themselves with the site conditions.				
i	41.3mm (with 19mm thick insulation).	RMT	10	3161.41	31614.10
ii	34.9 mm (with 19mm thick insulation).	RMT	10	2478.20	24782.00
iii	28.6 mm (with 19 mm thick insulation).	RMT	10	1711.55	17115.50
iv	25.4mm (with 19 mm thick insulation).	RMT	40	1301.34	52053.60
v	22.2mm with 19 (mm thick insulation).	RMT	20	1265.98	25319.60
vi	19.1mm (with 13 mm thick insulation).	RMT	20	1145.75	22915.00

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

vii	15.88 mm with 13 mm thick Nitrile rubber insulation.	RMT	60	905.07	54304.20
viii	12.7 mm with 13 mm thick Nitrile rubber insulation.	RMT	60	551.66	33099.60
ix	9.52mm with 13 mm thick Nitrile rubber insulation.	RMT	60	471.03	28261.80
x	6.4mm with 13 mm thick Nitrile rubber insulation.	RMT	10	381.92	3819.20
HC5	Providing and fixing of UPC drain water pipe with fittings support, jointing and any other item required to make the system complete with 6mm closed cell nitrile rubber foam insulation with proper saddling .Nominal diameters of of pipee in mm as indicated below. (Payment will be made as per actual execution)				
i	32 mm dia(with 6 mm class O Nitrile Rubber)	RMT	50	282.90	14145.00
ii	40 mm dia(with 9 mm class O Nitrile Rubber)	RMT	20	353.63	7072.60
HC6	Providing and fixing control cum Transmission cabling of2 corex1.5 sq mm copper in suitable PVC conduits between indoor units and out door unit properly metal saddled wall/ cable tray etc.(Payment will be made as per actual execution)	RMT	200	247.54	49508.00
HC7	Supply & installation of following sizes perforated painted with powder coated M.S cable tray with perforation not more than 17.5 % in convenient sections joined with connectors, suspended from the ceiling with M.S suspenders including bolts & nuts painting suspenders etc as required.				
i	150mmx50mm depth x1.6 thickness	RMT	60	1032.59	61955.40
	Cables				
HC8	Supply ,laying ,testing and commissioning of 1.1 KV grade PVC insulated Aluminium conductor, XLPE armoured cable 3.5 core 50 sqmm sizes installed and laying in cable tray or clamped with 1.0 mm thick GI saddle or in masonry trench as may be required at site from main Electrical Penal To HVAC Penal .(Payment will be made as per actual execution)	RMT	40	664.82	26592.80
HC9	Supply ,laying ,testing and commissioning of 1.1 KV grade PVC insulated Aluminium conductor, XLPE armoured cable 3.5 core 35 sqmm sizes installed and laying in cable tray or clamped with 1.0 mm thick GI saddle or in masonry trench as may be required at site from HVAC Panel to Outdoor units .(Payment will be made as per actual execution)	RMT	60	483.76	29025.60
HC10	Supply ,laying ,testing and commissioning of 1.1 KV grade PVC insulated Aluminium conductor, XLPE armoured cable 3.5 core 25 sqmm sizes installed and laying in cable tray or clamped with 1.0 mm thick GI saddle or in masonry trench as may be required at site from HVAC Panel to DB .(Payment will be made as per actual execution)	RMT	40	367.77	14710.80

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

HC11	supply and laying of 2.5 sq. mm x3 core copper cable from indoor unit to D.B for all the units with the necessary fittings ,thimble with PVC conduit.(Payment will be made as per actual execution)	RMT	100	172.57	17257.00
	Electrical Work				
	HVAC outdoor unit Panel				
HC12	Fabrication 'Supply, installation ,testing & commissioning of outdoor type feeder pillar compartmentalized double door , front and back openable cover with locking arrangement ,dust and vermin proof with slanting roof on the Top made out of 2.0mm thick CRCA sheet and size not less 2.4 sq.mtr and 300mm depth with 300 amp copper bus bar fixed on suitable size pedestal made from M.S Angle iron base d-frame of size 50mmx50mmx5mm and grouting in the RCC &proper gland plate at the bottom complete with painting ,supplying and fixing the following accessories;-				
	1. INCOMER				
	a) 100A (36KA) DH type 4 Pole MCCB. 1 No				
	b) 4 Strip 300 Amp TPN copper bus bar size 50x6mm with coloured sleeves -1 Set				
	c) Neutral link -1 No.				
	d) LED -3 Nos (R,Y,B)				
	e) Digital Ammeter -1 No. with inbuilt selector switch				
	f) Digital Voltmeter (0-500V) -1 No. with inbuilt selectror switch				
	g) Watt meter				
	h) CT 500/5 -1 Set				
	2.OUTGOING				
	32 Amp, 10 KA TP MCCB- 3 Nos for out door units and 1 No. for spare.				
	25 Amp TP MCCB-2 , 1 No for indoor units DB and 1 No spare				
	neutral link -6 Nos				
	Instruments:- 1 No Multi fuction meter with (volt,Amp,Kwa,kw)				
	1 sets of phase indicating lights (RBY) with protection fuses (one set for each incoming breaker).				
	1sets auto trip indicating lamp, Reserve Phase Preventer.				
	Note -Short Circuit capacity should not less than 35k Amp				
	Complete as above.	Nos.	1	63652.50	63652.50

HC13	Supplying and fixing following way prewired vertical mounted TP&N MCB distribution board of steel sheet for 415 volts on surface/ recess complete with loose wire box, terminal connectors for all incoming and outgoing circuits, duly prewired with suitable size FR PVC insulated copper conductor up to terminal blocks, tinned copper bus bar, neutral link, earth bar, din bar, detachable gland plate, interconnections, powder painted including earthing etc. as required.				
	i) Incoming one 25A FP MCB 25 KA C type				
	ii) Outgoing 8 nos. 6A SP MCB C type.				
	Complete DB as above.	No	1	5658.00	5658.00
	End Termination				
HC14	Supplying and making cable end terminations with brass compression gland and Aluminium lugs for 150 sq mmx 3.5 core pvc insulated sheathed XLPE Aluminium conductor cable of 1.1 KV complete as required.	Each	2	674.72	1349.44
HC15	Supplying and making cable end terminations with brass compression gland and aluminium lugs for 50 mmx 3.5 core pvc insulated sheathed XLPE aluminium conductor cable of 1.1 kv complete as required.	Each	2	466.79	933.58
HC16	Supplying and making cable end terminations with brass compression gland and aluminium lugs for 35 mmx 3.5 core pvc insulated sheathed XLPE aluminium conductor cable of 1.1 kv complete as required.	Each	4	379.09	1516.36
HC17	Supplying and making cable end terminations with brass compression gland and aluminium lugs for 25 mmx 3.5 core pvc insulated sheathed XLPE aluminium conductor cable of 1.1 kv complete as required.	Each	2	318.26	636.52
HC18	Supplying and making cable end terminations with PVC compression gland and pin type copper lugs for 2.5 mmx3 core pvc insulated sheathed copper conductor cable of 1.1 kv complete as required.	Each	14	91.94	1287.16
HC19	Earthing with GI plate 600mmx600mmx6mm thick including accessories and providing masonry enclosure with cover plate locking arrangement and watering pipe of 2.7 meter long including 2.7 meter GI strip of 25mmx5mm thick having with charcoal/coke and salt as required.	Each	2	15205.88	30411.76
HC20	Providing and fixing 25 mm × 5.00 mm thick GI strip on surface or in recess for connections, etc., as required.	RMT	150	144.28	21642.00
HC21	Supply and laying of 6 SWG dia GI wire on surface or in recess for loop earthing along with recessed conduit /submain wiring /cable e required	RMT	60	50.92	3055.20

HC22	Dismantling the existing Hi wall mega split and Tower type split Air conditioning units capacity 3.0 Tr including copper pipe, drain pipe and power control wire from indoor unit to outdoor unit and power control box to outdoor unit. etc.	Nos	7	1000.00	7000.00
	TOTAL HC				1626770.07
	TOTAL OF PART H HVAC WORK (HA+HC)				2964347.47
I	TECHNOLOGY				
IA	Auditorium				
	AUDIO SYSTEM				
IA1	FOH- Left & Right:- Supply, Installation, Testing & Commissioning of Two-way, Bi-amp point source loudspeaker with bass reflex enclosure. LF Transducer - 12 inch with 3 inch voice coil, neodymium or better, HF Transducer - Compression driver, 1.4-inch exit, 3-inch voice coil or better, The loudspeaker should include reconfigurable and rotatable half-horn assemblies for better control over sound coverage, Coverage - Symmetrical: 120° x 50°, 90° x 50° or better, Asymmetrical: 105° x 50° or better, Crossover HF-LF - 1 kHz (bi-amp) or better, Sensitivity - LF: 97 dB, HF - 108dB or better, Max Peak SPL (Bi-amp) - 133 dB, Power Continuous : LF - 450W, HF - 70W or better, Impedance LF & HF - 8Ω & 16Ω or more, Enclosure - Exterior plywood, Connectors - 2x speakON NL4 and 1x Euroblock. Rigging points for Yoke and Flushmount installations, Weatherization - IP54 or better. Should include OEM supplied mounting bracket as per site. Approved Make: QSC/ Martin Audio/ L-Acoustics/ Bose	Each	2	364346.00	728692.00
IA2	Fills Speakers:- Supply, Installation, Testing & Commissioning of Two-way Loudspeaker. LF Transducer - 8-inch with 2-inchvoice coil, neodymium, HF Transducer - Compression driver, 1.75-inch voice coil, Configurable Coverage - 120° x 50°, 90° x 50° or better, Sensitivity - 99dB, Max Continuous SPL - 118dB, Enclosure Material - Exterior plywood, IP-54 rated. With OEM supplied mounting bracket. Approved Make: QSC/ Martin Audio/ L-Acoustics/ Bose	Each	2	228128.00	456256.00
IA3	Subwoofer:- Supply, Installation, Testing & Commissioning of Passive subwoofer in bass-reflex enclosure. Transducers - 18-inch with 4-inch voice coil or better. Continuous Power - 77 Vrms, 700W or better, Frequency Range - 32-101Hz or better, Senitivity - 97dB or better, Max continuous SPL - 138dB or better, Impedance - 8Ω or more, Coverage Modes - Omni-directional or cardioid radiation modes. Enclosure material - Exterior plywood, Weatherization -IP54, External plywood Stainless screws Treated grille vs. UV and corrosion Hydrophobic stainless steel mesh behind grille Polyurea Paint Input cup (IP65) sealing with gland. Connectors - Connector				

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

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	2xSpeakon NL4 with IP65 sealing plate. Approved Make: QSC/ Martin Audio/ L-Acoustics / Bose	Each	2	312238.00	624476.00
IA4	Stage Monitor :-Supply, Installation, Testing and Commissioning of 2-Way Full Range Active Speaker. Frequency Range (-10 dB) 47 - 20 kHz, Maximum Peak SPL at 1m 126 dB SPL, 1000 Watts Peak Power Class D Amplifier (800 Watts LF, 200 Watts HF), 75 Degree Axisymmetric Coverage. 12" LF Driver, 1.4" Compression Driver. Controls - Power, 2 x Gain, Mic Boost Push Switch, 6-Way Contour Selection Switch, Power LED, 2 x Input Signal LED, Limiter Active LED Indicators, 2 x locking XLR/F ¼" combo (Line Input and Mic/Line Input), 1 x XLR/M (Mix Output), 1 x IEC Power Connectors, Polypropylene Enclosure, Powder Coated Steel Grille. Approved Make: QSC/ Martin Audio/ L-Acoustics	Each	2	71851.00	143702.00
IA5	Green Room & Control Speakers :-Supply, Installation, Testing & Commissioning of 6.5-inch, 2 way, wall-mount loudspeaker. LF Transducer - 6.5-inch woofer with 1-inch voice coil or better, HF Transducer-1-inch tweeter and 1-inch voice coil or better. Rated impedance- 8Ω, Transformer Taps- 70V/100V:30/15/7.5 Watts, Frequency Range-60Hz – 20kHz or better, Rated RMS power-30 watts or better, Sensitivity-86 dB SPL or better, Coverage- 130° conical (500 Hz to 5 kHz) or better, Maximum continuous SPL-101 dB or better, Maximum peak SPL- 107 dB or better, Grille - Powder coated steel or similar, Enclosure - UV treated, high impact ABS polymer or similar, Mounting Brackets Included. Approved Make: QSC/ Martin Audio/ L-Acoustics/ Bose	Each	4	22708.00	90832.00

IA6	Amplifier for FOH (LF) & Sub:- Supply, Installation, Testing & Commissioning of Quad Channel Class-D Network Amplifier. Total Power - 8000W or better, which can be asymmetrically distributed across amplifier channels. Should support 16 Ω ,8 Ω ,4 Ω ,70V,100V on each channel individually. Amplifier shall support Power sharing and Bridge and Parallel modes for combining multiple channels. Frequency Response (8 Ω)-20 Hz - 20 kHz or better, Noise Weighted output muted->104 dB or better, Input impedance->8k balanced and >4k unbalanced or better, Front Panel Display for Indication and Control with Knobs and buttons or better. 4 or More Routable Mic/Line Inputs or better. Ethernet Ports - 2 Gigabit ethernet ports for network redundancy or better. Approved Make: QSC/ Martin Audio/ Powersoft	Each	1	647996.00	647996.00
IA7	Amplifier FOH(HF) & Fills :- Supply, Installation, Testing & Commissioning of Quad Channel Class-D Network Amplifier. Total Power - 2000W or better, which can be asymmetrically distributed across amplifier channels. Should support 16 Ω ,8 Ω ,4 Ω ,70V,100V on each channel individually. Amplifier shall support Power sharing and Bridge and				
	Parallel modes for combining multiple channels. Frequency Response (8 Ω)-20 Hz - 20 kHz or better, Noise Weighted output muted->104 dB or better, Input impedance->8k balanced and >4k unbalanced or better, Front Panel Display for Indication and Control with Knobs and buttons or better. 4 or More Routable Mic/Line Inputs or better. Ethernet Ports - 2 Gigabit ethernet ports for network redundancy or better. Approved Make: QSC/ Martin Audio/ Powersoft	Each	1	425780.00	425780.00
IA8	Amplifier Control Room Speakers:- Supply, Installation, Testing & Commissioning of Dual Channel Class-D amplifier. Per Channel Power 60W @8 Ω /4 Ω or better. Support for 70V/100V or more. Power Sharing or Bridge/Parallel modes for better power distribution. Frequency Response- 20 Hz – 20 kH or better. Signal to Noise ratio -> 103 dB or better, Input impedance - >10k, balanced or unbalanced or better, Front and Rear panel indicators for Power, signal (per channel), limit / mute / protect etc. or better. Better to have Remote standby and Power saving features - Auto-standby. Approved Make: QSC/ Martin Audio/ Powersoft	Each	1	91238.00	91238.00

IA9	Digital Mixer:- Supply, Installation, Testing & Commissioning of 32 Channel Touch Screen Digital Mixer or better. 7-inch Color TFT Screen or larger, Input ports - 24 Mic/Line Inputs, 6 Line Inputs, Stereo USB/MP3 Playback or more, Input Processing - 4 Band Parametric EQ, Gate & Compressor etc. Output Ports - Balanced Main LR Output on 2 x XLR (Line Level), 14 x Balanced Aux Outputs on XLR (Line Level), Stereo TRS Headphone Output, Stereo TRS Monitor L/R Output or better, Output Processing - 1/3 Octave Graphic EQ, 6 Band Parametric EQ, Variable High & Low Pass filters, 12-Band Anti-Feedback Filters, Limiter, Delay Output Processing etc., Stereo mp3 & 32 x 32 Multitrack Recording & Playback direct to hard drive & DAW or better, 8 DCA & Mute Groups or better, External Control using WiFi enabled iOS or Android devices, Selectable 44.1 kHz to 48 kHz Sampling Frequency. 48V Phantom Power Individually Switchable on all Mic Inputs. Approved Make: QSC/ Digico/ Allen Heath	Each	1	28160.00	28160.00
IA10	Digital Signal Processor :- Supply, Installation, Testing & Commissioning of Open Architecture Digital Signal Processor with 4 Mic/Line Input with Phantom Power and 4 Line Outputs. GPIO Ports - 8x8 or better. AEC channels - 8 or more with 200ms tail length for the analog & network audio. Minimum 8x8 Dante channels and support for up to 64x64 Network audio channels via Dante /AES67 or similar protocol. SIP Softphone integration for Audio conferencing. USB-B & C port supporting AV USB Bridging for software or web-based conferencing applications emulating USB Audio (Speakerphone) and driver. 24 bit-A/D-D/A converters or better, 48 kHz Sample rate or better, Input frequency response of 20 Hz to 20 kHz or better, Input dynamic range > 108 dB or better. RS232 Ports -1 or more. The processor should support Network amplifiers without any additional cards or accessories. Approved Make: QSC/ Biamp/ Symetrix	Each	1	404016.00	404016.00

IA11	Wireless Handheld Microphone Set:- Supply of Dual Wireless handheld microphone set with dual channel digital receiver, should support automatic frequency setup function for more than 250 channels. Frequency response: 20Hz - 20KHz, System latency: 1.9 ms, Dynamic range: 130 dB, AES 256 encryption, 88 MHz switching bandwidth, Ethernet ports (RJ-45) for remote network-based monitoring, headphone output along with OLED display to showing the current frequency, channel number, metering of RF level, metering of AF level, lock status, muting function, antenna switching diversity, app connection, gain, audio output level, menu, and battery status for each of the transmitters. It should have 2 no. dynamic handheld transmitters with Cardioid pickup pattern along with rechargeable batteries along of 12 hours of battery backup. Approved Make: Sennheiser/ Shure/ DPA	Each	2	197428.00	394856.00
IA12	Wireless Lapel Microphone Set:- Supply of Dual Wireless Lapel microphone set with dual channel digital receiver, should support automatic frequency setup function for more than 250 channels. Frequency response: 20Hz - 20KHz, System latency: 1.9 ms, Dynamic range: 130 dB, AES 256 encryption, 88 MHz switching bandwidth, Ethernet ports (RJ-45) for remote network-based monitoring, headphone output along with OLED display to showing the current frequency, channel number, metering of RF level, metering of AF level, lock status, muting function, antenna switching diversity, app connection, gain, audio output level, menu, and battery status for each of the transmitters. It should have 2 Bodypack transmitter, 2 nos. omni-directional clip-on lavalier microphone with Sensitivity: 5 mV/Pa, Max. SPL at 1 kHz: 142 dB, Frequency response: 20 to 20,000 Hz, Connector: 3.5 mm jack along with rechargeable batteries along of 12 hours of battery backup. Approved Make: Sennheiser/ Shure/ DPA	Each	1	245710.00	245710.00
IA13	Gooseneck Microphone:- SITC of pre-polarized condenser gooseneck microphone with an overall length of minimum 450 mm and with XLR3M-type connector at its base, which shall offer radio frequency interference (RFI) shielding against intermodulation from wireless equipment or devices, cardioid microphone capsule with uniform 120° angle of acceptance (-3dB) or better, frequency response of 50 Hz to 17,000 Hz or better and sound input levels handling capability of minimum 123 dBspl, nominal equivalent noise level of 29 DbA or better and output shall be low impedance balanced (<180 ohms) with current consumption shall be 3 mA or less ,SITC of table stand for connecting and operating XLR gooseneck microphones shall be rugged and unobtrusive with XLR-3F microphone input and an XLR-3M microphone output operating on 48 V phantom power or better . Approved Make: Sennheiser/ Shure/ DPA	Each	2	138252.00	276504.00

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IA14	Charging Kit:- Supply of Network enabled 2 bay charger for handheld and Bodypack transmitter, it can be cascaded upto 5 chargers with the help of external power supply unit, 3 hrs charging team, RJ-45, IEEE 802.3 network socket, It shall support the Media Control Protocol to provide for remote control and status monitoring via the centralized management software. Approved Make: Sennheiser/ Shure/ DPA	Each	3	41818.00	125454.00
IA15	Antenna Splitter:- Supply of Active Antenna Splitter with 2 x 1:4 or 1 x 1:8 active connections, which work on 56 MHz Bandwidth and allow for up to 90 channels, Supports Mobile App streamlines setup and operation and eliminates complicated menus, Frequency range: 470 – 694 MHz, along with Automated setup creates reliable connections with minimal time and effort. Approved Make: Sennheiser/ Shure/ DPA	Each	1	62575.00	62575.00
IA16	Antenna Booster:- Supply of Antenna booster which work on 56 MHz Bandwidth and allow for up to 90 channels, Supports Mobile App streamlines setup and operation and eliminates complicated menus, Frequency range: 470 – 694 MHz, along with Automated setup creates reliable connections with minimal time and effort. Approved Make: Sennheiser/ Shure/ DPA	Each	2	24218.00	48436.00
IA17	Antenna:- Supply of Passive directional antenna, Built-in $\frac{5}{8}$ " and $\frac{3}{8}$ " threads allow for easy mic stand mounting, Frequency range 470 – 1075 MHz, Apex angle (-3 dB) approx. 100°, Front-to-back ratio > 14 dB, Gain typ. 5 dBi and Impedance 50 Ω . Approved Make: Sennheiser/ Shure/ DPA	Each	2	36749.00	73498.00
IA18	Wired Vocal/Instrumental Mic:- Supply of Dynamic super Cardioid Vocal Mic with Nominal Impedance of 350 Ohms and Min terminating impedance of 1000 Ohms with Extended high frequency response and supercardioid pick-up pattern for higher signal output, cuts through high on-stage sound levels. Smooth warm tonal response and full dynamic range, with presence lift for vocal clarity and projection. Consistent on/off axis and proximity response maintain sound quality while moving, providing greater on-stage freedom. Full metal construction and extensive suspension and shock-mounting minimize handling noise and signal interference. High output performance microphone, offering power, clarity and projection . Approved Make: Sennheiser/ Shure/ DPA	Each	4	32948.00	131792.00
IA19	Drum Kit:- Supply and installation of drum kit with 7 microphone set Approved Make: Sennheiser/ Shure/ DPA	Each	1	101376.00	101376.00
	VIDEO SYSTEM	Each			

IA20	Active LED :- SITC of Video wall with display of Approx. size 17.0 x 8.5 ft. or higher with Pixel Pitch 1.58 mm or less. It should have Pixel Configuration 1R1G1B and LED Technology COB(Chip On Board). It should have Pixel Density 409000 pixels/m2 or better and Brightness Typ 800 cd/m2 or better. The wall should have Dimming Capability 0-255 Levels or higher and Contrast Ratio 18000:1 or better. It should have Refresh Rate of 3840 Hz or better and Color Processing 18-bit or better. The wall should have support for 18 Quadrillion colors or better and it should have viewing angle H: 170° or better , V: 170° or better. The wall should have provision for making it compatible for running 3 D content whenever required by using active 3D vision glasses (necessary software/ hardware must be included and tested for this operation) . The wall should have lifetime of 100,000 hrs or better and should be Front service access. The wall should be IP30/IP50 grade. LED Tile/ Cabinet Calibration LED tiles/cabinets should be calibrated before being supplied. These screens should also be calibrated after the installation to ensure brightness uniformity. Calibration should also be performed as and when it is required during the warranty period. Offered product which does not support dot calibration shall be rejected. The OEM being proposed should have a brightness measurement tool for measurement of Emitted brightness measurement tool namely a luminance meter (which can provide direct brightness reading in cd/m²) for brightness measurement of offered LED screen. OEM of LED Display should provide details (Model No. & Date of Purchase) of the luminance meter available with them in India along with its latest calibration certificate. The same instrument shall be used to check the minimum brightness levels as offered in the bid. Please note- Illuminance meters are not acceptable as they are not for measuring emitted light. Approved Make: Delta/ NEC/ Barco/ LG / Sony/ Panasonic	Sqfr	140	68799.00	9631860.00
IA21	Confidence monitor (for stage front, side walls & control room):- Supply, Installation, Testing & Commissioning of 55" Display, Resolution 3,840 x 2,160 (16:9),Brightness 500 Nits, Orientation Landscape/Portrait, Contrast ratio 4000:1,Active Display Area 1,209.6 (H) x 680.4 (V),Certifications Class B,Energy Star 8.0 EPEAT Approved Make: Samsung/ NEC/ Barco/ LG	Each	4	67161.00	268644.00
IA22	Floor Moveable Trolley :-Supply, Installation, Testing & Commissioning of Display Trolley mount	Each	1	22683.00	22683.00

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IA23	Camera:- Supply, Installation, Testing & Commissioning of AI based Full 4K @ 60fps Presenter PTZ Tracking Camera with Dual Camera- one PTZ Camera for Presenter Tracking and second fixed lens Panoramic Camera. PTZ Presenter Camera should support min 30X Zoom and 8x Digital Zoom with Panning range of +170 deg to - 170 deg and Tilt Range of -30 to +90 Degrees, Field of View for PTZ Camera should be min 58 Degree and for Panoramic Camera min. 85 Degree, camera should support simultaneous outputs through HDMI, 3G-SDI, USB 3.0 and IP with 1x Audio In and can be controlled via RS232 and IP. Should support multiple video streams with PIP. Tracking Camera should support Everywhere Tracking, Partition Tracking, Auto Framing & Gesture Control. Should support PoE+ and Virtual USB Driver. Quoted model should be BIS, CE, FCC , Clickshare & RoHS Certified with Test Lab Reports. Approved Make: Lumens/ Sony/ Vaadio	Each	4	350646.00	1402584.00
IA24	Recording Streaming Device:- SITC of Recording, Streaming & Webcasting Hardware simultaneously, Built-in 4x HDMI & IP Inputs with 4x Line Inputs, 2x HDMI Outputs. The system should be capable to record upto any four inputs simultaneously in a single frame and as well as individual sources simultaneously. Should have minimum 1TB inbuilt storage and can be connected to local NAS storage. The system should be able to support minimum 3 unicast streams. The recorded files should have the option of time and date stamp. The device can be controlled and managed through centralised software on network .Quoted model should be CE, FCC & RoHS Certified with Test Lab Reports. Approved Make: Lumens/ Sony/ Vaadio	Each	1	455715.00	455715.00
IA25	Joy Stick:- SITC of IP+RS 232/VISCA based Joystick Controller SITC of Joystick with 3" LCD for Preview Monitoring, PAN/Tilt/Zoom Control, Communication via IP & RS232C/RS455 Interfaces, Auto Backlit Keys, Should be able to control minimum 200 Cameras on IP & 10 Cameras through RS232/422, Should support VISCA, VISCA Over IP protocols & PoE. Quoted model should be BIS, CE, FCC & RoHS Certified with Test Lab Reports. Approved Make: Lumens/ Sony/ Vaadio	Each	1	197453.00	197453.00
	VIDEO,SWITCHING & INTERFACE SYSTEM				

IA26	AvoverIP HDMI Encoder:- Supply, Installation, Testing & Commissioning of Network Video Endpoint configured as Encoder. Minimum Inputs – 1 x HDMI Input and 1 x USB-C for single cable connectivity for Video encoding, AV USB Bridging - emulating webcam video and AEC speakerphone audio driver for Software based Video Conferencing and for charging the connected device. Local - Output – 1x HDMI with Scaling , HDMI audio embedding and deembedding, Network Audio supported via Dante/AES67 or similar protocol, Video Resolution – 4K60 4:4:4 or better. Power – PoE and AUX, Control Port – RS232 or better, Mounting hardware included. Approved Make: QSC/ Extron/ Crestron	Each	4	249986.00	999944.00
IA27	AvoverIP HDMI Decoder:- Supply, Installation, Testing & Commissioning of Network Video Endpoint configuraed as Decoder. Outputs -1xHDMI with scaling or better. Local Inputs – 1xHDMI and 1xUSB-C for local switching. Audio embedding and deembedding, Network Audio supported via Dante/AES67 or similar protocol. Video Resolution – 4K60 4:4:4 or better. Power – PoE and AUX, Control Port – RS232 or better, Mounting hardware included. Approved Make: QSC/ Extron/ Crestron	Each	7	249986.00	1749902.00
IA28	Decoder:- AVoIP Decoder-IP to USB 3.0 & HDMI Output SITC of AVoIP Decoder supporting 4K @60fps with simultaneous outputs through HDMI 2.0, USB Type C & USB Type A with Line Out & 3.5 mm, 1x Line In & 3.5 mm. The decoder should be capable to convert IP to USB 3.0. The decoder should support Video Decoding Formats of H.264/HEVC with in-built AES128 encryption and NDI HX3 / NDI HX2 / RTSP, PoE+ Approved Make: QSC/ Lumens/ Crestron	Each	1	93456.00	93456.00
IA29	Floor Box:- Supply, Installation, Testing & Commissioning of Floor BOX with Power/LAN/XLR Connectivity	Each	4	29272.00	117088.00
IA30	Floor Box:- Floor Box : 4 x XLR Point Input Stage / Floor Box Make:Ahuja/VAV/Custom	Each	5	13928.00	69640.00
IA31	Floor Box:- Floor Box : 2 x XLR Point Input Stage / Floor Box Make:Ahuja/VAV/Custom	Each	2	10925.00	21850.00
	CONTROL SYSTEM	Each			
IA32	Control System:- Supply, Installation, Testing & Commissioning of Hardware or Software based control system with required ports to control the devices mentioned in BOQ with perpetual licenses to connect Wall/Table mount touch screen controllers and iOS and Windows devices as wireless touch controller. Approved Make: QSC/ Extron/ Crestron	Each	1	154374.00	154374.00

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IA33	Touch Controller:- Supply, Installation, Testing & Commissioning of 10.5 Inch Ipad with Docking Station Approve Make: Apple	Each	1	98297.00	98297.00
IA34	Network Switch:- 24 port POE Giga Switch with 2 port SFP:- 12 X 10/100/1000 Mbps Base-T auto-sensing PoE ports; 2 X 1000 Base-x SFP uplink ports; Bandwidth: 20 Gbps full duplex, Buffer memory: 512 KB embedded memory per unit, Address database size: 4k media access control (MAC), PoE (46 Watts of power budget), Power consumption: 59.3W maximum, 48V, 1.25A external power adapter, Protected ports complete Approved Make: QSC/ Netgear/ Cisco	Each	1	131788.00	131788.00
	CABLE, CONNECTORS, ACCESSORIES	Each		0.00	0.00
IA35	Cables & Connectors:- Supply, Installation, Testing & Commissioning of all kind of Cables, connectors, adaptors etc. (Electrical(wires as well as cables), Speakers, Audio,Cat x, hdmi etc) for connecting the entire AV equipment of Auditorium, Conference Room & Lobby irrespective of quantity required for satisfactory completion of entire job as per technical requirement & instruction of engineer- in-charge	Job	1	367662.00	367662.00
IA36	AV Rack:- Supply, Installation, Testing & Commissioning of 42U AV Rack complete with shelf tray, mounting hardware ,and PDU. Make: Prinnet/Dynamic/APW president /Valrack/ Kramer/Crestron/Extron	Each	1	83472.00	83472.00
IA37	Headphone: professional monitoring headphones with linear sound reproduction, folding and rotating earcupes, frequency response 10 Hz - 22 KHz or better,max SPL 112 dB or more complete with all accessories Make:Sennheiser/ Shure/ DPA	Each	1	22421.00	22421.00
IA38	Tall Microphone Stand: SITC of tall adjustable microphone stands with tripod base complete with all accessories as required. Make: Ahuja / hercules / i&A stands	Each	4	29894.00	119576.00
IA39	Short Microphone Stand: SITC of Short stands complete with all accessories as required.Make: Ahuja / hercules / i&A stands	Each	7	20926.00	146482.00
IA40	DI Box: SITC of Active DI Boxes for electronic instruments Powered by +48 V phantom power with a 9 V battery backup Signal levels ranging from +10 to +50 dBu Frequency response from 10 Hz to 90 kHz (±3 dB) Earth Lift Switch.Make: BSS/Behringer/Klark Teknik	Each	1	37368.00	37368.00
	TOTAL IA				21293608.00
IC	Conference Room				

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

IC1	Display Unit (for Conference Room & Lobby Area):- Supply Installation Testing and Commissioning of 104 Inch or more Diagonal,Resolution 5,120 x 2,160 (21:9),Brightness 500 Nits,Contrast ratio 4,000:1,Active Display Area 2,449.92 (H) × 1,033.56 (V),Pixel pitch 0.4785 x 0.4785,Operation Hrs 24 Hrs,5K Signage with,built-in MagicInfo S10, SSSP 10.0,Processor Cortex A76 Quad-core,H/W 2nd Gen. B2B Design, Center IR, Temperature Sensor, Ambient Sensor Auto Level, Wi-Fi(2.4/5.0GHz dual) & BT, Local Dimming, USB Type-C Port, OPS Support.S/W Signage New Home, Workspace (Microsoft365/RDP), Custom Home, Auto Source Switching & Recovery, Dicom Simulation Mode, Director Mode Multi-View**, SMARTVIEW+, Upgradable Web-Engine, Tizen Enterprise Platform, Smart Calibration, SmartThings Pro support, VXT support,Safety 60950-1 / 62368-1,Class A,ENERGY STAR 8.0, EPEAT Bronze,Security 802.1x(WPA2 Enterprise) : EAP-TLS, EAP-TTLS, EAP-PEAP WPA3-Personal,Power Supply AC 100 - 240 V, 50/60 Hz,Temperture 0°C~ 40°C Relative Humidity 10~80% Approved Makes:-Samsung/Nec/ LG/ Sony / Panasonic	Each	1	1492648.00	1492648.00
IC2	Recording, Streaming & Webcasting Device:- SITC of Recording, Streaming & Webcasting Hardware simultaneously, Built-in 4x HDMI & IP Inputs with 4x Line Inputs, 2x HDMI Outputs. The system should be capable to record upto any four inputs simultaneously in a single frame and as well as individual sources simultaneously. Should have minimum 1TB inbuilt storage and can be connected to local NAS storage. The system should be able to support minimum 3 unicast streams.The recorded files should have the option of time and date stamp.The device can be controlled and managed through centralised software on network .Quoted model should be CE, FCC & RoHS Certified with Test Lab Reports. Approved Make:-Lumens/Sony/Vaadio	Each	1	455715.00	455715.00

IC3	Camera:- 20x Optical Zoom PTZ Broadcast Camera SITC of Full HD 1080p @ 60 frames per second PTZ Camera with minimum 20X Optical Zoom and FoV of minimum 57 deg, min 255 Presets.Camera should support simultaneous outputs through Ethernet, HDMI, 3G-SDI & USB 3.0, Audio In and can be controlled via RS232 & 422 In & Out & IP.Panning angle -170° ~ +170°, Tilting angle -30° ~ +90° . The tilting and panning speed of camera should be minimum 200° per second. Camera should support SRT, FreeD Protocol, PoE and Virtual USB Driver.Camera can be controlled and managed through centralised software on network. Quoted model should be BIS, CE, FCC & RoHS Certified with Test Lab Reports. Approved Make:-Lumens/Sony/Vaadio	Each	1	276981.00	276981.00
IC4	AVoIP Decoder-IP to USB 3.0 & HDMI Output:- SITC of AVoIP Decoder supporting 4K @60fps with simultaneous outputs through HDMI 2.0, USB Type C & USB Type A with Line Out & 3.5 mm, 1x Line In & 3.5 mm. The decoder should be capable to convert IP to USB 3.0. The decoder should support Video Decoding Formats of H.264/HEVC with in-built AES128 encryption and NDI HX3 / NDI HX2 / RTSP, PoE+ Approved Make:-Lumens/QSC/Crestron	Each	1	93456.00	93456.00
IC5	Tabletop Gooseneck Microphones:- Supply, Installation, Testing & Commissioning of maximum 15cm gooseneck shotgun microphone with hyper cardioid pick-up pattern, frequency response: 40 Hz – 20 kHz, Nominal impedance: 50 Ohm, Sensitivity: 18 mV/Pa, Equivalent noise level: 23 dB (A) with a table stand base with a programmable microphone button (Toggle on/off, PTM, PTT, and permanent on) and a bi-color LED ring for status indication along with XLR-3 connector. Approved Make:-Sennheiser/Shure/DPA	Each	25	72989.00	1824725.00

IC6	Digital Signal Processor:- Supply, Installation, Testing & Commissioning of Digital Signal Processor with a minimum of 16 or more microphone/line inputs that include phantom power and AEC. It should also have 6 or more line outputs, . The sampling rate should be 48kHz or better and the DSP should be expandable for port expansion. It should have a minimum of 64x64 Dante channels for digital audio transfer , DSP must support with electrical features of THD+N (22Hz to 22kHz) : 0.002% (1kHz @ +4dBu); EIN : <125dBu, unweighted (20Hz to 20kHz); Dynamic Range : 110dB, unweighted; Propagation Delay 4ms; Crosstalk, input to input, 1kHz : <110dB; Phantom Power +48VDC up-to 100mA maximum;andcompliant to FCC Part 15 B and conform to CE and ICES-003:7 safety requirements.. The DSP should support control with an app via iOS and Android devices or any third-party control system. Additionally, it should have built-in filters, feedback suppression, and other necessary features as per specifications.Xilica /Symmetrix/Biamp Approved Make:-Xilica/Audac/Bose/ Symmetrix/ Biamp	Each	2	578447.00	1156894.00
IC7	Speaker system:- SITC of Full range Passive wall mount weatherised loudspeaker with Min IP 66 rated, LF: 6" or better, HF : 1" or better having Frequency Response (+/-3 dB) : 65Hz - 20 kHz or better, RMS power : 60 W at 8 Ohms or better, Line transformer tapping 50W/25W/12.5W or better, Maximum SPL: 106 dB or better, Sensitivity: 89 dB or better, Dispersion : 120° X 120° or better and speaker inclining option upto 30 degree on left , right and bottom side, OEM mounting arrangement to be supplied. The speaker capable to be used for indoor or outdoor applications. CE Certification or more Approved Make:-Audac / Bose/ Martin Audio	Each	6	27909.00	167454.00
IC8	Column Speakers (for OLED display unit of Conference Room):- Passive Column Loudspeaker with min 12 X 2" Driver or better; RMS 60W @ 12 Ohms or better ; Frequency range : 120Hz – 20Khz ; Sensitivity 90 dB and Max SPL 106 dB; Beamwidth @1KHz : 174° x 28° (H X V) or better (Horizontal more is better; vertical less is better), Power Taps (100V) : 40 W/ 20 W/ 10W or better, ; OEM Mounting Bracket to be Included, Construction : Aluminium, CE Certification or moreApproved Make:-Audac / Bose/ Martin Audio	Each	2	86347.00	172694.00

IC9	Power Amplifier:- Quad Channel power amplifier, RMS/AES power handling @ 4 Ω : 4 x 250 W, @ 8 Ohms : 4 x 130 W, @ 8 Ohm Bridge : 2 x 500 W, Frequency response: 20 Hz - 20 kHz, Signal / Noise: > 90 dB, THD+N (@ 1 kHz): < 0.1%, Crosstalk (@ 1 kHz): > 70 dB, Technology: Class-D, Inputs sensitivity: 0 dB (1V RMS), Protection: DC Short circuit; Over heating; Over load; Signal limiting; Convection cooled, should be energy star rated, etc., Should have Inbuilt Crossover, CE Certification or more Approved Make:-Audac / Bose/ Powersoft	Each	2	101601.00	203202.00
IC10	PoE Giga Switch:- 12 port POE Giga Switch with 2 port SFP:- 12 X 10/100/1000 Mbps Base-T auto-sensing PoE ports; 2 X 1000 Base-x SFP uplink ports; Bandwidth: 20 Gbps full duplex, Buffer memory: 512 KB embedded memory per unit, Address database size: 4k media access control (MAC), PoE (46 Watts of power budget), Power consumption: 59.3W maximum, 48V, 1.25A external power adapter, Protected ports complete Approved Make:-QSC/Netgear/Cisco	Each	1	121493.00	121493.00
IC11	Cable Cubby:- Supply Installation Testing and Commissioning of Cable Cubby includes HDMI Ports,Power Port,USB - A,USB-C and LAN Approved Make:-Magnum/Gigatronic/Crestron	Each	6	31541.00	189246.00
IC12	Matrix Switcher :- Supply Installation Testing and Commissioning of Eight HDMI inputs matrixed to eight HDMI outputs with HDMI 2.0a specification and 18Gbps (600 MHz) 4k UHD support, HD resolutions upto 3840 x 2160@60Hz (4:4:4, 8-bit) & 4096x2160@60Hz (4:4:4, 8-bit), 16-bit Deep Color upto 1080p@60Hz. Eight audio output ports can pair with eight HDMI outputs individually. Audio support Digital and analog formats. Device should provide an intuitive set of front panel controls with an LCD as well as RS-232, Telnet, WebGUI and IR remote control options. Approved Make:-Crestron/ QSC/ Cypress	Each	1	398252.00	398252.00

IC13	SITC of Speakers Set (for display unit of Lobby) :- Integrated Audio System,40W Active Wall Speaker Set,RMS/AE'S power handling: - 2 x 20 W,Dynamic power: - 2 x 40 W,Sensitivity (1W/1m): - 89 dB,Sound Pressure (Max. W/1m): - 105 dB,Frequency Response: - (± 3 dB) 80 Hz - 20 kHz),Power Consumption: - Nominal (1/8 MUP) 11.3 W, Standby < 0.35 W,Inputs Balanced Stereo Connector: - 2 x 3-pin Euro Terminal Block (Pitch - 3.81 mm),Unbalanced Stereo Connector: - 3.5 mm Jack (2x),Connector: - IEC C7/C8 power inlet,Connectors: - Remote control RJ45,Outputs Passive loudspeaker: - 2-pin Euro Terminal Block (Pitch - 5.08 mm),Drivers: - HF 13 mm (PEI tweeter), LF 5 1/4" (Polypropylene),Dispersion: -Horizontal 210° (Average -6 dB / 100 Hz – 10 kHz), Vertical 205° (Average -6 dB / 100 Hz – 10 kHz),CE Certification should be attached with the bid. Approved Make:-Audac / Bose/ Powersoft	Set	1	46648.00	46648.00
IC14	RACK: SITC of Rack 19" minimum 24U/600mm(W)/650mm(D) Alongwith Side Panels. Rack Consisting of the following accessories: Front Glass Door 24U, Rear Steel Door 24U , Castor Wheels with Front Brake (Set of 4 Nos), 2 Fan 90CFM 230VAC (Top Mounted), 19" Stationary Shelf 375mm(D), PDU 6 Points 6 Amp. Socket with MCB, Cable Manager 1U MS with PVC Loops, Hardware (Pkt of 10 Nos). Makes:Dynamic/Prinet/Valrack/ Kramer/Crestron/Extron	Each	1	160172.00	160172.00
IC 15	OLED Display:- Supply, Installation, Testing & Commissioning of display having size: minimum 95 inches (measured diagonally) or higher (measured diagonally), Resolution: 4K (3840 x 2160) or better, Panel Technology: OLED, Picture processor: 4k AI processor, HDR Support: Dolby Vision, HLG, HDR10, HDR10+ Refresh Rate: 120Hz or higher with wide viewing angles , Low response time for minimal motion blur, Contrast Ratio: High contrast ratio, potentially with local dimming or QD-OLED technology for deeper blacks and brighter highlights or MLA OLED for improved brightness, Virtual Surround Sound Support 11.1.2 Ch surround Sound or better Approved Make: Samsung/ Sony/ LG	Each	1	2174000.00	2174000.00
	TOTAL IC				8933580.00
	TOTAL OF PART I TECHNOLOGY WORK (IA+IC)			30227188.00	

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J	LIGHTING				
J1	SITC of Round recessed luminaire with contact frame with approx 12W in 3000/4000K with net delivered lumen at least 1357lm with LED MacAdam Step 2 binning and high performance optics, The LEDs are set a long way back to minimize glare and guarantee a high level of visual comfort. The main body is made of Aluminium with textured powder coat finish optimum heat dissipation. Interchangeable lens & reflectors-with the option of 15°,25°,35°,50° optic. The diameter of the fixture should not be more than 80-85mm with the contact frame. High color rendering CRI 90 index 3000K LED. The fixture to support all possible Dimming Protocols DALI/Triac/Analog/DMX and to have optional accessories for elliptical distribution, honeycomb louvre Fixture should have an option of White, Black finish and Internal frame should have option of chrome, dark chrome, matt white, matt black options as per site requirement. The Cut off Angle to be around 28 Deg. with options of IP20, IP44, IP65. Fixture price to include Non-Dim Electronic Driver Make - IBL/iGuzzini/Fagerhult/ERCO/forma/aura/eqv. The color temperature as per the exhibit and conservation norms. The appropriate lux as per the artefact and conservation norms.As per approved by design consultants.	Nos.	138	6131.28	846116.64

J2	SITC of Round recessed luminaire with contact frame with approx 9W in 3000/4000K with net delivered lumen at least 1056lm with LED MacAdam Step 2 binning and high performance optics, The LEDs are set a long way back to minimize glare and guarantee a high level of visual comfort. The main body is made of Aluminium with textured powder coat finish optimum heat dissipation. Interchangeable lens & reflectors-with the option of 15°,25°,35°,50° optic. The diameter of the fixture should not be more than 60-65mm with the contact frame. High color rendering CRI 90 index 3000K LED. The fixture to support all possible Dimming Protocols DALI/Triac/Analog/DMX and to have optional accessories for elliptical distribution, honeycomb louvre Fixture should have an option of White, Black finish and Internal frame should have option of chrome, dark chrome, matt white, matt black options as per site requirement. The Cut off Angle to be around 28 Deg. with options of IP20, IP44, IP65. Fixture price to include Non-Dim Electronic DriverMake - IBL/iGuzzini/Fagerhult/ERCOforma/aura/eqv. The color temperature as per the exhibit and conservation norms. The appropriate lux as per the artefact and conservation norms.As per approved by design consultants.				
		Nos.	4	4311.72	17246.88
J3	SITC of 9.6 watt / mtr LED strips with 989lm/mtr. lumens, IP20 suitable for cove light applications. To have color Temperature of 2700K/3000K/4000K with 50mm LED Cut point and 3 Step Macadam and CRI>90Ra. Securely mounted with or without aluminium channel with lens / diffuser etc as per requirement. Complete with Non-Dim driver mounting bracket / clamp accessories etc as required. Make : IBL /Led Linear/Fagerhult/ERCOforma/aura/eqv. The color temperature as per the exhibit and conservation norms. The appropriate lux as per the artefact and conservation norms.As per approved by design consultants.				
		Mtrs.	80	1947.00	155760.00
J4	SITC of 14.4 watt / mtr LED strips with 1483lm/mtr. lumens suitable for cove light applications. To have color Temperature of 2700K/3000K/4000K with 33.3mm LED Cut point and 3 Step Macadam and CRI>90Ra. Securely mounted with or without aluminium channel with lens / diffuser etc as per requirement. Complete with Non-Dim driver mounting bracket / clamp accessories etc as required. Make : IBL /Led Linear/Fagerhult/ERCOforma/aura/eqv. The color temperature as per the exhibit and conservation norms. The appropriate lux as per the artefact and conservation norms.As per approved by				
			70	2301.00	161070.00

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	design consultants.				
J5	SITC of 4.8 watt / mtr LED strips with 494lm/mtr. lumens suitable for cove light applications. To have color Temperature of 2700K/3000K/4000K with 100mm LED Cut point and 3 Step Macadam and CRI>90Ra. Securely mounted with or without aluminium channel with lens / diffuser etc as per requirement. Complete with Non-Dim driver mounting bracket / clamp accessories etc as required. Make : IBL /Led Linear/Fagerhult/ERCO/forma/aura/eqv. The color temperature as per the exhibit and conservation norms. The appropriate lux as per the artefact and conservation norms.As per approved by design consultants.	Mtrs.			
		Mtrs.	40	1888.00	75520.00

J6	SITC of BIS certified, IP40 rated fixture equipped with low power LEDs with 24V inputs, compact surface mounted linear LED luminaire with maximum dimensions of 20MM x 20MM x Length mounted on adjustable brackets, offering tremendous modularity and ease of installation. Extruded and anodized aluminium housing profile connected in daisy chain to achieve perfect fixture to fixture light overlap. Fixture should be equipped with linear optics having options of beam angles of 10°,30°, 60° precise light control to deliver excellent homogeneous light on the surface, assembled using state of the art automated Reel-to-Reel (LEDs engine without solder joints) production process. Fixture should be 13W/m with options of 7W,18W,24W/m 2700K/3000K/3500K/4000K with source lumen of minimum 2510@3500K and delivered lumen package of minimum 1880 lm/m@3500K, LEDs should have minimum lifetime of > 60.000 hrs (L80/B10). LEDs with 3 step MacAdams (SDCM3) binning centered on target CCT (One Bin Only) with an extended photometric code of Wxxx/339 ensuring an exceptional colour consistency over the rated lifetime. Premium colour rendition with a CRI of 90+ (R9 = 60) and TM-30-15 Rf = 87 / Rg = 97 ensuring a remarkable light quality. For consistent light intensity all along the luminaire length LED engine should be equipped with active current regulation operated by dedicated integrated circuits (ICs) on each step. Protected against electrostatic discharge +/- 2,000 V and polarity miswiring. Fully PWM dimmable for frequency > 0 Hz up to 2 kHz (flicker free for frequency higher than 1.2 kHz according to IEEE P1789 standard).Make - IBL/LED Linear/KKDC/ERCO/forma/aura/eqv. The colour temperature is as per the exhibit and conservation norms. The appropriate lux as per the artefact and conservation norms.As per approved by design consultants.	Mtrs.	2	14820.80	29641.60
J7	SITC of approx.20~ 24 Watt Surface mounted type 4 feet Batten LED fixture made up of extruded polycarbonate housing, fixture should have minimum net efficacy at System level (Not Chip Level)≥100lumens/watt, nominal system lumen of 2000 lumens, Life of fixture 50000hrs @ L70 Lumen maintenance, CCT 4000 - 6000K, CRI≥80, PF>0.95, and suitable for 230V AC, 50Hz. supply. Minimum Internal Surge Protection≥2.5KV. LED driver shall be BIS registered & luminaire manufacture shall provide LM79report from NABL accredited lab & LM80 report issued by LED manufacturer. Make: Wipro / Signify / Regent/eqv.	Nos.	36	554.60	19965.60

J8	Provision and fixing of L-angle with required hardware and fixtures, for additional support to lights. The thickness may vary from 2-3mm with required structural composition. The cost includes all the necessary accessories required for installation of the L-angle. The details of the L-angle may vary according to site conditions.	mm.	50	867.30	43365.00
J9	Supply, Installation, Testing and Commissioning of RCU 8 Relay Switch + 8 Digital Input, 8 Channel operate separately. Manual Operation enabled. Bus protocol. RCU 8 Relay switch (1 master 20A, 7*relay 10A, 1* 0-10V, 8 Digital inputs). Bus Voltage: 12-32V DC. Protection: Reverse Polarity Protection. (TIS/GM/La Martini)	Nos.	7	36922.20	258455.40
J10	Supply, Installation, Testing and Commissioning of 6 Channel Leading Edge Dimmer with 2 Amp each channel. 12 to 32 Volt dc. 6 internal fuses. Reverse polarity protection. Manually programmable. 6 channel controlled separately, 12 scenarios, ABS Anti fire material. Manually ON/OFF and Programming. Heat Sink-Aluminum alloy with straight fin. (TIS/GM/La Martini)	Nos.	7	34664.86	242654.02
J11	Supply, Installation, Testing and Commissioning of IP Port with RS232, RS485 Ports used for programming, controlling 3rd party device, and to connect free IOS iPhone I pad and android free application. (TIS/GM/La Martini)	Nos.	2	33372.76	66745.52
J12	Supply, Installation, Testing and Commissioning of touch panel with TFT screen 4.3". Controls minimum 18 point to point circuits in each room. Has a AC page. Can control TV and DTH. Has a mood page to plan scenarios. Can be programmed by hand. (TIS/GM/La Martini)	Nos.	5	33160.36	165801.80
J13	Supply, Installation, Testing and Commissioning of Bus Coupler. Need to be connected behind the panel to make it work with additional 3 digital inputs and 12 Volt output. (TIS/GM/La Martini)	Nos.	5	3788.98	18944.90
J14	Supply, Installation, Testing and Commissioning of Din rail Power supply 24 Volt DC 1.5 Amps to give all Devices its 24 volt power. (TIS/GM//La Martini)	Nos.	6	7813.96	46883.76

J15	Supply, Installation, Testing and Commissioning of timer module with built in time clock with central.DTS day time adjustment. Logic Lines: Total 960 logic lines: 240 Tables, each 4 Logic lines. Logic Commands: Simplified logic commands like: (if, or, nand, nor +255 Flags) - Upgrade IO : 1 x mini USB port (to connect to special programming board) - Operation Protection : Polarity Protection • BUS Short Circuit Protection - TIS BUS DC Supply : 24VDC with flexible tolerance between 8-32VDC. - Power consumption: 15mA. (TIS/GM//La Martini)	Nos.	1	38544.70	38544.70
J16	Supply, Installation, Testing and Commissioning of DALI 64 Channel Controller Standard DALI connections. Ports: Max 12 no of units. 12 no of Programmable addresses. 16 group. 16 scenes. Ports-Standard DALI connection Numbers of units max 12 units. (TIS/GM/La Martini)	Nos.	2	32042.90	64085.80
J17	Supply, Installation, Testing and Commissioning of DALI 4 Ch 8 Amp /4 * 700ma, Driver Manual /automatically DALI address setting. DALI address digital indicate. Four channels with four different addresses, 4 channels work separately. Compatible with SR-2400TL, SR-2400TG, SR 2400TS, SR-2400LC, SR-2400GC, SR-2400SC and any good quality. (TIS/GM/La Martini)	Nos.	7	11785.84	82500.88
J18	Supply, Installation, Testing and Commissioning of IR sensor with PIR motion sensor, Light intensity sensor, Infrared control, 2 digital inputs, 12 volt outputs, 32 logic lines, used for saving energy, AV control security and automation. (TIS/GM/La Martini)	Nos.	10	10291.96	102919.60
J19	SITC of LED PAR Light RGBW : 162w using 54 x 3w LEDs - RGBW ; UP to 16.7 million colours with flicker-free dimming (0-100%) ; control via DMX512, standalone mode ; Powercon IN & Link Out connectors for mains : Power supply : Beam Angle 25Degree 3/5/10 Channel and strobe Indoor IP 20 of 100-240 V AC, 50/60 Hz. Make : Neo Neon, Decibal, Lumens	Each	12	12287.00	147444.00
J20	SITC of LED PAR Light RGBW : 162w using 54 x 3w LEDs - RGBW ; UP to 16.7 million colors with flicker-free dimming (0-100%) ; control via DMX512, stand-alone mode ; Powercon IN & Link Out connectors for mains : Power supply : of Beam Angle 45 Degree 3/5/10 Channel and strobe Indoor IP 20 of 100-240 V AC, 50/60 Hz. Make : Neo Neon, Decibal, Lumens	each	8	12287.00	98296.00

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J21	SITC of RGBW Strobe LED 300 Watt Beam Angle 120Degree Colour Mixing Dimming, and auto programming Controlled by DMX cntroller 512 Indoor IP 20 of 100-240 V AC, 50/60 Hz. Make : Neo Neon, Decibal, Lumens	Each	4	18376.00	73504.00
J22	SITC of Controller - DMX controller 512, Model pilot-2000 of Neoneon with audio control, programmable.	Each	1	43339.00	43339.00
J23	Supply and laying of 0.5 Sqmm 2 Core Shielded Cable for Light control including all necessary accessories make: Falcon, Beldon	RM	200	204.21	40842.00
J24	SITC of 8 Way DMX splitter One in and 8 out , 90-240V 50/60 Hz Make: Neo Neon, Decibal, Lumens	each	1	11069.00	11069.00
J25	LIGHTING BAR:SITC of Stage Lighting Bar straight as per the design, made out of 63mm Outer dai, 50 nominal bore, GI Pipe, black painted with 1 coat of red oxide, Fixing Through Suspenders as per site conditions. Make- Custom	Each	4	15000.00	60000.00
J26	MS Lights Clamps for suspending lights from the light bar, Black Powder coated.	Each	20	450.00	9000.00
J27	Safety chain for suspending lights from the light bar, Black Powder coated.	Each	20	650.00	13000.00
J28	Supply Installation Testing and commissioning GO BO projection Light (WELCOME) Max 50 Watt white 1 PC glass GOBO IP 20 Rating for AC Supply of 100-250 V, 50Hz/60 Hz.	Each	1	43339.00	43339.00
	TOTAL OF PART J LIGHTING WORK				2976055.10
K	ELECTRICAL				
SUBHEAD - i - PANELS					
K-1	MDB (LIGHT & POWER) Panel				
	INCOMER				
	1 No.125 Amp FP MCCB, 25 kA breaking capacity with thermal release and adjustable setting and with rotary handle.				
	METERING & INDICATION				
	1 set of R,Y,B phase indicating lamps				
	Digital Multifunction meter for Voltage, Current & KW with selector switch. Each with 3nos. of 2A SP MCB & 3nos 125/5A CTs (125A/500V) rating				
	1 Sets of Breaker ON-OFF-TRIP, Spring charged indication Lamps as required.				
	BUS-BAR				
	1 Set of 160A 4 pole Aluminium Bus Bar with colour coded PVC Sleeves				
	OUTGOINGS				

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	2 Nos. 63 Amp FP MCCB, 25 kA breaking capacity with thermal release and adjustable setting and with rotary handle.				
	4 Nos. 63A 4 pole MCB,10KA.				
	4 Nos. 40A 4 pole MCB,10KA.				
	Supply, Receiving, fixing, testing & commissioning of MDB PANEL as described above	Set	1	183417.00	183417.00
K-2	UPS Panel				
	INCOMER				
	1 Nos. 63 Amp FP MCCB, 25 kA breaking capacity with thermal release and adjustable setting and with rotary handle.				
	METERING & INDICATION				
	1 set of R,Y,B phase indicating lamps				
	Digital Multifunction meter for Voltage, Current & KW with selector switch. Each with 3nos. of 2A SP MCB & 3nos 63/5A CTs (63A/500V) rating				
	MDB (LIGHT & POWER) Panel				
	INCOMER				
	2 No.125 Amp FP MCCB, 25 kA breaking capacity with thermal release and adjustable setting and with rotary handle.				
	METERING & INDICATION				
	4 Nos. 40A 4 pole MCB,10KA.				
	4 Nos. 40A SPN MCB,10KA.				
	Supply, Receiving, fixing, testing & commissioning of MDB PANEL as described above	Set	1	61628.00	61628.00
SUBHEAD - II - CIRCUIT CUM POINT WIRING					
	SWITCH CONTROL LIGHT POINTS				
K-3	Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface / recessed medium class PVC conduit, with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required.				
i	Group C	Point	29	1575.46	45688.34
K-4	Wiring for group controlled (looped) light point/fan point/exhaust fan point/ call bell point (without Independent switch etc.) with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed PVC conduit, and earthing the point with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable etc as required. (Switch Control Secondary Points)				

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i	Group C	Point	44	921.43	40542.92
K-5	Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface / recessed steel conduit, with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required. (Switch Control Primary Points)				
i	Group C	Point	0		0.00
K-6	Wiring for group controlled (looped) light point/fan point/exhaust fan point/ call bell point (without Independent switch etc.) with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed steel conduit, and earthing the point with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable etc as required. (Switch Control Secondary Points)				
i.	Group C	Point	0		0.00
	MCB CONTROL LIGHT POINTS				
K-7	Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface / recessed steel conduit, with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required. (Switch Control Primary Points)				
i.	Primary point controlled by one MCB.	Point	21	1505.14	31607.95
ii.	Same as item above but Secondary point. i.e. Points to be looped with Primary point with 2.5 sqmm wire and Point wiring	Point	64	1338.89	85689.25
K-8	Wiring for light/power plug with 2X4 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed medium class PVC conduit alongwith 1 No. 4 sq. mm FRLS PVC insulated copper conductor single core cable for loop earthing as required.	Metre	600	358.69	215214.00
K-9	Wiring for circuit/submain wiring along with earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/recessed medium class PVC conduit as required.				
i	2 X 1.5 sq. mm + 1 X 1.5 sq. mm earth wire	Metre	50	250.23	12511.32
ii.	MDB (LIGHT & POWER) Panel		450	295.33	132899.21

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iii.	INCOMER		0	471.46	
iv.	2 No.125 Amp FP MCCB, 25 kA breaking capacity with thermal release and adjustable setting and with rotary handle.		120	612.14	73457.02
v.	METERING & INDICATION		120	1079.30	129516.32
vi.	2 set of R,Y,B phase indicating lamps		120	1465.92	175910.23
K-10	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess including providing and fixing 3 pin 5/6 Amp modular socket outlet and 5/6 A modular switch, connection etc. as required.	Each	15	512.27	7683.99
K-11	Supply and Wiring for 250 volts single phase and neutral 2 Nos 6 amps socket outlet with control by 1 No switched with 2.5 sq.mm PVC insulated copper conductor 1100 volts grade stranded flexible FRLS wires in concealed or surface mounted 25 mm dia 2mm thick PVC conduit including providing and fixing of 6 amps 3 pin switch socket outlet of approved make and design in 2 mm thick GI box with grid plate and earthing of third pin of the socket with 2.5 Sq. mm PVC insulated copper conductor stranded flexible FRLS wire.(maximum four no. of switches socket shall be connected on one circuit)	Each	4	1761.00	7044.00
K-12	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 6 pin 5/6 & 15/16 A modular socket outlet and 15/16 A modular switch, connections etc. as required.	Each	35	629.32	22026.20
K-13	Supplying and fixing 3 pin, 5 A ceiling rose on the existing junction box/ wooden block including connections etc. as required.	Each	2	93.43	186.86
K-14	Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.				
i	Telephone socket outlet	Nos	2	158.94	317.88
K-15	Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required.				
i.	25 mm	Mtr	50	155.72	7786.01
ii.	32 mm	Mtr	50	197.60	9880.18
	SUBHEAD - III - DISTRIBUTION BOARDS				

K-16	Supplying and fixing following way, single pole and neutral, sheet steel, MCB distribution board, 240 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/Isolator)				
i	8 way, Double door	Each	1	2763.23	2763.23
ii.	12 way, Double door	Each	1	2486.15	2486.15
K-17	Supplying and fixing following way, three pole and neutral, sheet steel, MCB distribution board, 415 volts, on surface/ recess complete with tinned copper busbar, neutral busbar, earth bar, din bar, detachable gland plate, interconnections, phosphatized and powder painted including earthing etc. as required. (But without MCB/ RCCB/ Isolator)				
i	6 way (4 + 18), Double door	Each	1	5341.74	5341.74
ii	8 way (4 + 24), Double door	Each	3	6408.16	19224.47
K-18	Supplying and fixing 5 A to 32 A rating, 240/415 V, 10 kA, "C" curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required.				
i	Single Pole	Each	102	274.93	28042.54
ii	Single Pole Neutral	Each	0	643.29	0.00
K-19	Supplying and fixing following rating, double pole, 240 V, isolator in the existing MCB DB complete with connections, testing and commissioning etc. as required.				
i	40 A	Each	2	467.16	934.32
ii	63 A	Each	0	565.96	0.00
K-20	Supplying and fixing following rating, four pole, 415 V, isolator in the existing MCB DB complete with connections, testing and commissioning etc. as required.				
i	40 A	Each	2	1041.72	2083.43
ii	63 A	Each	2	1110.45	2220.89
K-21	Supplying and fixing following rating, double pole, (single phase and neutral), 240 V, residual current circuit breaker (RCCB), having a sensitivity current 30 mA in the existing MCB DB complete with connections, testing and commissioning etc. as required.				
i	40 A	Each	0	2837.33	0.00

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

ii	63 A	Each	0	2923.25	0.00
K-22	Supplying and fixing single pole blanking plate in the existing MCB DB complete etc. as required.	Each	10	13.96	139.61
	SUBHEAD - IV - LT CABLES				
K-23	Supplying and laying of following size DWC HDPE pipe ISI marked along with all accessories like socket, bend, couplers etc. conforming to IS 14930, Part II complete with fitting and cutting, jointing etc.direct in ground (75 cm below ground level) including excavation and refilling the trench but excluding sand cushioning and protective covering etc., complete as required.				
i	63 MM dia (OD-63 & ID-51 mm nominal)	Mtrs.	200	311.44	62288.11
K-24	Supplying and laying of following size DWC HDPE pipe ISI marked along with all accessories like socket, bend, couplers etc. conforming to IS 14930, Part II complete with fitting and cutting, jointing etc. in the existing trench, complete as required				
i	63 MM dia (OD-63 & ID-51 mm nominal)	Mtrs.	10	136.39	1363.89
K-25	Laying of one number PVC insulated & PVC sheathed/ XLPE Power cable of 1.1 KV grade of following size in the existing RCC/HUME/METAL pipe as required.				
i	Above 95 sq.mm and upto 185 sq.mm	RM	200	82.69	16538.57
K-26	Laying and fixing of one no PVC insulated and PVC sheathed /XLPE power cable of 1.1 kV grade of following size on Cable tray as required.				
i	Up to 35 sq mm. (Clamped with 1mm thick saddle)	RM	50	48.33	2416.35
K-27	Supply of following sizes of XLPE insulated Aluminum conductor strip/ wire Armoured, overall PVC sheathed 1.1 KV grade cables conforming to relevant IS-7098 Code and technical specifications.				
i	4 X 25 sq. mm	RM	50	581.48	29074.24
ii	3½ X 95 sq. mm	RM	200	1122.74	224547.34
K-28	Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.				
	4 X 25 sq. mm (28mm)	Each	2	338.29	676.58

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

	3½ X 95 sq. mm (45mm)	Each	2	631.47	1262.95
	SUBHEAD - V - EARTHING SYSTEM				
K-29	Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 metre long etc. with charcoal/ coke and salt as required.	Sets	2	8024.43	16048.85
K-30	Earthing with Cu. earth Plate 600mm x 600mm x 3mm thick including accessories, and providing masonry enclosure with cover plate (CI heavy duty) having locking arrangement and watering pipe of 2.7 mtr long etc. with charcoal or coke and salt) as required.	Sets	2	14861.08	29722.17
K-31	Providing and fixing 25 mm X 5 mm copper strip on surface or in recess for connections etc. as required. 2 nos used for 50 x 5 for the Neutral earthing of equipments)	Metre	40	1247.91	49916.41
K-32	Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.	Metre	40	262.04	10481.59
K-33	Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing along with existing surface/ recessed conduit/ submain wiring/ cable as required.	Metre	50	45.11	2255.26
	SUBHEAD - VI - UPS SYSTEM				
K-34	Supply, installation, Testing and commissioning of the following rating UPS as per specifications and complete in all respects.				
	10 KVA UPS 3 phase (415 V + 15%) Volts input & 3 phase output (415 V + 1%), 50 Hz, Input harmonic Current THD 3% typical at 100% load, 6% maximum at 50% load with Isolation Transformer and 30 min battery backup for each UPS along with battery cabinet complete in all respect including supporting steel structure for UPS and Battery as required.	Set	1	185000.00	185000.00
	SUBHEAD - VII - CCTV SYSTEM				
K-35	Supplying and drawing of UTP 4 pair CAT6 LAN cable in the existing surface /recessed steel /PVC conduit as required (1 run of cable).	Mtrs	400	61.21	24485.67

K-36	Supply, installation, testing and commissioning of 5 MP (2592 x 1944) Dome camera , ONVIF profile S , G& T BIS,UL , CE , FCC Certified ,1/2.7" Progressive Scan CMOS ,2.7 mm to 13.5 mm motorized varifocal lens , Quad stream with each stream support H.265 compression simultaneously ,min illumination : Color 0.05lux @ F1.2(AGC ON) ; B/W 0 lux @ IR ON , Shutter speed : 1 / 5s ~ 1 / 100,000 s ,WDR , Compression : H.265/H.265+/H.264/H.264+ .SD card support upto 256GB, Cloud Storage , Alarm trigger - 1 input / 1 output , frame rate : Main stream should support 25 &30 fps@5MP, , ROI Min. 8 Region, Two Way Audio, Hardware reset, Edge analytics : Face Detection, Customer Flow statistics, Heat Map, Human & Vehicle Detection, Pedestrian Intrusion Detection & Line cross Detection. Queue length detection, Regional population statistics, SOD-Stationary Object Detection, Tempering detection, Rare Sound Detection, Defog, Motion Detection, License plate detection. Protocol:- TCP/IP, HTTP, DHCP, DNS, DDNS, RTP, RTSP,SMTP, NTP, UPnP, SNMP, HTTPS,FTP PPPOE, NFS/SMB/CIFS, P2P , In built IR LED , IR Distance upto 45 meters , IP 66 ,IK10,POE/12V DC.	Nos	8	17021.05	136168.43
K-37	Supply, installation, testing and commissioning of 16 channel NVR , ONVIF compliant , recording bandwidth 640 Mbps , output interface 1 HDMI (up to 4K), 1 VGA , Alarm in/out :16ch in / 4ch out , 2 X RJ-45 port (1000M) , Bit Rate 16kbps-20mbps per channel, Sync Playback 4/8/10/16 ch playback, iOS smartphone support , third party camera supported, 8 HDD support , each HDD slot support upto 8 TB HDD , , 1x3.0 USB for backup /upgrade , 2x 2.0 USB for mouse, Display resolution up to 4K, 1 E-Sata Port, RS-485 Port, Cloud Storage, Net HDD, Two Way Talk, Edge analytics : Customer Flow statistics, Face Attendance, Face Detection and Recognition, Heat Map, Human & Vehicle Detection, Pedestrian Intrusion Detection & Line cross Detection, Queue length detection, Regional population statistics, SOD-Stationary Object Detection, Deterrence, PIR, AI Registered Qty- 10000 & AI Captured Qty-200000. Protocol support:- HTTP, TCP/IP, IPv4, UPnP, RTSP,UDP,SMTP,NTP,DHCP,DNS,IP filter,PPPOE,DDNS,FTP,IP search, P2P, NFS/SMB/CIFS, IPC Management. Certifications: UL,CE,FCC,BIS.	Nos	1	134994.57	134994.57
K-38	Supplying ,Installation, Testing and commissioning of 8TB HDD for Storage.	Nos	1	20542.65	20542.65

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

K-39	Supply, Installation, Testing & Commissioning of 16 port 10/100/1000 + 2 X gigabit SFP , managed L-2 Switch with SFP module switching capacity 216 gbps, Complete as per side required.	Nos	1	9156.15	9156.15
K-40	Supplying ,Installation, Testing and commissioning of 42" Full HD LED Display Unit - Wall Mount.	Nos	1	45193.83	45193.83
K-41	Supplying ,Installation, Testing and commissioning of HDMI Cable- 3Mtr	Nos	1	1173.87	1173.87
K-42	Supply, Installation, Testing and commissioning of 6U Rack - Outdoor with PDU,FAN and Cable Manager(Wallmount).	Nos	1	8720.94	8720.94
K-43	Supplying and fixing of following sizes of steel conduit along with accessories in surface/recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required.				
i	25 mm	Mtr	200	274.93	54985.37
ii	32 mm	Mtr	80	350.10	28008.17
	SUBHEAD - VIII - FIRE ALARM SYSTEM				
K-44	Supplying, installation, testing and commissioning of micro processor based intelligent addressable main fire alarm panel, central processing unit with the following loop modules and capable of supporting not less than 240 devices (including detectors) and minimum 120 detectors per loop and loop length up to 2 km, network communication card, minimum 320 character graphics/ LCD display with touch screen or other keypad and minimum 4000 events history log in the non volatile memory (EPROM), power supply unit (230 ± 5% V, 50 hz), 48 hrs back-up with 24 volt sealed maintenance free batteries with automatic charger. The panel shall have facility to connect printer to printout log and facility to have seamless integration with analog/digital voice evacuation system (which is part of the schedule of work under SH: PA System) and shall be complete with all accessories . The panel shall be compatible for IBMS system with open protocol BACnet/ Modbus over IP complete as per specifications.				
	2 Loop Panel	Nos.	1	256911.62	256911.62

K45	Supplying, installation, testing & commissioning of repeater panel with 320 character/ Touch screen LCD display with inbuilt reset, acknowledge and silence switches complete as required.	Nos.	1	116723.63	116723.63
K-46	Supplying, installation, testing & commissioning of fault isolator complete with base as required.	Nos.	4	3511.76	14047.04
K-47	Supplying, installation, testing & commissioning of intelligent addressable thermal detector with rate of rise cum fixed temperature thermistor complete with base as required.	Nos.	2	2927.54	5855.08
K-48	Intelligent and electronically addressable photoelectric smoke detector with microprocessor in head and including mounting base with LED etc. complete as per specification	Nos.	33	2209.00	72897.00
K-49	Supplying, installation, testing & commissioning of 1.5/3/6W metal box ceiling/wall speakers complete as required.	Nos.	5	1925.56	9627.81
K-50	Supplying, installation, testing & commissioning of digital audio amplifier 50 Watt, 25V rms operating at 240 volt AC supply complete as required.	Nos.	1	103934.16	103934.16
K-51	Supplying & laying of 2x1.5 sqmm fire alarm armoured cable, 600/1000V rated with annealed copper conductor having XLPE insulation, steel wire armouring & FRLS outer sheath complete as required.	Mtrs	480	185.79	89179.40
K-52	Supplying and fixing of following sizes of steel conduit along with accessories in surface/recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required.				
	25 mm	Mtr	100	274.93	27492.68
	32 mm	Mtr	40	350.10	14004.09
	TOTAL OF PART K ELECTRICAL WORK				3111937.53
L	MISCELLANEOUS				

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

L-1	Supply, fabrication, and installation of Entry, Exit, Emergency Signages, including Auditorium Row Signages and Fire Escape Route Plans, made from 1.5 mm thick Stainless Steel Sheet of Grade 304 with No. 4 brushed or matte finish, comprising deep engraving or acid etching of text/symbols filled with UV-stable, weatherproof multicolor epoxy enamel, with a non-reflective and anti-glare surface finish, including all supports, brackets, concealed stainless steel spacers, bolts, washers, and fixing accessories for wall-mounted or ceiling-suspended installation. Signages shall be multilingual (English/Hindi/Arabic as required) with universally recognized pictograms and directional arrows, and shall conform to ISO 7010, NFPA 101, OSHA 1910.145, and relevant local safety codes. Fire Escape Route Plans shall include laser-engraved floor maps with directional arrows, assembly points, fire extinguisher locations, exit routes, and "you are here" indicators, filled with colored epoxy pigment. The item includes all materials, labour, transport, installation, and necessary approvals as per drawings and direction of the Engineer-in-Charge. Only the signage surface area (in sqm) shall be measured for payment.	Sqm	10	19934.00	199340.00
L-2	Provision and application of anti-termite treatment for the auditorium, including all required materials, labour, tools, and equipment, as per specifications. The work shall include: Soil treatment with approved anti-termite chemicals. Application to the foundation, plinth area, and along walls as per IS 6313 (Part II) standards or equivalent. Drilling holes along the walls, injecting anti-termite solution, and sealing. Treating wooden structures, joints, and furniture with an approved termiticide. High-quality, eco-friendly, and approved anti-termite chemicals (e.g., Chlorpyrifos, Imidacloprid, or equivalent) shall be used. The application method may be spray, injection, or trench, as appropriate to the site conditions. The chemical shall be of reputed make (e.g., Pidilite or equivalent).				
	The area to be treated shall cover the entire auditorium complex, including the foyer area, main auditorium, stage area, backside of stage, green rooms, conference rooms, seminar halls, VIP lounge, etc., including all associated fittings, fixtures, and furniture. The agency shall provide a warranty undertaking on a Judicial Stamp Paper of appropriate value, binding them to the terms of the five-year on-site warranty from the date of completion of the work	LS	1	120000.00	120000.00

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc. at National Science Centre, Delhi

L-3	Providing, fixing, testing, and commissioning of heavy-duty air curtain of approved make and model (Make: Euronics or equivalent), Model No: EAS6 or equivalent, having stainless steel body (ABS casing), suitable for 6-7 feet width (1800-2100 mm), with air throw capacity of minimum 21 m/s, CE/GS approved, with sealed casing to prevent dust ingress and allow easy maintenance. The air curtain shall be equipped with in-built sensors for auto operation and remote control. Unit to be installed at approved height and location as per design consultant/Engineer-in-Charge, including all hardware, brackets, fixtures, electrical connections, accessories, and civil works necessary for complete installation and operation. The item includes all labour, tools, consumables, and taxes.	Each	2	67463.00	134926.00
L-4	Vinyl Plotter Cut - Providing and fixing of vinyl plotter cut- with 1 year warranty on pre finished primer base surface Walls, as per approved size and graphic design. (base rate of Vinyl plotter cut to be consider as 1165 sq/mt)	SQM.	9	2251.86	20266.71
L-5	Providing and applying of NON PVC, 3M/eqv vinyl with necessary adhesives with 3 to 5 year warranty on both printing and material as per approved conceptual design. (base rate of Vinyl Graphic Printing to be consider as 1125 sq/mt)	SQM.	14	2028.05	28392.69
L-6	Providing and fixing of 12mm thick MDF , with etching depth from 1mm to 4mm as per conceptual design & approval given by Museum Design Consultant. Rate to be quoted shall include the cost of custom designed graphics / 2D artwork , illustrations / artwork and Copywriting and editing of textual content in Hindi, English, Gujrati as per conceptual design provided by consultant.	SQM.	9	1713.72	15423.49
L-7	Providing and fixing of 12mm toughenend non reflective glass with all necessary hardwares, fixtures, tools etc complete for the installation as per the approval of the design consultant / engineer in charge.	SQM.	9	7938.97	71450.70
L-8	Providing and fixing a vision glass panel made of 18 mm thick commercial/plywood board and 12 mm thick toughened clear vision glass, suitable to accommodate a 95-inch TV screen, including cutting, edge polishing, and fixing the glass securely in the ply frame with approved adhesive/silicon sealant. The panel shall include all necessary hardware such as stainless steel/brass screws, anchor fasteners, glass clamps, hinges if applicable, wooden/metal framing support, and all other accessories required for safe installation.The work shall be executed to the satisfaction of the Museum Design Consultant/Engineer-in-Charge.	SQM.	3.5	16892.70	59124.44

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

L-9	Providing and fixing of aluminium nose profile for edges of stairs and stage of size 45 mm as per design requirements of make: BOTTOMLINE PROFILES(Protect - Incline 12.5mm: code : PIP131 : black).	Rm	22	2335.22	51374.88
L-10	Providing and fixing aluminium skirting of 100mm height specified profile and finish, securely fastened to the acoustic panelling and partitions using appropriate fixings, including all necessary as per approved drawings, complete." of make: BOTTOMLINE PROFILES(Easy Fix - Height : 100mm: code : SKP003 : black)	Rm	374	2001.77	748661.31
L-11	Providing and fixing carpet edge Aluminium L profile with adhesive on the joints. Size 25mm , up to 50mm. make: BOTTOMLINE PROFILESAluminium Stair Nosing 68mm X 29mm : code : SNP084 : black)	Rm	66	4098.98	270532.54
L-12	Providing and fixing carpet edge Aluminium T profile with adhesive on the joints. Size 25mm , up to 50mm. make: BOTTOMLINE PROFILES(Protect -Classic 25 mm : code : PCP190 : black)	Rm	11	1639.94	18039.29
	TOTAL OF PART L MISCELLANEOUS WORK				1737532.05
	-	SUMMARY			
	Total of Part-A(Dismantling & Demolishing)			903811.65	
	Total of Part-B (New Civil Work.)			7258805.00	
	Total of Part-C (Finishing Painting)			379889.00	
	Total of Part-D (False ceiling work.)			3242380.75	
	Total of Part-E (Acoustic Work)			2338560.00	
	Total of Part-F (Flooring)			2738559.28	
	Total of Part-G (Furniture)			9781524.88	
	Total of Part- H (HVAC WORK)			2964347.47	
	Total of Part- PART I (TECHNOLOGY WORK)			30227188.00	
	Total of Part- PART J (Lighting)			2976055.10	
	Total of Part- PART K (Electrical)			3111937.53	
	Total of Part- PART L (MISCELLANEOUS WORK)			1737532.05	
	Total including GST @18% and Labour cess @1% Rs.			67660590.71	
	GENERAL ABSTRACT OF COST				
	Basic value excluding GST and Labour Cess Rs.			56771765.99	
	Add GST @ 18% of Rs.			10218917.88	
	Gross value including GST			66990683.87	
	Add LC @ 1% of Rs.			669906.84	
	Gross value including GST & LC Rs.			67660590.71	
				Rs.	677 Lakhs

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

GENERAL SPECIFICATION OF WORKS FOR CIVIL WORKS ITEMS

- I. The work shall be carried out as per the drawings issued by Architect/ Consultant, relevant B.I.S codes, CPWD specifications and the code of practice and manufacturer's instructions.
- II. The contractor shall follow the safety codes as per the relevant codes.
- III. Resolving local constraints, seeking permission/ consent/ approved/ permit/ license shall be the responsibility of the contractor.
- IV. Contractors shall prepare all shop/ fabrication drawings, as and when required, obtain necessary approval from the Engineer in charge.
- V. Contractor shall co-ordinate Gantt chart and progress report on a regular basis and obtains necessary approval from engineer in charge.
- VI. Contractor shall prepare Bar bending Schedule and obtain necessary approval from Engineer In Charge.
- VII. Rate quoted shall include provision of scaffolding, hoist tackles, shuttering materials and all other materials required for the proper execution of work.
- VIII. The contractor shall provide all labors, materials and equipments required by the Engineer In Charge for testing measuring the work.
- IX. The contractor shall adhere to all local bye laws and all other statutory regulations, as applicable to this particular Site. No extra payment shall be made as the account.
- X. After completion the contractor shall satisfy himself/ Employer and the Engineer In Charge for the proper functioning of the system and shall carry out performance test in the presence of the Engineer In Charge.
- XI. All materials shall conform to the latest edition of the Bureau of Indian Standards. Standards issued from any other source may be used only if approved by NCSM/Architect and for those materials only for which appropriate BIS does not exist.
- XII. All technical specifications of all works shall conform to the latest CPWD Specifications, with up to date correction slips, amendments and additions. The work shall be carried out in general as per the latest Central Public Works Department (CPWD) specifications with up to date correction slips, amendments and additions.
- XIII. If specification for any material is not available in the above i) and ii) the contractor should consult NCSM/Architect for further clarification before execution of work or the manufacturer's manual has to be followed after NCSM/Architect approval.

TECHNICAL SPECIFICATIONS – CIVIL WORKS

1. Specifications

- 1.1 Except for the items, for which Particular Specifications are given or where it is specifically mentioned otherwise in the description of the items in the schedule of quantities, the work shall generally be carried out in accordance with the “CPWD Specifications” additional / Particular Specifications, Architectural / structural drawings and as per instructions of Engineer-in-Charge. (Elaborate CPWD specification is attached as Annexure A).
- 1.2 All Technical Specifications in respect of all material to be used, method of execution, workmanship and quality for each item of the work shall be as per CPWD specifications and latest Indian Standard unless otherwise specified.
- 1.3 Any reference made to any Indian Standard Specifications, shall imply to the latest version of that standard, including such revisions / amendments as issued by the Bureau of Indian Standards up to last date of receipt of tenders.
- 1.4 The Contractor shall keep at his own cost all such publications including relevant Indian Standard Codes applicable to the work at site.

2. Materials :

Cement : 43 grade Ordinary Portland cement (OPC) confirming to IS 8112 procured from preferred manufacturers as listed in these documents shall be used in works.

Reinforcement Steel : TMT reinforcement bars of Fe 500 grade confirming to IS 1786-2000 procured from preferred manufacturers as listed in these documents shall be used in works.

Solid Concrete Block: Shall be of 100 mm/200mm thick and strength of not less than 35kg/sq.cm. Conforming to IS: 2185–1992.

Coarse Aggregate: Shall be of the best quality, hard machine crushed granite stone approved by the engineer in charge, free from earth or any organic matter etc. Suitably graded and shall conform to IS: 383-1990.

Fine aggregate : Shall be clean, sharp, strong, angular and composed of hard siliceous materials. It shall be free from any harmful materials such as iron pyrites, coal mica, shale, clay alkali, soft fragments, sea shale, organic impurities, etc. it shall conform to the appropriate gradation / zones of IS. It shall be obtained from approved quarries and shall conform to IS: 383-1990.

Bricks: It shall be table moulded bricks approved by the engineer, well burnt, sound, hard square and with sharp edges and shall conform to Indian Standards 1077 – 1992 having strength of not less than 35 kg/sq. cm as specified in the item.

Timber: Shall be of best quality as specified in the schedule of quantities perfectly dry, well-seasoned and free from sap wood, sound straight, free from loose knots, cracks shakes and any appearance of root and any other defect and conforming to IS: 12896 – 1990 and shall be approved by the engineer, No wood work shall be placed in position covered in the wall unless it is approved by the engineer.

Granite: Polished granite slab and tiles shall be of the kind specified in the schedule of quantities conforming to samples approved by the engineer for colour & texture. The slab shall be machine cut to required dimensions and shall conform to IS Standards.

Paints : Plastic emulsion painting will be of approved brand of paint and colour conforming to IS: 5411 – 1991 & will be applied over a coat of primer (including preparation of wall surface).

- a) Synthetic enamel paint will be of approved brand and colour confirming to IS 4511-1993 applied over one coat of primer.
- b) Oil bound distemper will be of approved brand and colour confirming to IS 428(2000) applied over one coat of primer.
- c) Acrylic washable distemper will be of approved brand and colour confirming to IS 428(2000) applied over one coat of primer.

Aluminum – the material shall conform to IS 1285.

Structural steel –

IS: 800 : 2007 - Code of Practice for general construction in Steel

IS: 802 Part 2 : 1978 - Code of Practice for use of Structural Steel in Overhead Transmission Towers- Fabrication, Galvanizing, Inspection and Packing

IS: 806 : 1968 - Code of Practice for USE OF Steel Tubes in General Building Construction

IS: 808 : 1989 - Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections

IS:814 : 2004 - Covered Electrodes for Manual Metal Arc Welding of Carbon and Carbon Manganese Steel Specification

IS:816 : 1969 - Code of Practice for use of Metal Arc Welding for General Construction in Mild Steel.

IS:1161 : 1998 - Specification For Steel Tubes for Structural Purposes.

IS:1182 : 1983 - Recommended practice for radiographic examination of fusion welded butt joints in steel plates

IS:1363 Part 1 & 3 : 2002 - Black Hexagonal Headed Bolts, Screws, Nuts & Locknuts of Product Grade C- Hexagon Head Bolts (M5-M64)

IS:1367 Part 1 To 3 & 5 To 7 : 2002 - Technical Supply Conditions for Threaded Steel Fasteners

IS:1852 : 1985 - Rolling and Cutting Tolerances for Hot Rolled Steel Products

IS:2062 : 1999 - Steel For General Structural Purposes- Specification

IS:3502 : 1994 - Specification For Steel Chequered Plates

IS:3658 : 1999 - Code of Practice for Liquid Penetrant Flaw Detection

IS:3757 : 1985 High Strength Friction Grip Structural Bolts

IS:4260 : 2004 - Recommended Practice for Ultrasonic Testing of Butt Welds in Ferritic Steel

IS:5334 : 2003 - Code of Practice for Magnetic Flaw Detection of Welds IS:5369 : 1975 - General Requirements for Plain Washers and Lock Washers. IS:5372 : 1975- Specification - Taper Washers for Channels.

IS:5374 : 1975 - Specification - Taper Washers for I – Beams IS:6639 : 2005 - Specification for Hexagon Bolts for Steel Structures IS:7205 : 1974 Safety Code for Erection of Structural Steel Work IS:7215 : 1974 - Tolerances for Fabrication Of Steel Structures

IS:7307 Part 1 - 1974 - Approval Tests for Welding Procedures Part 1- Fusion Welding of Steel IS:7310 Part 1 : 1974 - Approval Tests for Welders working to Approved Welding Procedures Part 1- Fusion Welding of Steel

IS:7318 Part 1 : 1974 - Approval Tests for Welders when Welding Procedure Approval is not required. Part 1- Fusion Welding of Steel

IS:8500 : 1991 - Weldable structural steel (Medium and High Strength qualities) IS:9595 : 1996 Recommendation for metal arc welding of carbon manganese steel IS:12843 : 1989 - Tolerances for Erection Of Steel Structures.

Anti-termite treatment - the materials shall conform to IS 6313 part II

Admixtures: Admixtures to concrete shall not be used without the written consent of the engineer. When permitted, the contractor shall furnish full details from the manufacturer and shall carry such test as the engineer may require before any admixture is used in the work to check particularly for Chlorides.

3. Repairs to concrete work :

Wherever concrete is found with less than required quality as per acceptance criteria, repairs to concrete will be made. Honeycombed areas and loose pockets will be repaired by grouting using Portland Cement Mortar/Polymer Modified Cement Mortar /Epoxy Mortar, etc. after chipping loose concrete in appropriate manner. In areas where concrete is found below acceptance criteria and defects are not apparently visible on surface, injecting approved grout in appropriate proportion using epoxy grout /acrylic Polymer modified cements slurry made with shrinkage

compensating cement / plain cement slurry etc will be resorted to for repairs (as per relevant chapters from CPWD Hand Book on Repairs and Rehabilitation of RCC Buildings). Repair to concrete will be done till satisfactory results are obtained as per the acceptance criteria by retesting of the repaired area. If satisfactory results are not obtained dismantling and relaying of concrete will be done. No further work is allowed on these areas of unacceptable concrete.

4. Makes of Materials : The makes of materials shall be as per the details furnished in the list of preferred makes. (Elaborate List of Approved Makes is attached as Annexure B).

TECHNICAL SPECIFICATIONS OF NON SCHEDULED ITEMS AS SPECIFIED IN THE CIVIL TENDER PACKAGE

1. STAINLESS STEEL SLIDING DOOR BOLTS

Stainless steel sliding door bolts of Door set or equivalent make with necessary screws etc. all complete as per direction of Engineer-in-charge

300x16 mm 250x16 mm

Stainless steel patch fittings of approved make for frameless door Top & bottom Pivot Door Closer

Lock with adopter Floor spring

Refer manufacturer's specification.

2. SIKA TOPSEAL 109 HI

SIKA TOPSEAL 109 Hi water proofing works over terrace slab as per manufacturer's quotation all complete.

Refer manufacturer's works manual and specification.

3. STAINLESS STEEL DOOR STOPPER

Stainless steel door stopper of godrej cat no.8830 Refer manufacturer's specification.

4. STAINLESS STEEL TOWER BOLTS

Stainless steel Tower bolts of Door set or equivalent make with necessary screws etc. all complete as per direction of Engineer-in-charge

450x10 mm 200x10 mm

Refer manufacturer's specification.

5. GRC JALI

GRC Jali as per manufactures specification Refer manufacturer's specification.

6. ALUMINIUM LOUVERS

18 G -75 mm wide Aluminum louvers as per architects drawing & specifications Refer manufacturer's specification.

7. SCREEN PANEL CLADDING

Luxalon screen panel cladding fixed system manufactured by M/s Hunter Douglas (Or Equivalent) in Tree Pattern. The Screen panels of various sizes say 900 mm X 3500 mm as per design requirement shall be manufactured from high corrosion resistant aluminum of 2.0 / 3.0 mm thick. Screen panels shall have customized perforation as per architects design.

Combination of perforations to be provided to suite the design Panels. Panels shall be coated on visible side with Exterior Architectural Akzonobel Coating in approved colour. The panels of required length and height shall be fixed to sub structure by means of screen panel guide clamps of 20 x 43x 2mm GI (Installer's scope). Panels shall be

bend from all four sides and shall have extended flanges to accommodate clamps. Client shall provide sub frame made from Al/Steel.

The Panels shall be fixed to a suitable structure by means of rigid fixing details, taking into account the relevant live loads and a dead load. Installation shall be carried out as per manufacturer recommendation.

8. SLATE STONE TILE

6 mm thick Slate Stone tile (polished) work for wall lining over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand) and cement slurry @ 3.3 kg/sqm including pointing in white cement complete.

9. LAMINATED WOODEN FLOORING

8mm THICK PERGO UNIVERSAL LAMINATE FLOOR - CLASS OF USE 23(31), AC-4 as per EN

13329:2000), with 0.2mm THICK DIRECT LAMINATE ON TOP OF SPECIALLY DEVELOPED SUBSTRATE CORE OF PLANK SIZE 1285 MM X 195MM HAVING SMARTLOCK TONGUE AND GROOVE CONSTRUCTION WITH EDGES DULY IMPREGRATED TO SECURE LONG LASTING JOINTS SECURED TOGETHER CONFIRM TO EN 13329.

10. ACOUSTICAL DOORS

70 mm acoustical doors with 10 mm neoprene rubber sheet on both side seal covering inside the main core Z - frame of wooden 2nd class bars of 30 X 150 mm thick with side lapping cover of 70 mm x 12 mm. The core wooden frame should remain in the center of 70 mm lapping . Now fill the total area with synth PF 5 x50 of 500 gsm as covering on either side of the center core wood after inserting. Next Sealed with 10 mm plywood & topping as 1.5 mm laminated finish on the top of external side facing of the door. The internal side of the same door will be pasted with 2mm fabric cloth with PUF & press the 10 mm plywood with open area of square shape on the periphery of the styles & rails of the doors will be of 2nd class hard wood bead on the borders fixing where hinge of 6 inches stainless steel the Brass free from rust shall be fixed on the door & frames of thickness 150 mm thick of 2nd class hard wood to pasted on the walls with proper fixing arrangement & apply to stick silicon sealant on the gaps of frame & walls to work out as complete seal & air tight door. The locking system are handle , aldrops bolt , locking bolt made of brass , door closer with 6 mm with transparent acrylic sheet .

11. USG BORAL 62.5 mm thick USGBORAL Drywall partition system.

This includes fixing of Ultra frame brand Floor and Ceiling Ultra frame Perimeter channel (0.55 mm BMT, 28mm wide& having two flanges of 20mm and 30mm) to the RCC Floor and Slab with Approved Fasteners @ 600 mm C/C respectively. This includes fixing of Ultra frame Wall bracket shell be screw fixed onto masonry substrate using appropriate fixings spaced at 800mm vertical centres and 610mm horizontal centres. Ultra frame universal section(45mm x 0.55mm thick with two flanges of 15mm each) installed perpendicularly within the flanges of perimeter channel at not more than 406mm centres screw fixed to perimeter and wall bracket using Boral13mm Wafer Head Self Tapping screw. 50mm thick @ 48kg/cum density Rockwool Insulation to be suspended on USGBORAL Insulation Holder Strip positioned at 1200mm vertical

centers within the stud cavity. 1x 12.5 mm USGBORAL Impac Bloc Plasterboard up to 1200 mm height and then 1x12.5mm USG Boral Echo bloc Plasterboard C4 n10 up to soffit height is screw fixed to metal system using “type S” USGBORAL Self tapping 3.5 x25mm corrosion resistant drywall screws spaced at 200mm centres on all joints and 300mm centres in the field of plasterboards. Screw fixing is done mechanically. Install USGBORAL Flat Strap 90mm x 0.55mm behind horizontal board joints. Finally, plasterboards and screw heads are to be jointed and finished to have a flush look which includes filling tapered edge and square edges of board with USGBORAL APJC Compound, USGBORAL Paper Tape (As per recommended practice of USGBORAL Building Products India Pvt Ltd). All perimeters and penetrations to be sealed with acoustic sealant along with baker rod as per manufacturer’s specifications.

(Signature of Architect consultant).

TECHNICAL SPECIFICATIONS FOR ELECTRICAL WORKS

1. WORKS TO BE DONE BY THE CONTRACTOR

The scope of internal and external electrification under this contract shall include the supply of all material, labour, T&P, erection, testing and commissioning of followings:-

Sub and branch distribution boards, MCB's and RCBO's etc.

Mains and Sub mains between various panels, meter boards and distribution boards.

Point wiring with Conduits for all type of wiring including circuits, sub mains, light, fans, power and AC etc. Switches and socket outlets for light, fans, plug, power, Tel, TV, computer network etc with suitable MS/GI boxes with accessories complete)

Earthing with earth leads/strips.

Conduits and wiring for Telephone, EPABX, TV system, broad band etc. (as specified in bill of quantities Underground and above ground Cables and other allied works.

Lighting Fixtures fans and exhaust fans. (If these are supplied by the client, then the contractor will erect the fixture as required without any extra payment beyond the contract)

All the above work shall be complete in all respects up to the satisfaction of architect, consultant, Client and Engineer in charge.

Unless and otherwise mentioned in the tender documents the following works shall be done by the contractor, and therefore their cost shall be deemed to be included in their tendered cost:

- i. Foundations for equipment and components where required, including foundation bolts.
- ii. Cutting and making good all damages caused during installation and restoring the same to their original finish.
- iii. Sealing of all floor openings provided by him for pipes and cables, from fire safety point of view, after laying of the same.(if required)
- iv. Painting at site of all exposed metal surfaces of the installation other than pre-painted items like fittings, fans, switch gear/distribution gear items, cubical switchboard etc. Damages to finished surfaces of these items while handling and erection, shall however be rectified to the satisfaction of the Engineer-in-charge.
- v. Temporary shed if required over the storage space and locking arrangement thereof, and watch and ward of the materials and completed installation till completion of the work.
- vi. Water and power as may be required for installation and testing.
- vii. Testing and commissioning of completed installation.

2. ELECTRIC POWER SUPPLY AND WATER SUPPLY :-

Unless and otherwise specified, power supply and water supply as may be required shall be arranged by the contractor for installation and testing of the equipment's at the site of work.(will be made available without cost)

3. TOOLS FOR HANDLING AND ERECTION :-

All tools and tackles required for handling of equipment and materials at site of work as well as for their assembly and erection and also necessary test instruments shall be the responsibility of the contractor.

4. CO-ORDINATION WITH OTHER AGENCY :-

The contractor shall co-ordinate with all other agencies involved in the building work so that the building work is not hampered due to delay in his work. Recessed conduit and other works which directly affect the progress of building work should be given priority.

5. CARE OF BUILDINGS :-

Care shall be taken by the contractor to avoid damage to the building during execution of his part of the work. He shall be responsible for repairing all damages and restoring the same to their original finish at his cost. He shall also remove at his cost all unwanted and waste materials arising out of his work from the site, from time to time as designed by the Engineer-in-charge.

6. STRUCTURAL ALTERATIONS TO BUILDINGS :-

- i. No structural member in the building shall be damaged/altered, without prior approval from the competent authority through the Engineer-in-charge.
- ii. Structural provisions like openings, cutouts if any, provided by the department for the work, shall be used. Where these require modifications, or where fresh provisions are required to be made, such contingent works shall be carried out by the contractor at his cost.
- iii. All such openings in floors provided by the department shall be closed by the contractor after installing the cables/conduits/rising mains etc. as the case may be, by any suitable means as approved by the Engineer-in-charge without any extra payment.
All chase required in connection with the electrical works shall be provided and filled by the contractor at his own cost to the original architectural finish of the building

7. STATUTORY REGULATION AND APPROVALS:-

All electrical works shall be carried out only by those Contractors who are licensed by the concerned local authorities to execute this type of work. Only "A" Class government approved electrical contractor shall execute the job.

It shall be the responsibility of the Contractor to comply with the regulations laid down by the Indian Electricity Rules and local authorities. The Contractor shall also be responsible for obtaining all the statutory approvals/certificates for the work from the concerned Departments and these certificates shall be handed over to the Architects/Clients at the completion. All coordination with the local electric supply authorities, submitted of application, getting the desired load sanctioned shall be in the

scope of contractor. The fees required to obtain the desired load sanctioned and other legal and miscellaneous charges by local electric supply authority / undertaking shall be given by the client but all follow ups etc. shall be the contractor's responsibility.

On completion of the work, the contractor shall obtain the certificates of final inspection and approval by the local electric supply authority and deliver these certificates to the Owner/Architects in original. The contractor shall bear all expenses and fees required to obtain these certificates without which the work shall not be taken over and shall not be considered complete..

8. STANDARDS AND CODE OF PRACTICE :-

The work shall be carried out as per the enclosed Specifications of work and the construction drawings to be issued from time to time. These specifications shall be read in conjunction with National Building Code, National Electrical Code 1985, Relevant Codes of Practices and Standards as issued by ISI and Indian Electricity Rules, CPWD specifications for electrical works (all with the latest amendments). The installation shall confirm in all respects to Indian Standard code of Practices. Following BIS codes shall be referred - National Electrical Code

IS : 694 – 1977 : PVC insulated cables for working voltage up to and including 1100 volts
IS : 732 -1989 : Electrical wiring installation

IS : 1225 -1938 : Installation and Maintenance of power Cables up to and including 33KV Rating
IS : 1554 : PVC insulated heavy duty electrical cables.

IS : 1860 : Installation operation and maintenance of passenger and goods elevator. IS : 2309 -1989 : Protection of building and allied structures against lightning.

IS: 3043 -1987: Earthing

IS: 3646 (Part-1) -1992: Interior Illumination

IS: 3661 (Part-2) -1967: Current rating for cable
IS: 3661 (Part-5) -1968: Current rating for cable

IS: 5216 (Part-1) -1982: Recommendations on safety procedures and practices in electrical work.

9. MATERIAL SAMPLES AND SHOP DRAWINGS :-

It shall also be the responsibility of the Contractor to submit without any extra charge the samples of the materials/equipment as and when asked by the Architect/Consultant. If the Contractor wishes to use an alternative make due to non-availability of the approved one, he should take the prior approval of the Architect/Consultant. Under such situations the Contractor shall show such promptness as not to hamper the progress of the work.

The Contractor shall submit for Architect/Consultant's approval the shop drawings at approved scale indicating the custom-built equipment, L.T. Panels, run of cables and conduits he proposes to install.

10. ELECTRICAL DRAWINGS

- i) The electrical drawings issued from time to time to the contractor are diagrammatic but shall be following as closely as actual construction and work will permit. Any deviation from the drawings required to conform to the building construction shall be made by the Contractor at his own expenses. The architectural drawings shall take precedence over the electrical drawings as far as the civil and other trades works are concerned.
- ii) If there is any discrepancy due to in-complete description, ambiguity or omission in the drawings and other documents relating to this Contract found by the Contractor either before starting the work or during execution or after completion, the same shall be immediately brought to the attention of the Architect/Consultant and his decision would be final and binding on the Contractor.

11. TESTING AND COMMISSIONING

The Contractor shall be responsible for testing and commissioning the entire electrical installation described in these specifications and relevant IS specifications and will demonstrate the operation of the systems to the entire satisfaction of the Architect/Consultant and to the Client approval.

12. COMPLETION DRAWINGS

The contractor shall submit, after the completion of the work, one set of originals and two sets of prints of the As-Fitted drawings/Completion drawings, giving the following information.

- a. Run and size of conduits, inspection, junction and pull boxes.
 - b. Size of conductor in each circuit.
 - c. Location and ratings of sockets and switches controlling the light/fan and power outlets.
 - d. Location and details of distribution boards, mains, switches, switch gears and other particulars.
 - e. A complete wiring diagram as installed and schematic drawings showing all connections in the complete electrical system.
 - f. Location of telephone outlets, junction boxes and sizes of various conduits.
 - g. Location of all earthing stations, route and size of all earthing conductors etc.
- Layout and particulars of all cables.

13 POINT WIRING :-

13.1. DEFINITION :-

A point including socket outlet point shall include all work necessary in complete wiring to the following outlets from the controlling switch or MCB. The scope of wiring for a point shall include the circuit wiring from distribution board to the switch board and from switch board to the individual point. The wiring includes the phase, neutral and earth wire as required.

- i. Ceiling rose or connector (in the case of points for ceiling/exhaust fan points, pre wired light fittings and call bells).
- ii. Ceiling rose (in the case of pendants except stiff pendants)
- iii. Back plate (in the case of stiff pendants).

13.2. SCOPE :-

Following shall be deemed to include in point wiring.

- i. Conduit/casing and capping as the case may be, accessories for the same and wiring cables between the switch box and the point outlet.
- ii. All fixing accessories such as clips, nails, screws, Phil plug, rawl plug etc as required.
- iii. Metal switch boxes for control switches, regulators, sockets etc, recessed or surface type of modular type or piano type with sheet as required and as mentioned in BOQ.
- iv. Outlet boxes, junction boxes, pull-through boxes etc, but excluding metal boxes if any, provided with switchboards for loose wires/conduit terminations.
- v. Any special block required for neatly housing the connector.
- vi. Control switch or MCB, as specified.
- vii. 3 pin or 6 pin socket, ceiling rose or connector as required.
- viii. Connections to ceiling rose, connector, socket outlet, lamp holder, switch etc.
- ix. Interconnecting wiring between points on the same circuit, in the same switch box or from another.
- x. Protective (loop earthing) conductor from one metallic switch box to another in the distribution circuits, and for socket outlets.

Bushes conduit or porcelain tubing where wiring cables pass through wall etc.

13.3. MATERIAL :-

- i. The system of wiring shall consist of ISI marked single core, PVC insulated, FRLS, 1100 volt grade, stranded, flexible copper conductor wires as per IS: 694 amended up to date.
- ii. The Conduit and accessories shall be of ISI marked heavy duty Rigid PVC. The wall thickness shall be 2 mm.

13.4. CONDUCTOR SIZE :-

Wiring shall be carried out with following sizes of wires –

a.	Light/fan/call bell/ exhaust fan point -	1.5 sq mm.
b.	5 amp plug points -	1.5 sq mm.
c.	Light circuit -	2.5 sq mm.
d.	General / Primary Power point -	4.0 sq mm.
e.	Power point for AC -	4.0 sq mm.

13.5 Size of Earth wires shall be as per following table -

Size of point/ circuit / submain wires Earth wire

2x1.5 sqmm.	-	1.5 sqmm.
2x2.5 sqmm.	-	1.5 sqmm.
2x4 sqmm.	-	2.5 sqmm.
2x6 sqmm.	-	4 sqmm.
2x10 sqmm.	-	6 sqmm.
2x16 sqmm.	-	6 sqmm.
4x6 sqmm.	-	2x4 sqmm.
4x10 sqmm.	-	2x6 sqmm.
4x16 sqmm.	-	2x6 sqmm.

14. CIRCUIT AND SUBMAIN WIRING :-

14.1. CIRCUIT WIRING :-

Circuit wiring shall mean the wiring from the distribution board up to the tapping point for the nearest first point of that distribution circuit, viz. up to the nearest first switch box. (This is included in the point wiring)

14.2. SUB MAIN WIRING :-

Sub main wiring shall mean the wiring from one main/distribution switchboard to another

15. SYSTEM OF DISTRIBUTION AND WIRINGS :-

- i. Main distribution board shall be controlled by the circuit breaker. Each outgoing circuit shall be controlled by a circuit breaker on the phase or live conductor.
- ii. The branch distribution board shall be controlled by a circuit breaker. Each outgoing circuit shall be provided with a MCB of specified rating on the phase or live conductor.
- iii. The load of the circuits shall be divided, as far as possible, evenly between the number of ways of the distribution boards, leaving at least one spare circuit for future extension.
- iv. The neutral conductors (incoming and outgoing) shall be connected to a common link (multi way connector) in the distribution board and be capable of being disconnected individually for testing purposes.

16. BALANCING OF CIRCUITS :-

The balancing of circuits in three wire or poly phase installations shall be arranged up to the satisfaction of the Engineer-in-charge.

17. WIRING SYSTEM :-

Unless and otherwise specified the wiring shall be done only by the "Looping system". Phase or live conductors shall be looped at the switch boxes and neutral conductors at the point outlets.

Lights, fans and call bells shall be wired in the 'lighting' circuits. 15A/16A socket outlets and other power

outlets shall be wired in the 'Power' circuits. 5A/6A socket outlets shall also be wired in the "Lighting" circuit unless mentioned otherwise.

The wiring throughout the installation shall be such that there is no break in the neutral wire except in the form of a linked switch gear.

Surface wiring shall run, as far as possible, along the walls and ceiling so as to be easily accessible for inspection.

In all types of wiring, due consideration shall be given for neatness, good appearance and safety.

18. PASSING THROUGH WALLS OR FLOORS :-

i. When wiring cables are to pass through a wall, these shall be taken through a protection (steel/PVC) pipe or porcelain tube of suitable size such that they pass through in a straight line without twist or cross in them on either end of such holes. The ends of metallic pipe shall be neatly bushed with porcelain, PVC or other approved material.

Where a wall pipe passes outside a building so as to be exposed to weather, the outer end shall be bell mouthed and turned downwards and properly bushed on the open end.

19. JOINTS IN WIRING :-

i. No bare conductor in phase and/or neutral or twisted joints in phase, neutral, and/or protective conductors in wiring shall be permitted.

ii. There shall be no joints in the through-runs of cables. If the length of final circuit or sub main is more than the length of a standard coil, thus necessitating a through joint, such joints shall be made by means of approved mechanical connectors in suitable junction boxes. (sleeved straight through lug)

iii. Termination of multi stranded conductors shall be done using suitable crimping type thimbles.

20. CONFORMITY TO I.E. ACT, I.E. RULES AND STANDARDS :-

i. All electrical works shall be carried out in accordance with the provisions of the Indian Electricity Act, 1910 and Indian Electricity Rules 1956 amended up to date.

ii. The work shall also conform to relevant Indian Standard codes of practice for the type of work involved. In all electrical installation works, relevant safety codes of practice shall be followed.

The complete wiring installation shall conform to IS : 732 amended up to date.

21. GENERAL REQUIREMENTS OF COMPONENTS :-

21.1 QUALITY OF MATERIALS :-

All materials and equipment supplied by the contractor shall be new. They shall be of such design, size and material as to satisfactorily function under the rated conditions of operation and to withstand the environmental conditions at site.

21.2 RATING OF COMPONENTS :-

- i. All components in a wiring installation shall be of appropriate ratings of voltage, current and frequency, as required at the respective sections of the electrical installation in which they are used.
- ii. All conductors, switches and accessories shall be of such size as to be capable of carrying the maximum current which will normally flow through them, without their respective ratings being exceeded.

21.3 CONFORMITY OF STANDARDS:-

All components shall conform to relevant Indian Standard specification, wherever existing. Materials with ISI certification mark shall be preferred. However for conduits, wiring cables, piano/tumbler switches and socket outlets, ISI marked materials shall only be permitted.

21.4 INTERCHANGEABILITY:-

Similar parts of all switches, lamp holders, distribution fuse boards, switch gears, ceiling roses, brackets, pendants, fans and all other fittings of the same type shall be interchangeable in each installation.

APPROVED MAKES OF ACCESSORIES MK
NORTH WEST SCENIEDER
FANS/PUMPS/EXHAUST FANS CROMPTON
BAJAJ GEC KRUGER

1. SWITCHGEAR AND CONTROLGEAR

1.1. GENERAL ASPECTS :-

- i. All items of switchgear and distribution boards (DB' s) shall be double door metal clad type.
- ii. The types, rating and/or categories of switch gear and protective gear shall be as specified in the tender schedule of work.
- iii. RCCB's, ELCB's and RCBO's where specified, shall conform to the requirements of current rating, fault rating, single phase or three phase configuration and sensitivity laid down in the tender documents.
- iv. While each outgoing way of distribution board (D.B.) shall be of miniature circuit breaker (MCB) as specified, and of suitable rating on the phase conductor, the corresponding earthed neutral conductor shall be connected to a common neutral terminal block and shall be capable of being disconnected individually for testing purpose.
- v. Independent earth terminal block.

Every distribution board (single phase as well as three phase) shall have an earth terminal block identical to, but independent from neutral terminal block, to enable termination of protective (loop earthing) conductors (incoming as well as outgoing) individually by screwed connection and without twisting.

vi. Earthing terminal (1 for single phase and 2 for three phase) shall be provided on the metal cladding of switches and D.B.'s for body earthing. These shall be suitably marked.

vii. Knock out holes, with or without end plates as per standard design of manufacturers, shall be provided in the metal cladding of switches and D.B.'s for termination of conduits/cables.

viii. Each distribution board shall be provided with a circuit list giving details of each circuit which it controls and the current rating of the circuit, and the size of the fuse element.

1.2. MCB TYPE DISTRIBUTION BOARDS (MCB DB) :-

i. MCB DB's may be of single phase, three phase (horizontal type) suitable for feeding single phase loads or 3 phase (vertical type) suitable for feeding single phase as well as three phase loads, each phase isolation type three phase DB in which each phase can be isolated by a separate circuit breaker or RCCB, as specified. These shall be complete with accessories, but without MCB's, which shall be specified as a separate item in the tender documents.

ii. The current ratings and the number of ways shall be as specified. Blanking plates shall be provided to close unused ways. These shall be indicated as a separate item in the Schedule of work.

iii. MCB DB's shall be of surface/flush mounting pattern according to the requirement of their location, and shall be suitable to accommodate MCB's and MCB type isolators and RCCB (ELCB) at incoming in single pole or multi pole configuration, as required.

iv. MCB DB's shall be double door type, dust and vermin proof conforming to IP 42, and shall be fabricated out of CRCA sheet steel, 1.6 mm thick, with stove enameled paint finish.

v. In case of Concealed / Recessed D.B.'s, cutting of brick work, providing suitable lintel, making good the wall including plastering etc. with necessary civil work including all Civil material shall be included in

contractor's scope for proper completion of work.

vi. MCB DB's shall have removal type end plates with knock-outs at the bottom and top, and shall have hinged covers with locking arrangement.

vii. Only the knobs of the MCB's shall protrude out of the front covers through openings neatly machine made for the purpose.

viii. The bus bars used shall be solid electrolytic copper of appropriate sections.

ix. Din bar(s) shall be provided for mounting the MCB's.

x. The complete board shall be factory fabricated and shall be duly pre-wired in the works, ready for installation at site.

xi. The board shall be fully pre wired with single core PVC insulated copper conductors/insulated solid copper links, and terminated on to extended type terminal connectors, suitable for connections to the sizes of the respective conductors.

xii. All incoming and outgoing wiring to the pre wired MCBDB' s shall be terminated only in the extended terminal connectors to be provided within the DB. The terminal connectors shall therefore be so provided as to facilitate easy cable connections and subsequent maintenance.

1.3. A. MINIATURE CIRCUIT BREAKERS (MCB) :-

All MCB' s shall be ISI marked as per IS : 8828-1998.

ii. Ratings, numbers of poles, type of MCB shall be as specified in the tender documents.

iii. The breaking capacity of MCB' s shall be 10 KA.

2. MOULDED CASE CIRCUIT BREAKER (MCCB's)

The Moulded Case Circuit Breaker shall be magneto-thermal type or Static trip electronic release type (as specified in BOQ) for 100 Amp frame rating and current limiting type with Static trip electronic release for above 100 Amp frame rating for accurate overload and short circuit protection.

MCCB's of over 100 Amp rating shall be provided with field adjustable setting plug for accurate adjustment of continuous current. 100 Amp MCCB shall be provided with factory adjusted settings as required.

The minimum Breaking capacities of M.C.C.B.'s shall be as follows: 100 / 125 Amp
: 25 KA

160/200/250 Amp : 35 KA

300/400/630/800 Amp : 50 KA

APPROVED MAKES OF DOUBLE DOOR DISTRIBUTION BOARDS
MSD/LEGRAND

SIEMENS HAGER SCHNEIDER

MCCB/MCBs LEGRAND/HAGER/SCHNIEDER/L&T

ELCB

HAGER MDS/SIEMENS/ L&T MAIN LT & METERING PANEL FROM
APPROVED FABRICATOR

2.1. WORKMAN SHIP

i. Good workmanship is an essential requirement to be complied with. The entire work of manufacture/fabrication, assembly and installation shall conform to sound engineering practice.

ii. The work shall be carried out under the direct supervision of a first class licensed foreman, or of a person holding a certificate of competency issued by the state Government for the type of work involved, employed by the contractor, who shall rectify then and there the defects pointed out by the Engineer-in-charge during the progress of work.

2.2. COMMISSIONING ON COMPLETION

Before the workman leaves the work finally, he must make sure that the installation is in commission, after due testing.

2.2. COMPLETION PLAN AND COMPLETION CERTIFICATE

i. For all works completion certificate after completion of work shall be submitted to the Engineer-in-charge.

ii. Completion plan drawn to a suitable scale in tracing cloth with ink indicating the following, along with three blue print copies of the same shall also be submitted.

General layout of the building.

Locations of main switch board and distribution boards, indicating the circuit numbers controlled by them.

Position of all points and their controls.

d) Types of fittings, viz. fluorescent, pendants, brackets, bulkhead, fans and exhaust fans etc.

e) Name of work, job number, accepted tender reference, actual date of completion, names of Division/Sub-Division and name of the firm who executed the work with their signature.

2.3. ADDITION TO AN INSTALLATION :-

An addition, temporary or permanent, shall not be made to the authorised load of an existing installation until it has been definitely ascertained that the current carrying capacity and the condition of the existing accessories, conductors, switches etc affected, including those of the supply Authorities, are adequate for the increased load.

3. PVC CONDUIT WIRING SYSTEM

3.1 SCOPE :-

This chapter covers the detailed requirements for wiring work in non-metallic conduits. This chapter covers both surface and recessed types of wiring work.

3.2. APPLICATION :-

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc. at National Science Centre, Delhi

1. Recessed conduit work is generally suitable for all applications. Surface conduit work may be adopted in places like workshops etc. and where recessed work may not be possible to be done. The type of work shall be as specified in individual works.

2. Flexible non-metallic conduits shall be used only at terminations, wherever specified.

3. Special precautions

If the pipes are liable to mechanical damages, they should be adequately protected.

Non-metallic conduit shall not be used for the following applications

a) In concealed/ inaccessible places of combustible construction where ambient temperature exceeds 60oC.

b) In places where ambient temperature is less than 5oC.

c) For suspension of fluorescent fittings and other fixtures.

d) In areas exposed to sunlight.

3.3. MATERIAL CONDUITS

All non-metallic conduit pipes and accessories shall be of suitable material complying with IS 2509-1973 and IS : 3419-1976. for rigid conduits and IS 6946-1973 for flexible conduits. The interior of the conduits shall be free from obstructions. The rigid conduit pipes shall be ISI marked.

ii. The conduit shall be circular in cross-section. The conduit shall be designated by their nominal outside diameter. The dimensional details of rigid non-metallic conduits are given in Table.

iii. No non-metallic conduit less than 20 mm in diameter shall be used.

iv. WIRING CAPACITY

The maximum number of PVC insulated aluminium/copper conductor cables of 650/1100 V grade conforming to IS 694-1990 that can be drawn in one conduit of various sizes is given in table . Conduit sizes shall be selected accordingly.

CONDUIT ACCESSORIES :-

i. The conduit wiring system shall be complete in all respect including accessories. Rigid conduit accessories shall be normally of grip type.

Flexible conduit accessories shall be of threaded type.

iv. Bends, couplers etc. shall be solid type in recessed type of works, and may be solid or inspection type as required, in surface type of works.

v. Saddles for fixing conduits shall be heavy gauge non-metallic type with base.

vi. The minimum width and the thickness of the ordinary clips or girder clips shall be as per For all sizes of conduit, the size of clamping rod shall be 4.5mm (7 SWG) diameter

APPROVED MAKES PVC CONDUIT HEAVY DUTY 2MM WALL THICKNESS
AKG

POLYCAB SETIA.

3.4. INSTALLATION :-

1. COMMON ASPECTS FOR BOTH RECESSED AND SURFACE CONDUIT WORKS.

i. The erection of conduits of each circuit shall be completed before the cables are drawn in.

ii. CONDUIT JOINTS

All joints shall be sealed/cemented with an approved cement. Damaged conduit pipes / fittings shall not be used in the work. Cut ends of conduit pipes shall have no sharp edges nor any burrs left to avoid damage to the insulation of conductors while pulling them through such pipes.

The Engineer-in-charge, with a view to ensuring that the above provision has been

Carried out, may require that the separate lengths of conduit etc. after they have been prepared, shall be submitted for inspection before being fixed.

iii. BENDS IN CONDUITS

All bends in the system may be formed either by bending the pipes by an

approved method of heating, or by inserting suitable accessories such as bends, elbows or similar fittings, or by fixing non-metallic inspection boxes, whichever is most suitable. Where necessary, solid type fittings shall be used.

Radius of bends in conduit pipes shall not be less than 7.5 cm.

Care shall be taken while bending the pipes to ensure that the conduit pipe is not injured, and that the internal diameter is not effectively reduced.

iv. PAINTING

After installation, all accessible surface of metallic accessories shall be painted.

3.5. ADDITIONAL REQUIREMENTS FOR SURFACE CONDUIT WORK :-

Conduit pipe shall be fixed by heavy gauge non-metallic saddles with base, secured to suitable approved plugs with screws in an approved manner, at an interval of not more than 60 cm, on either side of couplers or bends or similar fittings, saddles shall be fixed at a closer distance from the center of such fittings. Slotted PVC saddles may also be used where the PVC pipe can be pushed in through the slots.

Where the conduit pipes are to be laid along the trusses, steel joists etc. the same shall be secured by means of saddles or girder clips as required by the Engineer-in-charge. Where it is not possible to use these for fixing, suitable clamps with bolts and nuts shall be used.

3.6. ADDITIONAL REQUIREMENTS FOR RECESSED CONDUIT WORK

i. MAKING CHASE

chase in the wall shall be neatly made, and of ample dimensions to permit the conduit to be fixed in the manner desired.

In the case of buildings under construction, the conduits shall be buried in the wall Before plastering, and shall be finished neatly after erection of conduit.

In case of exposed brick/rubble masonry work, special care shall be taken to fix the conduit and accessories in position along with the building work.

ii. **FIXING CONDUITS IN CHASE**

The conduit pipe shall be fixed by means of staples, or by means of non-metallic saddles, placed at not more than 60 cm apart, or shall be fixed by any other approved means of fixing. At either side of the bends, saddles/staples shall be fixed at a distance of 15 cm from the center of the bends.

iii. **ERECTION IN RCC WORK**

The conduit pipes shall be laid in position and fixed to the steel reinforcement bars by steel binding wires before the concreting is done. The conduit pipes shall be fixed firmly to the steel reinforcement bars to avoid their dislocation during pouring of cement concrete and subsequent tamping of the same.

Fixing of standard bends or elbows shall be avoided as far as practicable, and all

Curves shall be maintained by bending the conduit pipe itself with a long radius which will permit easy drawing of conductors.

Location of inspection/junction boxes in RCC work should be identified by suitable means to avoid unnecessary chipping of the RCC slab subsequently to locate these boxes.

iv. **FIXING INSPECTION BOXES**

Suitable inspection boxes to the minimum requirement shall be provided to permit inspection, and to facilitate replacement of wires, if necessary.

These shall be mounted flush with the wall or ceiling concrete. Minimum 65 mm Depth junction boxes shall be used in roof slabs.

Suitable ventilating holes shall be provided in the inspection box covers.

v. **FIXING SWITCH BOXES AND ACCESSORIES**

Switch boxes shall be mounted flush with the wall. All outlets such as switches, socket outlets etc. shall be flush mounting type, unless otherwise specified in the additional specification.

vi. **FISH WIRE**

To facilitate subsequent drawing of wires in the conduit, GI fish wire of 1.2 mm (18 SWG) shall be provided along with the laying of the recessed conduit.

3.7. BUNCHING OF CABLES

a) Cable carrying alternating current, installed in metal conduit, shall always be bunched so that the outgoing and return cables are drawn into the same conduit.

b) Where the distribution is for single phase loads only, conductors for these phases shall be drawn in one conduit.

c) In case of three phase loads, separate conduits shall be run from the distribution boards to the load points, or outlets as the case may be.

3.8. EARTHING REQUIREMENTS

A protective (earth) conductor shall be drawn inside the conduit in all distribution circuits to provide for earthing of non-current carrying metallic parts of the installation. These shall be terminated on the earth terminal in the switch boxes, and/or earth terminal blocks at the DB's.

Protective conductors of large size which may not be possible to be carried inside the conduits (as in the case of some sub mains etc.) may be laid external to the conduits and clamped thereto suitably.

Gas or water pipes shall not be used as protective conductors (Earth medium).

TABLE - 3.

DIMENSIONAL DETAILS OF RIGID NON-METALLIC CONDUITS.

(All dimensions in mm)

S.No. Nominal outside diameter

(In mm)	Maximum outside diameter				
(In mm)	Minimum inside diameter				
(In mm)	Maximum permissible eccentricity				
(In mm)	Maximum permissible ovality				
(In mm)					
1. 20	20 +0.3	17.2	0.2	0.5	
2. 25	25 +0.3	21.6	0.2	0.5	
3. 32	32 +0.3	28.2	0.2	0.5	
4. 40	40 +0.3	35.8	0.2	0.5	
5. 50	50 +0.3	45.0	0.4	0.6	

TABLE - 4

MAXIMUM NUMBER OF PVC INSULATED 650/ 1100 VOLT GRADE ALUMINIUM/COPPER CONDUCTOR CABLE THAT CAN BE DRAWN INTO RIGID PVC CONDUIT.

Nominal cross sectional area of

conductor in Sqmm. 20

mm	25			
mm	32			
mm	40			
mm				
1.50	6	10	14	-
2.50	5	8	12	-
4.00	3	6	10	-
6.00	2	5	9	-
10.00	-	4	7	8
16.00	-	2	4	5

25.00 - - 2 4

Note :-

The above table shows the maximum capacity of conduits for a simultaneous drawing of cables.

TABLE - 5.

ORDINARY CLIPS OR GIRDER CLIPS.

S.No.	Size of conduit	Width	Thickness
1.	20 mm & 25 mm	19 mm	20 SWG (0.9144 mm)
2.	32 mm & above	25 mm	18 SWG (1.219 mm)

4. EARTHING

4.1. SCOPE

This chapter covers the essential requirements of earthing system components and their installation. For details not covered in these specifications. IS code of Practice on Earthing (IS:3043-1987) shall be referred to.

4.2. INSTALLATION (in case of plate / pipe earthing)

1. ELECTRODES

Plate electrode shall be buried in ground with its faces vertical, and its top not less than 3 m below the ground level. The installation shall be carried out as per standard drawing.

When more than one electrode is to be installed, a separation of not less than 2 m shall be maintained between two adjacent electrodes.

a) The strip or conductor electrode shall be buried in trench not less than 0.5 m deep.

b) If condition necessitate the use of more than one strip or conductor electrode, they shall be laid as widely distributed as possible, in a single straight trench where feasible, or preferably in a number of trenches radiating from one point.

iv. Earth Electrodes shall be kept clear of the building foundation & in no case shall it be nearer than 2 meters from the outer surface of the wall.

2. WATERING ARRANGEMENT

In the case of plate earth electrodes, a watering pipe 20mm dia. medium class pipe shall be provided and attached to the electrodes. A funnel with mesh shall be provided on the top of this pipe for watering the earth.

The watering funnel attachment shall be housed in a masonry enclosure of size not less than 30cm*30cm*30cm.

A cost iron/MS frame with MS cover, 6 mm thick, and having locking arrangement shall be suitably embedded in the masonry enclosure.

3. EARTHING CONDUCTOR (Main earthing lead)

The earthing conductor shall be securely terminated on to the plate with two bolts, nuts, check nuts and washers.

A double C-clamp arrangement shall be provided for terminating tape type earthing conductor with GI watering pipe coupled to the pipe earth electrode. Galvanized "C" shaped strips, bolts, washers, nuts and check nuts of adequate size shall be used for the purpose.

The earthing conductor from the electrode up to the building shall be protected from mechanical injury by a medium class 15 mm dia GI pipe in the case of wire, and by 40 mm dia, medium class GI pipe in the case of strip. The protection pipe in ground shall be buried at least 30 cm deep (to be increased 60 cm in case of road crossing and pavements). The portion within the building shall be recessed in walls and floors to adequate depth in due co-ordination with the building work.

The earthing conductor shall be securely connected at the other end to the earth stud/earth bar provided on the switchboard by:

Soldered or preferably crimped lug, bolt, nut and washer in the case of wire, and, Bolt, nut and washer in case of strip conductor.

Earthing Terminal / neutral point / earth bus in case of equipments / sub stations.

4. PROTECTIVE (Loop earthing/earth continuity) CONDUCTOR

Earth terminal of every switchboard in the distribution system shall be bonded to the earth bar/terminal of the upstream switchboard by protective conductor(s).

Two protective conductors shall be provided for a switchboard carrying a 3 phase switch gear thereon. All the mountings of industrial type switchboards shall be bonded to the earth stud/earth bar using a protective conductor looping from one to another. Loop earthing of individual units will not be however necessary in the case of cubical type switchboards.

The earth connector in every distribution board (DB) shall be securely connected to the earth stud/earth bar of the corresponding switchboard by a protective conductor.

All metallic switch boxes and regulator boxes in a circuit shall be connected to the earth connector in the DB by protective conductor (also called circuit protective or loop earthing conductor), looping from one box to another up to the DB.

The earth pin of socket outlets as well as metallic body of fan regulators shall be connected to the earth stud in switch boxes by protective conductor. Where the switch boxes are non-metallic type, these shall be

looped at the socket earth terminals, switch or at an independent screwed connector inside the switch box. Twisted earth connections shall not be accepted in any case

5. EARTH RESISTANCE :-

The earth resistance at each electrode shall be measured. No earth electrode shall have a greater ohmic resistance than 5 ohms as measured by an approved earth testing apparatus. In rocky soil the resistance may be up to 8 ohms.

Where the above stated earth resistance is not achieved, necessary improvement shall be made by additional provisions, such as additional electrode(s), different type of electrode, or artificial chemical treatment of soil etc., as may be directed by the Engineer-in-charge.

iii. If the earth resistance is too high and the multiple electrode earthing does not give adequate low resistance to earth, then the soil resistivity immediately surrounding the earth electrodes shall be reduced by adding sodium chloride, calcium chloride, sodium carbonate, copper sulphate, salt and soft coke or charcoal in suitable proportions.

6. MARKING :-

i. Earth bars/terminals at all switchboards shall be marked permanently either as "E".

ii. Main earthing terminal shall be marked "SAFETY EARTH - DO NOT DISCONNECT".

5. CABLES

5.1. GENERAL

All cables shall be supplied, inspected, laid tested and commissioned in accordance with drawings, specifications, relevant Indian standards specifications and cable manufacturer's instructions. The cable shall be delivered at site in original drums with manufacturer's name clearly written on the drum.

The recommendations of the cable manufacturer with regard to jointing and sealing shall be strictly followed.

The laying of cable shall be done as per IS 1255 amended up to date.

5.2. MATERIAL

The 1.1 KV MV cables shall be XLPE insulated PVC sheathed aluminium conductor armoured conforming to IS : 7098 (part - 1) amended up to date, laid in trenches, ducts and underground as shown on drawing or as per instruction given by engineer-in-charge.

The Aluminium conductor shall be stranded, grade H4 class 2 as per IS 8130 and copper conductor shall be annealed copper class 2 as per IS 8130.

Technical data sheets for above cables, including all electrical & mechanical parameters shall be furnished with offer.

5.3. INSPECTION

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

5.4. 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 avoidance of jointing in cables. This apportioning shall be got approved by the engineer-in-charge before the cables

are cut to lengths. Straight joints are prohibited and shall not be allowed in any case without the permission of consultant.

5.5. JOINTING

Aluminium conductor cables of 16 sq mm and above shall be terminated in adequately rated tinned copper cable sockets. In the case of cables less than 16 sqmm, the ends should be thoroughly tinned with solder before connection to terminals.

5.6. CABLE SUPPORTS

Cables shall be laid on MS cables racks or trays with supports spaced not more than apart. For cables run vertically through service shaft, cable racks shall be provided.

5.7. Test certificates

Test certificates of all the test carried out at the works shall be turn shed in six (6) copies for approval of the engineer in charge.

Test reports shall be completed with all details and shall also contain IS specified limit values wherever applicable to facilitate review.

The cable shall be dispatched from works only after receipt of engineer in charge written approved of the test reports.

5.8. Drawings, data and manuals :

Drawings, data and manuals shall be submitted in triplicate on the following. Manufacturer's catalogues giving cable construction details and characteristics.

Cable current ratings for different types of installation inclusive of derating factors for ambient temperatures, grouping etc.

Write up on manufacturer's recommended method of splicing, jointing, termination etc of the cables.

6. STORAGE AND HANDLING

Cable drums shall be stored on a wall drained, hard surface, preferably of concrete, so that the drums do not sink in the ground causing rot and damage to the cable drums. The cable drum shall conform to IS : 10418.

During storage periodical rolling of drums once in 3 months through 90° shall be done especially in the case of paper insulated cables. Rolling shall be done in the direction of arrow marked on the drum.

It should be ensured that both ends of the cable are properly sealed to prevent ingress/absorption of moisture by the insulation.

Protection from rain and sun is preferable. Sufficient ventilation between cable drums, should be ensured during storage.

The drums shall always be rested on the flanges and not on the flat sides. Damaged battens of drums etc. should be replaced, if necessary.

When cable drums have to be moved over short distances, they should be rolled in the direction of the arrow, marked on the drum.

For transportation over long distances, the drum should be mounted on cable drum wheels strong enough to carry the weight of the drum and pulled by means of ropes. Alternatively, they may be mounted on a trailer or on a suitable mechanical transport.

When unloading cable drums from vehicles, a crane shall preferably be used. Otherwise the drum shall be rolled down carefully on a suitable ramp or rails, where necessary.

While transferring cable from one drum to another, the barrel of the new drum shall have a diameter not less than that of the original drum.

Cable with kinks and straightened kinks or with similar apparent defects like defective armouring etc. shall be rejected.

Cable from the stores shall be supplied by this contractor as per the site requirement in cut pieces at the stores.

7. INSTALLATION

7.1 General

The cable installation including necessary joints shall be carried out in accordance with the specifications given herein. For details not covered in these specifications. I.S. 1255 – 1967 shall be followed.

7.2 Route

Before the cable laying work is undertaken, the route of the cable shall be decided by the engineer in charge. While shortest practicable route should be preferred, cable runs shall generally follow fixed developments such as roads, foot-paths etc. with proper offsets so that future maintenance, identification etc. are rendered easy.

7.3 Laying Methods

Cables shall be laid direct in ground in pipes/closed ducts, in open ducts or on surface depending on environmental conditions.

7.4 Laying in Pipes

In locations such as road crossing, entry to building, on poles, in paved areas etc. cables shall be laid in pipes

8. TESTING OF INSTALLATION

8.1 SCOPE :-

This chapter describes the details of tests to be conducted in the completed internal electrical installations, before commissioning.

8.2. GENERAL :-

1 Tests :-

On completion of installation, the following tests shall be carried out :- Insulation resistance test.

Polarity test of switch.

Earth continuity test.

Earth electrode resistance test.

2 Witnessing of tests :-

Testing shall be carried out for the completed installations, in the presence of and to the satisfaction of the Engineer-in-charge by the contractor. All test results shall be recorded and submitted to the Department.

3 Test instruments :-

All necessary test instruments for the tests shall be arranged by the contractor if so required by the Engineer-in-charge.

8.3 INSULATION RESISTANCE :-

1 The insulation resistance shall be measured by applying between earth and the whole system of conductors, or any section thereof with all fuses in place, and all switches closed, and except in earthed concentric wiring, all lamps in position, or both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure, provided it need not exceed 500 volts for medium voltage circuits. Where the supply is derived from a three wire D.C. , or a poly phase

A.C. system, the neutral pole of which is connected to earth either directly or through added resistance, the working pressure shall be deemed to be that which is maintained between the phase conductor and the neutral.

2 The insulation resistance shall also be measured between all the conductors connected to one pole, or phase conductor of the supply, and all the conductors connected to the neutral, or to the other pole, or phase conductors of the supply with all the lamps in position and switches in “off” position.

3 The insulation resistance in megaohms measured as above shall not be less than 12.5 megaohms for the wiring with PVC insulated cables, subject to a minimum of 1 megaohm.

4 Where a whole installation is being tested, a lower value than that given by the formula, subject to a minimum of 1 megaohm, is acceptable.

5 A preliminary and similar test may be made before the lamps etc. are installed, and in this event the insulation resistance to earth should not be less than 25 mega ohms for the wiring with PVC insulated cables, subject to a minimum of 2 mega ohms.

6 The term “out let” includes every point along with every switch, except that a switch combined with a socket outlet, appliance or lighting fitting is regarded as one out let.

7 Control rheostats, heating and power appliances and electric signs may, if required, be disconnected from the circuit during the test, but in that event the insulation resistance between the case or frame work, and all live parts of each rheostat, appliance and sign, shall be not less than that specified in the relevant Indian Standard Specifications, or where there is no such Specification, shall be not less than one mega ohm.

8.4 POLARITY TESTS OF SWITCH :-

1 In a two wire, installation, a test shall be made to verify that all the switches in every circuit have been fitted in the same conductor throughout, and such conductor shall be labeled or marked for connection to the phase conductor, or to the non-earthed conductors of the supply.

2 In a three wire or a four wire installation, a test shall be made to verify that every non-linked single pole switch is fitted in a conductor which is labeled, or marked for connection to one of the phase conductors of the supply.

3 The installation shall be connected to the supply for testing. The terminals of all switches shall be tested by a test lamp, one lead of which is connected to the earth. Glowing of test lamp to its full brilliance, when the switch is in “on” position irrespective of appliance in position or not, shall indicate that the switch is connected to the right polarity.

8.5. TESTING OF EARTH CONTINUITY PATH :-

The earth continuity conductor, including metal conduits and metallic envelopes of cables in all cases, shall be tested for electric continuity. The electrical resistance of the same along with the earthing lead, but excluding any added resistance, or earth leakage circuit breaker, measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

8.6. MEASUREMENT OF EARTH ELECTRODE RESISTANCE :-

1 Two auxiliary earth electrode, besides the test electrode, are placed at suitable distance from the test electrode (see figure). A measured current is passed between the electrode ‘A’ to be tested and an

auxiliary current electrodes ‘C’ and the potential difference between the electrode ‘A’ and auxiliary potential ‘B’ is measured. The resistance of the test electrode ‘A’ is then given by :-

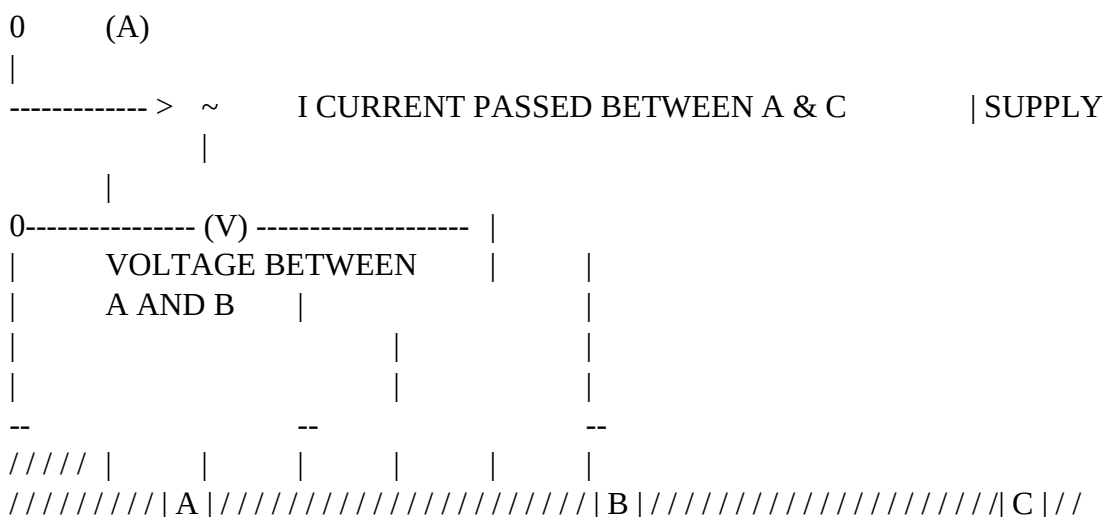
$$R = V / I$$

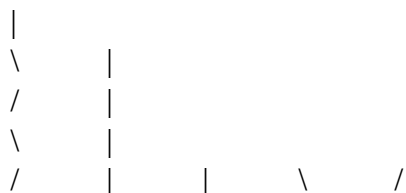
Where :-

R - Resistance of the test electrode in ohms.

V - Reading of the voltmeter in volts. I - Reading of the ammeter in

amps





Earth electrode

Auxillary earth

Auxillary earth

To be tested electrode electrode

2 (i) Stray currents flowing in the soil may produce serious errors in the measurement of earth resistance. To eliminate this, hand driven generator is used.

(ii) If the frequency of the supply of hand driven generator coincides with the frequency of stray current, there will be wandering of instrument pointer. An increase or decrease of generator speed will cause this to disappear.

3 At the time of test, the test electrode shall be separated from the earthing system.

4 The auxiliary electrodes shall be of 13 mm diameter mild steel rod driven up to 1 m into the ground.

5 All the three electrodes shall be so placed that they are independent of the resistance area of each other. If the test electrode is in the form of a rod, pipe or plate, the auxiliary current electrode 'C' shall be placed at least 30 m away from it, and the auxiliary potential electrode 'B' shall be placed midway between them.

6 Unless three consecutive readings of test electrode resistance agree, the test shall be repeated by increasing the distance between electrodes A and C up to 50 m, and each time placing the electrode B midway between them.

7 On these principles, "Megger Earth Tester", containing a direct reading ohm – meter, a hand driven generator and auxiliary electrodes are manufactured for direct reading of earth resistance of electrodes.

8.7. TEST CERTIFICATE: -

On completion of an electrical installation (or an extension to an installation), a certificate shall be furnished by the contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out.

9. L.T. PANEL

9.1 Scope

This covers supply/ erection/ testing and commissioning of the equipments suitable for 415 Volt, 3 Phase, 50 HZ 4 wire system.

9.2 Requirements

(i) For each equipment, required IP rating and short circuit rating capacity will be specified. Governing BIS also will be specified.

(ii) All the equipments will be factory fabricated in an approved factory having modern fabrication and testing process. It shall have seven tank pre-treatment process comprising of degreasing, rinsing, de-rusting, rinsing, phosphatising, rinsing and passivation followed by powder coat painting having a paint thickness of 60 microns

or as specified. The powder paint will be subjected to oven-heated process. All panels will be provided with suitable gasket to make it dust/ vermin proof.

9.3. Specification of LT Cubicle Panel

1 Cubicle panel shall be floor mounted (on a base frame) totally enclosed and extensible type. The general construction shall conform to IS 8623 : 93. The design shall include all provisions for safety of operating and maintenance personnel. Degree of IP protection shall be IP-42 for indoor application and IP-54 for outdoors, unless

otherwise specified.

2 The panel shall be compartmentalized type having space and arrangement for incoming cable/ bus ducting, incoming switchgear/ switchgears, bus coupler, insulated and properly supported compartmentalized bus bars, outgoing compartmentalized switchgear, bus bar supports, joint shrouds, cable alleys of suitable size for cabling routing, support and terminations, inter-connection between bus bars and switchgear with auxiliary bus bars/ insulated conductors/ strips etc. Also the panel will be provided with necessary instrumentation like CTs, PTs, Ammeters, Voltmeters, phase indicating lamps, other required instruments, wiring, fuses etc.

3 It shall be fabricated out of CRCA sheet not less than 2.0 mm thick for load bearing members and 1.6 mm for doors of LT panels.

Iron/ Channel/ Bolted type construction. General constructions shall employ the principle of compartmentalization and segregation of each circuit. Unless otherw

incomer and bus section panels shall be separate and independent

and shall not be mixed with sections required for feeders. Each section of the rear accessible type board shall have hinged access door at the rear. Operating

handle of the highest unit shall be at a height not more than 1.7 mt. Overall height of the board shall not exceed 2.3 meter

9.4. Arrangement for Incoming/Outgoing Cable Termination

Cable entries shall be provided either from the rear or from the front through cable alleys of suitable size. Removable gland plate to be provided for each cable entry. Cable support arrangement to be provided inside cable alley so that cables are neatly arranged and fixed. From each outgoing switch, insulated strip/ conductor of suitable size to be provided up to suitable terminal block, which will receive incoming/ outgoing cable termination. It is desirable that cables are not terminated directly to switchgear, but terminated through proper terminal blocks.

9.5. Specification of Cable Terminal Block

Terminal block of reputed make shall be used. The housing material shall be polyamide having unbreakable and fire-retardant characteristic. All the metal parts shall be made up of copper alloy including the screws. Mounting shall be 'Din' or 'G-rail' type. Screws shall be self captive type. No protection cover is required, and the block should be touch proof.

9.6. Bus bars/ Supports/ Clearances

The bus bar system may comprise of a system of main/ auxiliary bus bars run in bus bar alleys.

(a) Rating

Bus bars shall be made of wrought aluminium or aluminium alloy, or electric grade copper, conforming to relevant Indian Standard, as

specified. The ratings of the bus bars shall be 100A, 150 A, 200A, 300A, 400A, 500A, 600A, or 800A as specified.

(b) Current Density

Bus bars shall be of sufficient cross-section so that a current density of 130A/ sq.cm (800A/sq.inch) is not exceeded at nominal current rating for aluminium bus bars, and 160A/sq.cm (1000A/sq.inch) for

copper bus bars. The minimum sizes of sections of bus bars are given below

Current rating in Amps. Upto Recommended rectangular cross section

		Aluminium		Copper	
		No.of			
strip/phase		Size in mm		No.of	
strip/phase		Size in mm			
100	1	20x5	1	20x3	
200	1	30x5	1	25x5	
300	1	50x5	1	40x5	
400	1	50x6	1	50x5	
500	1	75x6	1	60x5	
600	1	80x6	-	-	
800	1	100x6	-	-	
1000	1	100x10	-	-	
1200	1	125x10	-	-	
1600	2	100x10	-	-	
2000	2	125x10	-	-	
2500	3	125x10	-	-	

(c) Cross Section of Bus Bars

The cross section of the neutral bus bar shall be the same as that of the phase bus bar for bus bars of capacities upto 200A; for higher

capacities, the neutral bus bar must not be less than half the cross- section of that of the phase bus bar.

(d) Insulation

Each bus bar shall be suitably insulated with PVC sleeves/ tapes.

The insulation of the rising mains shall be capable of withstanding the voltage of 660 V of AC.

(e) Bus Bar Supports

Bus bar support insulators shall be class F insulators made of non- hygroscopic, non-combustible, track resistant and high strength FRP/ SMC/ DMC material, and shall be of suitable size and spacing to withstand the dynamic stresses due to short circuit currents. The spacing between two insulators should be provided by the manufacturers according to the design approved by CPRI for their bus bar supports.

(f) Bus Bar Clearances

The minimum clearance to be maintained for enclosed indoor air insulated bus bars for medium voltage applications shall be as follows:

Between Min. Clearances

Phase to earth 26 mm Phase to phase 32 mm

Note: For strip connection from bus bars to switchgear, the above clearances don't apply.

(a) Bus bar joints shall be thoroughly cleaned and a suitable oxidizing grease shall be applied before making the joint.

(b) High tensile bolts, plain and spring washers shall be provided to ensure good contact at the joints.

(c) The overlap of the bus bars at the joints shall be not less than the area of the cross section of the bus bars.

9.7 Earthing;

2no. 20x3 mm copper strip for LT PANEL UPTO 400 Amp. Capacity or 2no. 20x5 mm copper strip for LT panel of higher capacity shall be fixed all around the panel connected to 2no. earth bus copper strips connected to incoming earth conductors.

9.8 Commissioning

After erection, the LT panel will be commissioned after:

(a) Tightening of all nuts and bolts.

(b) Closing any left out holes to ensure the entire panel is insect proof. (c) Megger testing.

(d) Earth testing.

Thanks and Regards,

(Signature of Architect consultant).

ANNEXURE – C

TECHNICAL SPECIFICATIONS FOR PLUMBING & FIRE FIGHTING WORKS.

Part A :- TECHNICAL SPECIFICATIONS FOR PLUMBING WORKS.

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

Section A: GENERAL REQUIREMENTS

1 Scope of work

1.1 The form of Contract shall be according to the "Conditions of Contract". The following clauses shall be considered as an extension and not in limitation of the obligation of the Contractor.

1.2 Work under this Contract shall consist of furnishing all labour, materials, equipment and appliances necessary and required. The Contractor is required to completely furnish all the plumbing and other specialised services as described hereinafter and as specified in the schedule of quantities and/or shown on the plumbing drawings.

1.3 Without restricting to the generality of the foregoing, the sanitary installations shall include the following:-

Plumbing Works

- Sanitary Fixtures
- Soil, Waste, Vent, Rainwater Pipes & Fittings
- Water Supply System
- Internal Sewerage & Storm Water Drainage

1.4 Services rendered under this section shall be done without any extra charge.

2 Specifications

2.1 Work under this Contract shall be carried out strictly in accordance with specifications attached with the tender.

2.2 Items not covered under these specifications or due to any ambiguity or misprints, or additional works, the work shall be carried out as per specifications of the latest Central Public Works Department with upto date amendments as applicable in the Contract.

2.3 Works not covered under para 2.1 and 2.2 shall be carried out as per relevant Codes & Bureau of Indian Standards and in case of its absence as per British Standard Code of Practice.

3 Execution of work

3.1 The Contractor should visit and examine the site of work and satisfy himself as to the nature of the existing roads and other means of communication and other details pertaining to the work and local conditions and facilities for obtaining his own information on all matters affecting the execution of work. No extra charge made in consequence of any

misunderstanding, incorrect information on any of these points or on ground of insufficient description will be allowed.

3.2 The work shall be carried out in conformity with the Plumbing drawings and within the requirements of architectural, HVAC, electrical, structural and other specialised services drawings.

3.3 The Contractor shall cooperate with all trades and agencies working on the site. He shall make provision for hangers, sleeves, structural openings and other requirements well in advance to prevent hold up of progress of the construction schedule. All supports to the civil structure shall be provided with dash fasteners.

3.4 On award of the work, Contractor shall submit a schedule of construction in the form of a PERT chart or BAR chart for approval of the Project Manager/Architect/ Consultant. All dates and time schedule agreed upon shall be strictly adhered to within the stipulated time of completion/ commissioning along with the specified phasing, if any.

4 Drawings

4.1 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 services drawings.

4.2 Architectural drawings shall take precedence over plumbing or other services drawings as to all dimensions.

4.3 Contractor shall verify all dimensions at site and bring to the notice of the Project Manager all discrepancies or deviations noticed. Decision of the Project Manager shall be final.

4.4 Large size details and manufacturers dimensions for materials to be incorporated shall take precedence over small scale drawings.

4.5 Any drawings issued by the Architects/Consultant for the work are the property of the Architects/ Consultant and shall not be lent, reproduced or used on any works other than intended without the written permission of the Architects/Consultant.

5 Inspection and testing of materials

5.1 Contractor shall be required, if requested, to produce manufacturers test certificate for the particular batch of materials supplied to him. The tests carried out shall be as per the relevant Bureau of Indian Standards.

5.2 For examination and testing of materials and works at the site Contractor shall provide all testing and gauging equipment necessary but not limited to the following:

- a) Steel tapes

- b) Weighing machine
- c) Plumb bobs, spirit levels, hammer
- d) Micrometers
- e) Hydraulic machine

5.3 All such equipment shall be tested for calibration at any approved laboratory, if required by the Project Manager. All testing equipment shall be preferably located in special room meant for the purpose.

5.4 Samples of all materials shall be got approved before placing order and the approved samples shall be deposited with the Project Manager.

6 Metric conversion

6.1 All dimensions and sizes of materials and equipment given in the tender document are commercial metric sizes.

6.2 Any weights, or sizes given in the tender having changed due to metric conversion, the nearest equivalent sizes accepted by Indian Standards shall be acceptable without any additional cost.

7 Reference points

7.1 Contractor shall provide permanent bench marks, flag tops and other reference points and check that with other agencies to confirm the same reference point for all the proper execution of work and these shall be preserved till the end of the work.

7.2 All such reference points shall be in relation to the levels and locations, given in the architectural and plumbing drawings.

8 Reference drawings

8.1 The Contractor shall maintain one set of all drawings issued to him as reference drawings. These shall not be used on site. All important drawings shall be mounted on boards and placed in racks indexed. No drawings shall be rolled.

8.2 All corrections, deviations and changes made on the site shall be shown on these reference drawings for final incorporation in the completion drawings to be submitted by the contractor in fulfilment of the conditions of this contract.

8.3. On award of the work the contractor shall be issued four sets of consultant's working drawings stamped "good for construction" by the Project Manager. The consultant's drawings shall be the basis of contractor's shop drawings. In addition, the Project Manager shall

also issue one copy of the Interior Designer's; Electrical & HVAC approved shop drawings relevant to his work

8.4 Shop drawings are detailed working drawings which incorporate the contractor's details for execution of the work and incorporate equipment manufacturer's details and dimensions to ensure that the same can be installed in the space provided.

8.5 All shop drawings should detailed pipe routing and levels, showing location of other services at crossings etc., cable runs, route cable trays and all allied works and must be fully co-ordinated with other services and approved by the Project Manager before execution of the works. Project Manager shall arrange to issue two copies/prints of services drawings from the respective contracting agencies. Additional copies/prints may be provided on payment of actual cost of the copies/ prints. All drawings will valid only when stamped and issued by the Project Manager.

8.6 Shop drawings shall also be furnished for detailed layout of all equipment, foundation, bolting and vibration elimination details along with information on dead and dynamic load, vibration etc.

8.7 Six sets of manufacturer's equipment drawings, roughing in and wiring diagrams shall be submitted.

8.8 Contractor shall submit shop drawings furnishing all details of MCC panels, cable routes, wiring diagrams and connection details as required.

8.9 Three copies of each set of shop drawings shall be submitted for initial scrutiny, discussion and approval.

8.10 Each submission shall be accompanied by contractor's certificate stating that the shop drawings meet all the contract requirements and that the piping and equipment can be satisfactorily installed without any obstructions in the space available.

8.11 On approval of the above the contractor shall furnish six sets of the approved shop drawings for execution of the work.

9 Completion drawings

9.1 On completion of work, Contractor shall submit one complete set of original tracings and two prints of "as built" drawings to the Project Manager. These drawings shall have the following information.

a) Run of all piping, diameters on all floors, vertical stacks and location of external services.

b) Ground and invert levels of all drainage pipes together with location of all manholes and connections up to outfall.

c) Run of all water supply lines with diameters, locations of control valves, access panels.

d) Location of all mechanical equipment with layout and piping connections and mechanical equipment.

f) All shop drawings shall be updated from time to time for the purpose of making completion drawings.

No completion certificate shall be issued unless the above drawings are submitted.

9.2 Contractor shall provide four sets of catalogues, service manuals, manufacturer's drawings, performance data and list of spare parts together with the name and address of the manufacturer for all electrical and mechanical equipment provided by him.

9.3 All "warranty cards" given by the manufacturers shall be handed over to the Project Manager.

10. Contractor's rates

10.1 Rates quoted in this tender shall be inclusive of cost of materials, labour, supervision, erection, tools, plant, scaffolding, service connections, transport to site, taxes, octroi and levies, breakage,

wastage and all such expenses as may be necessary and required to completely do all the items of work and put them in a working condition.

10.2 Rates quoted are for all heights and depths and in all positions as may be required for this work.

10.3 All rates quoted must be for complete items inclusive of all such accessories, fixtures and fixing arrangements, nuts, bolts, hangers as are a standard part of the particular item except where specially mentioned otherwise.

10.4 All rates quoted are inclusive of cutting holes and chases in walls and floors and making good the same with cement mortar/concrete/water proofing of appropriate mix and strength as directed by the Project Manager. Contractor shall provide holes, sleeves, recesses in the concrete and masonry work as the work proceeds. All hot and cold water supply pipes crossing masonry walls shall be provided with G.I. pipe sleeves. The annular space between the pipe and sleeve shall be filled up with fire proof sealant after testing. Contractor shall give the pipe sleeves to the civil contractor well in time so that the same can be fixed along with civil works. Any co-ordination gap shall be of contractor's responsibility.

10.5 The Contractor shall furnish the Project Manager with vouchers & test certificates, on request, to prove that the materials are as specified and to indicate that the rates at which the materials are purchased in order to work out the rate analysis of non tendered items which he may be called upon to carryout.

11 Testing

11.1 Piping and drainage works shall be tested as specified under the relevant clauses of the specifications.

11.2 Tests shall be performed in presence of the Project Manager and test records for the tests shall be duly signed by Contractor and the Project Manager.

11.3 All materials and equipment found defective shall be replaced and whole work tested to meet the requirements of the specifications.

11.4 Contractor shall perform all such tests as may be necessary and required by the local authorities to meet municipal or other bye-laws in force.

11.5 Contractor shall provide all labour, equipment and materials for the performance of the tests.

12 Site clearance and cleanup

12.1 The Contractor shall, from time to time, clear away all debris and excess materials accumulated at the site.

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

12.3 On completion of all works, Contractor shall demolish all stores, remove all surplus materials and leave the site in a broom clean condition, failing which the same shall be done by the Project Manager at the Contractor's risk and cost. Cost of the cleanup shall be deducted from the contractor's bills on pro-rata basis in proportion to his contract value.

13 Licence permits and authorities

13.1 Contractor must hold a valid plumbing or any other as required licence by the municipal authority or other competent authority under whose jurisdiction the work falls.

13.2 Contractor must keep constant liaison with the local development, municipal/statutory authority and obtain approval of all drainage, water supply, fire suppression and other works carried out by him.

13.3 Contractor shall obtain, from the municipal and other authorities 'C' & 'D' & other forms as required for approval of drainage and water supply works during execution and the completion certificate with respect to his work as required for occupation of the building. Contractor shall

obtain permanent water supply and drainage connections from authorities concerned. OWNER'S shall re-imburse the fees paid to the authorities towards the connection charges on production of receipts for money paid.

13.5 Contractor shall get any materials tested from the appropriate authority if so required with no cost to the OWNER'S.

14 Recovery of cost for materials issued to Contractors free of cost

If any material issued free of cost by the OWNER'S to the contract for use on the work and the same is lost, stolen, pilfered or broken while in contractor's possession, the cost of the same shall be recovered from the Contractor on the basis of actual cost to OWNER'S. The cost shall include the cost paid, freight, transportation, excise duty, sales tax, octroi, import duty and other levies, plus 100% as penalty. The decision on the actual cost given by the OWNER'S shall be final and binding on the Contractor.

14.1 Contractor has to keep full records of material issued by the OWNER'S with reference and challans etc. Contractor has to give account of all such materials to the Project Manager.

15 Cutting of Water Proofing Membrane:

No walls terraces shall be cut for making and opening after water proofing has been done without written approval of project manager. Cutting of water proofing membrane shall be done very carefully so as other portion of water proofing is not damaged. On completion of work at such place the water proofing membrane shall be made good and ensured that the opening/cutting is made fully water proof as per specifications and details of water proofing approved by Project Managers.

16 Cutting of structural members

No structural member shall be chased or cut without the written permission of the Project Manager.

17 Materials supplied by OWNER'S

The Contractor shall verify that all materials supplied by the OWNER'S conform to the specifications of the relevant item in the tender. Any discrepancy found shall be brought to the notice of the Project Manager.

18 Materials

18.1 Unless otherwise specified and expressly approved in writing by the Project Manager, only materials of makes and specification as mentioned in the list of approved makes attached with the specifications shall be used.

18.2 If required, the Contractor shall submit samples of materials proposed to be used in the works. Approved samples shall be kept in the office of the Project Manager.

SECTION B: SANITARY FIXTURES

1 Scope of work

1.1 Work under this section shall consist of furnishing all materials & labour necessary and required to completely install all sanitary fixtures, chromium plated fittings and accessories as required by the drawings specified hereinafter and given in the Schedule of Quantities.

1.2 Without restricting to the generality of the foregoing the sanitary fixtures shall include the following:-

- a) Sanitary fixtures
- b) Chromium plated fittings
- c) Porcelain or stainless steel sinks
- d) Accessories e.g. towel rods, toilet paper holders, soap dish, towel rails, coat hooks etc as specified in the schedule of quantities.
- e) Connections to all kitchens, equipment, pump headers and other equipment requiring water and drainage connections.

1.3 Whether specifically mentioned or not all fixtures and appliances shall be provided with all fixing devices, nuts, bolts, screws, hangers as required.

1.4 All exposed pipes within toilets and near fixtures shall be chromium plated brass or copper unless otherwise specified.

2 General requirements

2.1 All fixtures and fittings shall be provided with all such accessories as are required to complete the item in working condition whether specifically mentioned or not in the Schedule of Quantities, specifications, drawings. Accessories shall include proper fixing arrangement, brackets, nuts, bolts, screws and required connection pieces, WC flexible connectors etc.

2.2 Fixing screws shall be half round head chromium plated brass screws with C.P. washers where necessary.

2.3 Contractor shall furnish without cost all such accessories and fixing devices that are necessary and required but not supplied along with the Plumbing Fixtures & CP Fittings by the manufacturers as a part of the original and standard supply.

2.4 All fittings and fixtures shall be fixed in a neat workmanlike manner true to level and heights shown on the drawings and in accordance with the manufacturer's recommendations. Care shall be taken to fix all inlet and outlet pipes at correct positions. Faulty locations shall be made good and any damage to the finished floor, tiling or terrace shall be made good at Contractor's cost.

2.5 Contractor shall seal all fixtures fixed near wall, marble and edges with an approved type of poly- sulphide sealant appropriate for its application.

3 European W.C

3.1 European W.C. shall be wash down or syphonic type floor or wall mounted set flushed by means of porcelain/ plastic flushing cistern or concealed type flush valves/cisterns, which will be an integral part of the WC system. Framework, walling and finishing will not form a part of the contractor's work. Where applicable flush pipe/ bend shall be connected to the W.C. by means of a suitable rubber adapter. Wall hung W.C. shall be supported by C.I. floor mounted chair or wall brackets with dash fasteners as per manufacturer's recommendations. Connection between water closet and waste pipe shall be made using W.C. connector with rubber insertion.

3.2 Each W.C. set shall be provided with a plastic seat shall be with rubber buffers and chromium plated hinges.

3.3 Plastic seat shall be so fixed that it remains absolutely stationary in vertical position without falling down on the W.C. Each W.C. shall be suitable for flushing in low volume of water 3-6 litres.

3.4 Flushing cistern when provided shall be provided with all internal flushing mechanism, 15 mm dia ball cock with unbreakable polythene float and overflow pipe. Any frame work required for fixing cistern has to be provided by the contractor.

3.5 Indian W.C.

Indian WC shall be Orissa pattern of size 500 x 630 mm. Each WC shall be provided with a 100 mm dia. C.I. P or S trap with or without vent horn. The WC shall be flushed by means of a concealed / exposed type flush valve. Flush pipe/bend shall be connected to the WC by means of suitable rubber adapter.

The Indian WC shall be fixed in level in a neat workman like manner. The WC and trap shall be set in cement concrete 1:2:4 mix (1 cement: 2 coarse sand: 4 stone aggregate 20 mm nominal size).

3.6 Urinals

3.6.1 Urinals shall be white glazed vitreous china of size, shape and type specified in the Schedule of Quantities.

3.6.2 Bowl urinals shall be provided with 15 mm dia C.P. spreader, 32 mm dia stainless steel domical waste and C.P. cast brass bottle trap with pipe and wall flange, and shall be fixed to wall by

C.I. brackets and C.I. wall clips as recommended by manufacturers complete as directed by Project Manager.

3.6.3 Urinals shall be fixed with C.P. brass screws and shall be provided with 32 mm dia domical waste leading to urinal's trap.

3.6.4 Flush pipes shall be uPVC pipes concealed in wall chase but with chromium plated bends at inlet and outlet or as given in Schedule of Quantities.

3.6.5 Urinals shall be flushed by means of auto push (pressmatic) tap/ fully automatic no-touch flush valve with solenoid valves as specified in the schedule of quantities.

3.6.6 Waste pipes for urinals shall be uPVC class III (6 kg/sqcm) or G.I pipes (Medium class) to IS: 1239 conforming to IS : 4985 as given in schedule of quantities.

Waste pipes may be concealed in chase or exposed on wall as directed by the Project Manager. Specifications for waste pipes shall be same as given in Section II.

3.7 Lavatory basin

3.7.1 Lavatory basins shall be white glazed vitreous china of size, shape and type specified in the Schedule of Quantities.

3.7.2 Each basin shall be provided with brackets and clips of approved and securely fixed. Placing of basins over the brackets without secure fixing shall not be accepted.

3.7.3 Each basin shall be provided with 32 mm dia. C.P. waste with overflow, pop-up waste or rubber plug and chain as specified in the Schedule of Quantities, 32 mm dia. C.P. brass bottle trap with C.P pipe to wall and flange.

3.7.4 Each basin shall be provided with pillar tap or hot and cold mixer fitting as specified in the Schedule of Quantities.

3.7.5 Basins shall be fixed at proper heights as shown on drawings. If height is not specified, the rim level shall be 79 cm or as directed by Project Manager.

3.8 Sinks

3.8.1 Sinks shall be stainless steel or any other material as specified in the Schedule of Quantities.

3.8.2 Each sink shall be provided with brackets of approved and securely fixed. Counter top sinks shall be fixed with suitable brackets or clips as recommended by the manufacturer. Each sink shall be provided with 40 mm dia. C.P. waste with chain and plug as given in the Schedule of Quantities. Fixing shall be done as directed by Project Manager.

3.8.3 Supply fittings for sinks shall be mixing fittings or C.P. taps as specified in the Schedule of Quantities.

3.9 Hand Drier (Where Specified)

3.9.1 The hand drier shall be no touch operating type with solid state time delay to allow user to keep hand in any position.

3.9.2 The hand drier shall be fully hygienic, rated for continuous repeat use.

3.9.3 The rating of hand drier shall be such that time required to dry a pair of hands upto wrists is approximately 30 seconds.

3.9.4 The hand drier shall be wall mounting type suitable for 230 volts, single phase, 50 Hz, A.C. power supply.

3.10 Toilets for Disabled (Where Specified)

3.10.1 Where specified in washroom facilities designed to accommodate physically handicapped, accessories should be provided as directed by the Project Manager.

3.10.2 Stainless steel grab bars of required size suitable for concealed or exposed mounting and non-slip gripping surface shall be provided in all washrooms to be used by physically handicapped as directed by the Project Manager.

3.11 Accessories

3.11.1 Contractor shall install all chromium plated and porcelain accessories as shown on the drawings or directed by the Project Manager.

3.11.2 All C.P. accessories shall be fixed with C.P. brass half round head screws and cup washers in wall with rawl plugs or nylon sleeves and shall include cutting and making good as required or directed by Project Manager.

3.11.3 Recessed porcelain accessories shall be fixed in walls and set in cement mortar 1:2 (1 cement: 2 coarse sand) and fixed in relation to the tiling work as per Interior Designer's drawings.

3.12 Urinal partitions

3.12.1 Urinal partitions shall be white glazed vitreous china, glass, marble, granite or any other material selected by the Project Manager.

3.12.2 Urinal partitions shall be fixed at proper heights with C.P. brass bolts, anchor fasteners and M.S. clips as recommended by the manufacturer and directed by Project Manager.

3.13 Measurement

3.13.1 Sanitary fixtures and accessories shall be measured by numbers in the unit given in the Schedule of Quantities.

3.13.2 Rates for all items shall be inclusive of cutting holes and chases and making good the same, C.P Brass screws, nuts, bolts and any fixing arrangements required and recommended by manufacturers, testing and commissioning.

SECTION C: SOIL, WASTE, VENT & RAINWATER PIPES & FITTINGS

1. Scope of work

1.1 Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install all soil, waste, vent and rainwater pipes and fittings as required by the drawings, and given in the Schedule of Quantities.

1.2 Without restricting to the generality of the foregoing, the soil, waste, vent pipes system shall include the following:-

- a) Vertical and horizontal soil, waste, vent pipes, and fittings, joints, clamps, connections to fixtures.
- c) Connection of all pipes to sewer lines as shown on the drawings at ground floor levels.
- d) Drainage, channels, gratings & floor drains.
- e) Floor and urinal traps, cleanout plugs, inlet fittings and rainwater heads/ Khurras.
- f) Testing of all pipe lines.

2 General requirements

2.1 All materials shall be new of the best quality conforming to specifications and subject to the approval of Project Manager.

2.2 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner.

2.3 Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.

2.4 Pipes shall be securely fixed to walls and ceilings by suitable clamps intervals specified.

2.5 Access doors for fittings and clean outs shall be so located that they are easily accessible for repair and maintenance. Any access panel required in the civil structure, false ceiling or marble cladding etc. shall be clearly reported to the OWNER'S in the form of shop drawing so that other agencies are instructed to provide the same.

3 Piping System

3.1 Schedule of Pipes Use shall be as below or as specified in the schedule of quantities.

1	uPVC pipes 75,110 & 160 mm dia. (O rings joints SWR system IS 13592 Type B)	Vt. stacks for Soil, Waste and Vent Pipes and main headers at basement ceiling
2	uPVC pipes 40, 50 & 63 mm OD (welded joints) 6 kg/sqcm class III	Waste lines for Wash basin, Urinal, Floor drain & Sink
Or		
1A.	Centrifugally Cast spun iron S&S Pipes Pipes As per I.S. 3989	Vt. stacks for Soil, Waste. & Vent
2A.	G.I. pipes conforming to IS 1239 class)	Waste lines for Wash basin, Urinal, (Heavy Floor drain & Sink.
3	uPVC pipes 75 mm to 200 mm OD system IS 13592 Type A)	Rain Water Pipes. (O rings joints SWR
4.	CI (Class LA) pipes to IS 1536 or D.I. class K-7	Pipes under building floor
5.	uPVC Class III (6 kg/sqcm) or G.I. pipes conforming to IS 1239 (Medium class)	Sump Rising Main

3.1 Soil, Waste & Vent Pipes

a) The Soil & Waste Pipe System above ground has been planned as a "Two Pipe System with all soil appliances ventilated" as defined in IS : 5329 having common pipes for soil and waste for W.C.

W.B. kitchen sinks, showers, washbasins, AHU's condensate drains and floor drains with a ventilating pipe for all soil appliances.

b) Where applicable all waste water from AHU's plant and pump rooms, floor channels will be provided with a deep seal trap before connecting to the main drain or vertical stack.

c) Vertical soil & waste stacks shall be connected to a separate horizontal drain at basement ceiling generally where applicable and shown on the drawings.

d) Toilet layouts have been so arranged that the W.C. outlets shall be with "P" trap above floor wherever possible.

e) All soil/waste from areas in basement (where applicable) will be collected in sumps and after treatment in STP shall be recycled for flushing and gardening. Excess water shall be pumped into sewer line.

f) Head (Starting point) of drains and sewage / Waste Water Sumps (as and where applicable) having a length of greater than 4 m up to its connection to the main drain or manhole shall be provided with a 50/75/100 mm vent pipe terminating above roof or as directed by Project Manager.

3.2 Rainwater Pipes

a) All open terraces shall be drained by rain water down takes.

b) Rainwater down takes is separate and independent of the soil and waste system and will discharge into the Storm water Drainage system of the Complex.

c) Rain water in open courtyards shall be collected in catch basins and connected to the storm water drainage system.

d) Any dry weather flow from waste appliances e.g. AHU's pump rooms, waste water sumps shall connect to sewers after traps and not in the storm water drainage system.

3.3 Balcony/Planter drainage

Wherever required, all balconies, terraces, planters and other formal landscape areas will be drained by vertical down takes or other type of drainage system shown on the drawings and directed by the Architect/Project Manager

3.4 Soil Waste & vent Pipes & fittings above ground

3.4.1 uPVC Pipes & Fittings (for toilets and kitchen waste)

- a) Soil, Waste, Vent and Anti-siphonage pipes shall be uPVC. All pipes 75 mm dia and above shall be straight and smooth conforming to IS : 13592 SWR of class B. Pipes less than 75 mm OD shall be uPVC (6 kg/sq cm) confirming to I.S. 4985.
- b) Pipes and fittings for main vertical stacks & branches 160mm, 110 mm & 75 mm dia shall be Soil, Waste & Rainwater System known in the short form as SWR drainage system with injection moulded fittings with approved type of socket & 'O' rubber ring joints/ solvent cement joints conforming to relevant IS code
- c) Joints shall be done as per the manufacturer's recommendations. The pipes and fittings must have matching dimension for perfect joints in the system. 'O' ring fittings must have sufficient gap (approx. 10 mm) for thermal expansion of pipes.
- d) uPVC pipes shall be clamped to the wall with approved type uPVC saddle clamps / U clamps and GI rod fixed to the angle iron support system within the shaft.
- e) Use proper uPVC pipe adapters for connections between cast iron pipes, traps & uPVC pipes where necessary. Such joints shall be made of an approved type of 'Putty'.

3.4.2 Cast Iron Soil, Waste & Vent Pipes (when specified).

- a) Soil, Waste & Vent Pipes used in toilets, kitchens, exposed locations, basement ceiling and under floors and such other locations which may expose them to internal or external high temperatures or to damage shall be centrifugally spun cast iron pipes (confirming to I.S. 3989) as specified below. All pipes shall be straight and smooth from inside free from irregular bore, blow holes, cracks and other manufacturing defects.

Standard weight, dimensions and pig lead required for joints shall be as follows:-

3.4.3 Standard weight, dimensions and pig lead required for joints shall be as follows:-

- Sand Cast Iron Pipes & Matching Fitting shall be to I.S. 3989 (where specified)

Nominal

inches Diameter

mm

mm Thickness

1.80 m

kg Overall Weight

mm Thickness Length of

mm Depth lead

2	50	3.5	8.4	3.5	25
3	75	3.5	12.50	3.5	25
4	100	4.0	18.80	4.0	25

- Sand Cast Iron Pipes & Matching Fitting shall be to I.S. 1729
Nominal

inches Diameter

mm

mm Thickness

1.80 m

kg Overall Weight

mm Thickness Length of

mm Depth lead

2	50	3.5	11.41	5.0	25
3	75	3.5	16.42	5.0	25
4	100	4.0	21.67	5.0	25
6	150	5.0	31.92	5.0	38

3.4.4 Tolerance

Acceptable tolerance for pipes to I.S. 3989 and I.S 1729 shall be as follows:-

- a) Wall thickness-15%
- b) Length $\pm$ 20 mm
- c) Weight-10%

3.5. Fittings

3.5.1 Fittings shall conform to the same Indian Standard as for pipes. Pipes and fittings must be of matching I.S. Specification. Interchange of pipes of one standard with fittings on the other standard will not be permitted.

3.5.2 Fittings shall be of the required degree of curvature with or without access door.

3.5.3 Access door shall be made up with 3 mm thick insertion rubber washer and white lead. The bolts shall be lubricated with grease or white lead for easy removal later. The fixing shall be air and water tight.

3.5.4 Connection from a vertical stack or position to a horizontal line shall be made only by a “Y” junction.

3.6 Fixing

3.6.1 All vertical pipes shall be fixed by galvanized clamps truly vertical. Branch pipes shall be connected to the stack at the same angle as that of the fittings. No collars shall be used on vertical stacks. Each stack shall be terminated at top with a cowl (terminal guard).

3.6.2 Horizontal pipes running along ceiling shall be fixed on galvanized structural adjustable clamps (Clevis clamps) of special design shown on the drawings or as directed. Horizontal pipes shall be laid to uniform slope and the clamps adjusted to the proper levels so that the pipes fully rest on them.

3.6.3 Contractor shall provide all sleeves, openings, hangers, inserts during the construction. He shall provide all necessary information to the PMC / Building Contractor for making such provisions in the structure as necessary. All damages shall be made good to restore the surfaces at no extra cost.

4 Clamps

4.1 Holder bat clamps shall be of standard design and fabricated from galvanized M.S. standard flats 40x3 mm thick and 12 mm dia M.S. Rod and 6 mm nuts and bolts. Holder bat clamps shall be fixed in cement concrete 1:2:4 mix blocks 10x10x10 cms deep.

4.2 Where holder bat clamps are to be fixed in RCC column or slotted angles, walls or beam they shall be fixed with galvanized 40x3 mm flat iron "U" type clamps with anchor fasteners of approved design or 6 mm nuts and bolts.

4.3 Structural clamps shall be fabricated by electro-welding from M.S. structural members e.g. rods, angles, channels flats as per detailed drawing. Contractor shall provide all nuts & bolts, welding material. All fabricated clamps, nuts, bolts and washers shall be not dipped galvanized.

4.4 Galvanized slotted angle/channel supports on walls shall be provided wherever shown on drawings. Angles/channels shall be of sizes shown on drawings or specified in schedule of quantities. Angles/channels shall be fixed to brick walls with bolts embedded in cement concrete blocks and to RCC walls with suitable anchor fasteners. The spacing of support bolts horizontally shall not exceed 1 m.

4.5 Wherever M.S. clamps are required to be anchored directly to brick walls, concrete slabs, beams or columns, nothing extra shall be payable for clamping arrangement and making good with cement concrete 1:2:4 mix (1 cement :2 coarse sand :4 mm stone aggregate 20 mm nominal size) as directed by the PMC.

4.6 For sleeves, anchor fasteners and clamp spacing chart shall be as follows:

CLAMP AND PIPE SUPPORT SPACING

S.No.	Type of Pipes & Position	<----- Commercial Pipe Dia.(Spacing in m) >							
		15/20	20/25	32/40	50	75/80	100/110	150/160	200
1	Vertical Pipes								
1.1	GI /MS Pipes	2.4	2.4	3		3.6	4.5	5.4	5.4
1.2	Cast Iron Pipes								
	SWR Pipes	x	x	<----- 3 m					
	IS 1729/3989								
	Water Supply Pipes								
	IS 1536 /1538/7181/8329			x	x	<----- 3.6 m			
1.3	uPVC /cPVC Pipes								
	IS 4985 for Water Supply			x	x	0.5	0.7	0.9	0.9
	IS 13585 for SWR		x	x	0.5	0.7	0.9	0.9	
2	Horizontal Pipes								
2.1	GI /MS Pipes	<-----2.0 m			>	2.4 m	3	3.6	4 <--- 4.5 m---
2.2	Cast Iron Pipes								
	SWR Pipes	<----- 3.0 m							

IS 1729/3989

Water Supply Pipes

3 3.6 3.6 4.5

IS 1536 /1538/7181/8329

5 Traps

5.1 Floor traps

Floor traps shall be siphon type full bore uPVC (SWR) 'P' / 'S' type having a minimum 50 mm deep seal. The trap and waste pipes shall be set in cement concrete blocks firmly supported on the structural floor. The blocks shall be in 1:2:4 mix (1 cement :2 coarse sand :4 stone aggregate 20 mm nominal size) and extended to 40 mm below finished floor level. Contractor shall provide all necessary shuttering and centering for the blocks. Size of the block shall be 30x30 cms of the required depth.

5.2 Urinal traps

Urinal traps shall be uPVC (SWR) 'P' / 'S' traps with or without vent and set in cement concrete block specified for floor traps.

5.3 Floor trap inlet

Bath room traps and connections shall ensure free and silent flow of discharging water. Where specified, Contractor shall provide a uPVC height raiser with one, two or three inlet sockets welded on side to connect the waste pipe. Joint between waste and hopper inlet socket shall

be rubber ring / cement solvent. Floor trap inlet hoppers and the traps shall be set in cement concrete blocks as specified in para above without extra charge.

5.4 Floor Gratings

Floor and urinal traps shall be provided with 100-150 mm square or round C.P./Stainless steel grating, with rim of approved design and shape. Minimum thickness shall be 4 mm or as specified in the Schedule of Quantities.

5.5 Jointing

Soil, waste vent, anti-syphonage and rainwater pipes shall be jointed with rubber ring / cement solvent.

6 Cleanout Plugs

6.1 Clean out plug for Soil, Waste or Rainwater pipes laid under floors shall be provided near pipe junctions bends , tees , “Ys” and on straight runs at such intervals as required as per site conditions. Cleanout plugs shall terminate flush with the floor levels . They shall be threaded and provided with key holes for opening. Cleanout plugs shall be uPVC suitable for the Pipe dia. screwed / flanged joint to a threaded PVC socket .

6.2 Cleanout on Drainage Pipes

a) Cleanout plugs shall be provided on starting point of each drain and in between at locations indicated on plans or directed by the PMC. Cleanout plugs shall be of size matching the full bore of the pipe but not exceeding 150 mm dia. FCO Plugs on drains of greater diameters shall be 150 mm dia. Fixed with a suitable reducing adapter.

b) Cleanouts at ceiling level pipe shall be provided with a bend terminating at floor level above. The brass plug shall be screwed type flush with the floor.

7 Waste pipe from appliances

7.1 General

a) Waste pipe from appliances e.g. washbasins, sinks and urinals shall be of uPVC class III, 6 kg/sq cm or galvanized steel, as given in the Schedule of Quantities or shown on the drawings.

b) All pipes shall be fixed in gradient towards the outfalls of drains. Pipes inside a toilet room shall be in chase unless otherwise shown on drawings. Where required pipes may be run at ceiling level in suitable gradient and supported on galvanized structural clamps. Spacing for clamps for such pipes shall be as per the pipe spacing chart given in section 1.

8 Cast iron pipes for drainage

8.1 All drainage lines passing under building shall be CI (LA) pipes, in exposed position above ground etc.. or as specified in the schedule of quantities. Position of such pipes shall generally be shown on the drawings.

8.2 Cast iron pipes shall be spigot & socket (S&S) centrifugally spun iron pipes conforming to I.S. 1536 (Class LA) suitable for pre-moulded rubber Tyton joints. Quality certificates shall be furnished.

8.3 Fittings

b) Fittings used for C.I. drainage pipe shall conform to I.S.1538 (Heavy class). Connections from vertical branch pipes shall be made by a “Y” tee.

8.4 Joints

a) Joints between pipes shall be made with pre-molded rubber joints (Tyton Joints) supplied by the manufacturer to ensure compatibility and water tightness.

b) Joints between pipes and fittings shall be made by caulked spun yarn dipped in tar and molten pig lead 45 mm deep by hammering with caulking tools.

9 Encasing pipe in Cement Concrete

uPVC (SWR) soil and waste pipes and drainage under floor in sunken slabs and in wall chases (when cut specially for the pipe) shall be encased in cement concrete 1:2:4 mix (1 cement : 2 coarse sand : 4 stone aggregate 12 mm size) 75 mm in bed and all-round. When pipes are running well above the structural slab, the encased pipes shall be supported with suitable cement concrete pillars of required height at intervals of 1.8 m. Rate for concrete round pipes shall be inclusive of pillars, supports, shuttering and centering.

10 Painting

10.1 All cast iron, soil, waste vent, anti-syphonage and rainwater pipes in exposed location in shafts and pipe spaces shall be painted with two or more coats of synthetic enamel paint to give an even shade.

10.2 Paint shall be of approved quality and shade. Where directed pipes shall be painted in accordance with approved pipe colour code.

10.3 G.I. waste pipes in chase shall be painted with two coats of bitumen paint, covered with polythene tape and a final coat of bitumen paint. Exposed pipes shall be painted with two or more coats of synthetic enamel paint.

10.4 C.I. soil and waste pipes below ground shall be covered all-round with cement conc. and shall not be painted.

11 Cutting and making good

11.1 Contractor shall provide all necessary holes cut outs and chases in structural members as building work proceeds. Wherever holes are cut or left originally, they shall be made good with cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 stone aggregate 20 mm nominal size) or cement mortar 1:2 (1 cement: 2 coarse sand) and the surface restored as in original condition.

12 Testing

12.1 Testing procedure specified below apply to all soil, waste and vent pipes above ground including C.I. LA pipes laid in basement ceiling.

12.2 Entire drainage system shall be tested for water tightness during and after completion of the installation. No portion of the system shall remain untested. Contractor must have adequate number of expandable rubber/bellow plugs, manometers, smoke testing machines, pipe and fitting work test benches and any other equipment necessary and required to conduct the tests. All testing shall be certified for its calibration by an approved laboratory.

12.3 All materials obtained and used on site must have manufacturer's hydraulic test certificate for each batch of materials used on the site.

12.4 Testing soil, waste and rainwater pipes.

12.4.1 Testing Procedure for uPVC SWR drainage pipes for soil waste vent and / or Rain Water Pipes.

a) Testing procedure specified below apply to all soil, waste and vent pipes above ground including pipes laid in basement ceiling. Horizontal lines with in bathrooms should be cement encased and tested before compacting of sunken floor to avoid any accidental damages. Smoke test should be avoided.

b) Entire drainage system shall be tested for water tightness during and after completion of the installation. No portion of the system shall remain untested. Contractor must have adequate number of expandable rubber bellow plugs / socket plugs or any other equipment necessary and required to conduct the tests.

c) All materials obtained and used on site must have manufacturers hydraulic test certificate for each batch of materials used on the site.

d) After installation all connections from fixtures, vertical stacks and horizontal drains including pipes along ceiling shall be tested to a hydraulic pressure not exceeding 3 m. Such tests shall be conducted for each floor separately by suitable plugs. Seal hermetically all openings below the top of section to be tested. The water level shall then be raised to a height of not less than 3 meters above the highest point of the section being tested. Every Joint shall be carefully examined for leaks.

e) After the installation is fully complete, it should be also tested by flushing the toilets, running at least 20% of all taps simultaneously and ensuring that the entire system is self draining, has no leakages, blockages etc. Rectify and replace where required.

f) Contractor shall maintain a test register identifying date and time of each area. All tests shall be conducted in presence of Project Manager and signed by both.

12.4.2 Testing Procedure for C.I. drainage pipes for soil waste vent and / or Rain Water Pipes. (Wherever required)

a) Apart from factory test all pipes and fittings shall be hydraulically tested for a head of 3 m preferably on a specially set up work bench. After applying pressure, strike the pipe with a wooden pallet and inspect for blow holes and cracks. Pressure may be applied for about 2 minutes. Reject and remove all defective pipes.

b) After installation all connections from fixtures, vertical stacks and horizontal drains including

C.I. LA pipes shall be tested to a hydraulic pressure not exceeding 3 m. Such tests shall be conducted for each floor separately by suitable plugs.

c) The entire installation shall be tested by smoke testing machine. The test can be conducted after the plumbing fixtures are installed and all traps have water seal or by plugging all inlets by bellow plugs. Apply dense smoke keeping the top of stack open and observe for leakages. Rectify or replace defective sections.

d) After the installation is fully complete, it should be tested by flushing the toilets, running atleast 20% of all taps simultaneously and ensuring that the entire system is self draining, has no leakages, blockages etc. Rectify and replace where required.

12.5 Contractor shall maintain a test register identifying date and time of each area. All tests shall be conducted in presence of PMC and signed by both.

13 Measurements

13.1 General

a) Rates for all items quoted shall be inclusive of all work and items given in the specifications and Schedule of Quantities.

b) Rates are applicable for the work in basements, under floors, in shafts at ceiling level area for all heights and depths.

c) Rates are inclusive of cutting holes and chases in RCC and masonry work and making good the same.

d) Rates are inclusive of pre testing, on site testing, of the installations, materials and commissioning of the works.

e) Pipes (unit of measurement. Linear meter to the nearest centimeter).

13.2 All uPVC soil, waste, vent, anti-syphonage and rain water pipes shall be measured net when fixed correct to a centimetre including all fittings along its length. No allowance shall be made for the portions of pipe lengths entering the sockets of the adjacent pipes or fittings. The above will apply to both case i.e. whether pipes are fixed on wall face or pillars or embedded in masonry or pipes running at ceiling level.

13.3 Pipes shall measured per running metre correct to a centimetre for the finished work which shall include fittings e.g. bends, tees, elbows, reducers, crosses, sockets, nipples and nuts. The length shall be taken along centre line of the pipes and fittings. All pipes and fittings shall be classified according to their diameter, method of jointing and fixing substance, quality, and finish. The diameters shall be nominal diameter of internal bore. The pipes shall be described as including all cutting and waste. In case of fittings of un equal bore, the largest bore shall be measured.

13.4 Cement concrete around pipes shall be measured along the centre of the pipe line measured per linear metre and include any masonry supports, shuttering and centering cutting complete as described in the relevant specifications.

13.5 Slotted angles/channels shall be measured per linear metre of finished length and shall include support bolts, nuts and clamps embedded in masonry walls with cement concrete blocks and nothing extra will be paid for making good the same.

13.6 Fittings

Unit of measurement shall be the number of pieces. Pipe fittings are included in the rate for pipes. Urinal traps, trap gratings, hoppers, cleanout plugs shall be measured by number per piece and shall include all items described in the relevant specifications and Schedule of Quantities.

13.7 Painting

Painting of pipes shall be measured per running meter and shall be inclusive of all fittings and clamps. No deduction for fittings shall be made.

13.8 Excavation for soil pipes

No payment shall be admissible with respect to excavation, refilling and disposal of surplus earth for cast iron soil and waste pipes laid below ground, in sunken slabs or over basement rafts.

13.9 PMC's decision with respect to the correct interpretation regarding mode of measurement shall be final and binding on the contractor .

14.1 uPVC Pipes & Fittings as specified in the schedule of quantities.

a) Soil, Waste and Anti-siphonage pipes and fittings shall be uPVC. All pipes shall be straight and smooth conforming to IS: 13592 or as specified in Schedule of Quantities.

b) Pipes and fittings for main vertical stacks & branches 110 mm, & 75 mm dia shall be Soil, Waste & Rainwater System known in the short form as SWR drainage system with injection moulded fittings with approved type of socket & 'O' rubber ring joints.

c) Joints shall be done as per the manufacturer's recommendations. The pipes and fittings must have matching dimension for perfect joints in the system. 'O' ring fittings must have sufficient gap (approx. 10 mm) for thermal expansion of pipes.

d) uPVC pipes shall be clamped to the wall with approved type uPVC saddle clamps/U clamps and G.I. rod fixed to the angle iron support system within the shaft.

e) Use proper uPVC pipe adapters for connections between cast iron pipes, traps & uPVC pipes where necessary. Such joints shall be made of an approved type of 'Putty'.

14.2 Clamps

14.2.1 For UPVC pipes standard UPVC clamps shall be used. For other pipes M.S. clamps, supports and hangers provided shall be galvanised. Factory made Pre fabricated clamps shall be preferred. Contractor may fabricate the clamps of special nature and galvanise them after fabrication but before installation. (Clamps shall be fabricated from mild steel sections) All nuts, bolts, washers and other fasteners shall be factory galvanised.

14.2.2 Clamps shall be of approved designs and fabricated from M.S. flats and other sections of thickness and sizes as per drawings or contractor's shop drawings. Clamps shall be fixed in accordance to manufacturer's details/shop drawings to be submitted by the contractors.

14.2.3 When required to be fixed on RCC columns, walls or beam they shall be fixed with approved type of galvanised expansion anchor fasteners (Dash fasteners) of approved design and size according to load.

14.2.4 Structural clamps e.g. trapeze or cluster hangers shall be fabricated by electro-welding from M.S. structural members e.g. rods, angles, channels flats as per Contractors shop drawing shall be galvanised after fabrication. All nuts, bolts and washers shall be galvanised.

14.2.5 Galvanised slotted angle/channel supports on walls shall be provided wherever shown on drawings. Angles/channels shall be of sizes shown on drawings or specified in schedule of quantities. Angles/channels shall be fixed to brick walls with bolts embedded in cement concrete blocks and to RCC walls with anchor fasteners mentioned above. The spacing of support bolts on support members fixed horizontally shall not exceed 1 m.

14.3 Traps

14.3.1 Floor traps

a) Floor traps where specified shall be of multi inlet or 100 x 100 mm deep seal type uPVC traps (SWR) having a minimum 50 mm deep seal. The trap and waste pipes when buried below ground shall be set and encased in cement concrete blocks firmly supported on firm ground or when installed on a sunken RCC structural slab. The blocks shall be in 1:2:4 mix (1 cement: 2 coarse sand: 4 stone aggregate 20 mm nominal size).

c) Contractor shall provide all necessary shuttering and centring for the blocks. Size of the block shall be 30x30 cms of the required depth.

14.3.2 Urinal traps

Urinal traps/horn shall be uPVC deep seal 100 x 100 mm traps with or without vent and set in cement concrete block specified for floor traps.

14.3.3 Cleanout plugs

a) Floor Clean out Plug.

Clean out plug for Soil, Waste or Rainwater pipes laid under floors shall be provided near pipe junctions bends, tees, "Ys" and on straight runs at such intervals as required as per site

conditions. Cleanout plugs shall terminate flush with the floor levels. They shall be threaded and provided with key holes for opening. Cleanout plugs shall be Cast Brass fixed by means of screwed to a G.I. socket/ uPVC . The socket shall be cement solvent / lead caulked / drip seal joint to the drain pipes.

SECTION D: WATER SUPPLY SYSTEM

1. Scope of work

1.1 Work under this section consists of furnishing all labour, materials equipment and appliances necessary and required to completely install the water supply system as required by the drawings, specified hereinafter and given in the Schedule of Quantities.

1.2 Without restricting to the generality of the foregoing, the water supply system shall include the following:-

- a) Distribution system from main supply headers from pump to all fixtures and appliances for cold & hot water.
- b) Cold water supply lines from tube wells and city water connections to Fire and Under Ground Water Tanks.
- c) Excavation and refilling of pipes trenches.
- d) Insulation to hot water pipes
- e) Pipe protection and painting.
- f) Control valves, masonry chambers and other appurtenances.
- g) Connections to all plumbing fixtures, tanks, appliances and municipal mains
- h) Inserts for R.C.C. tanks

2 General requirements

2.1 All materials shall be new of the best quality conforming to specifications. All works executed shall be to the satisfaction of the Project Manager.

2.2 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner.

2.3 Short or long bends shall be used on all main pipe lines as far as possible. Use of elbows shall be restricted for short connections.

2.4 Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.

2.5 Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals specified.

2.6 Clamps, hangers and supports on RCC walls, columns & slabs shall be fixed only by means of approved made of expandable metal fasteners inserted by use of power drills.

Name of the work: Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi

2.7. All pipe clamps, supports, nuts, bolts, washers shall be galvanised MS steel throughout the building. Painted MS clamps & MS nuts, bolts & washers shall not be accepted.

2.8 Valves and other appurtenances shall be so located as to provide easy accessibility for operations, maintenance and repairs.

3 Water Supply System

3.1 Contractor should study the site plan and the water supply systems separate for Domestic and flushing water from O.H.T. near under ground water tank and STP.

3.1.1 Source

Water supply will be acquired from local municipal and captive tube wells within the site and collected in water storage tanks located underground.

3.1.2 The system has been connected to a gravity feed system from overhead tanks to all parts of the building

3.1.3 It is proposed to provide flushing cistern / flush valves for all WCs and Infra red NO-TOUCH flush valves / auto push type shall be provided for Urinals. These will be fed from flushing over head tank by gravity.

3.1.4 Domestic water supply shall be provided with cold and hot water system only. Hot water provisions are limited to kitchen and toilets connected to a local electric hot water storage geyser.

4 CPVC / PPR / G.I. pipes, fittings & valves

4.1 CPVC Pipes for hot water application.

4.1.1 All pipes inside the toilets for domestic hot water supply shall be CPVC conforming to CTS SDR-11 at a working pressure of 27.8 kg/sqcm PSI at 23 deg C & 100 PSI at 82 deg. C.

4.1.2 Solvent welded CPVC fittings etc. tees, elbows, couplers, unions, reducers, brushing etc. including transition fittings (connection between CPVC and metal pipes/G.I. ie. Brass adapters conforming to ASTM D-2846) shall be provided.

4.1.3 All pipes shall be fixed in accordance with layout and alignment shown on the drawings. Care shall be taken to avoid air pockets. CPVC /G.I. pipes inside toilets shall run above false ceiling with vertical drop in wall chases for all fixtures. No pipes to run inside

sunken floor as far as possible. Pipes may run in wall chase, under the ceiling or floors and other areas as shown on drawings.

4.1.4 uPVC Pressure Pipes for cold water application.

All pipes inside the toilets for domestic and flushing cold water supply shall be uPVC unthreaded pressure class Sch 40 pipes as per ASTM–D standard 1785 pressure pipes suitable for jointing with cement solvent of approved grade. Fittings shall be solvent weld socketed and threaded with brass inserts for connection to threaded metal fixtures.

4.2 PP-R Pipes. (Alternate item when specified)

4.2.1 All Pipes upto 100 mm nominal size inside the buildings, and pipe shafts and where specified shall be anti bacterial UV stabilized (Green Colour), Polypropylene Random Copolymer (PP-R) rigid pipes of PN-16 grade confirming to DIN 8077 with matching fittings to DIN 16962 suitable for fusion joints. The pipe shall have fire retardant property.

4.2.1 Fittings shall be as per DIN 16962. Each fitting shall have manufacturer's trade mark stamped on it.

4.2.2 Pipes and fittings shall be jointed by Heat Fusion (no use of solvent ensuring leak proof joint) using welding machine and suitable die, by heating the outer surface of the pipe and inner surface of the fitting simultaneously and inserting the pipe in the fitting to achieve homogeneous joint. For making connection to metallic fittings PP-R fitting having threaded metal insert shall be used.

4.2.3 All pipes shall be fixed in accordance with layout and alignment shown on the drawings. Care shall be taken to avoid air pockets. Pipes inside toilets shall be fixed in wall chases well above the floor. No pipes be run inside a sunken floor as far as possible. Pipes may be run under the ceiling or floors and other areas as shown on drawings.

4.3 Joining Pipes & Fittings

a) Cutting

Pipes shall be cut either with a wheel type plastic pipe cutting or hacksaw blade and care shall be taken to make a square cut. All burrs should be removed for proper contact between pipe and fittings during jointing.

b) Solvent Cement Application

Only CPVC solvent cement conforming to ASTM-F-493 should be used for joining pipe with fittings. An even coat of solvent cement should be applied on the pipe end and a thin coat inside the fitting socket. Solvent cement for uPVC sch 40 pipes shall be pipe confirming to ASTM D 2563 medium bodied or as per manufacture's recommendations.

c) Assembly

After applying the solvent cement on both pipe and fitting socket, pipe should be inserted into the fitting socket within 30 seconds, and rotating the pipe $\frac{1}{4}$ to $\frac{1}{2}$ turn while inserting so as to ensure even distribution of solvent cement with the joint. The assembled system should be held for 10 seconds (approximately) in order to allow the joint to set up.

d) Testing

The system should be hydrostatically pressure tested at 150 psi (10 Bar) for one hour. During pressure testing, the system should be fitted with water and if a leak is found, the joint should be cut out the replaced with new one.

4.4 Transition of Flowguard cPVC in metals

When making a transition connection to metal threads, special brass/plastic transition fitting (Male and female adapters) should be used. Plastic threaded connections should not be over torqued.

4.5 Threaded sealants

Teflon tape shall be used to make threaded connections leak proof.

4.6 Solvent Cement

Only cPVC solvent cement conforming to ASTM F 493 should be used for joining pipe with fittings and valves. Solvent cement for uPVC sch 40 pipes shall be confirming to ASTM D 2563 medium bodied or as per manufacture's recommendations

4.7 Hangers and supports

For Horizontal runs, support should be given at 3 feet (90 cms) intervals for diameters of one inch and below and at 4 feet (1.2 m) intervals for larger sizes.

Supports should be as per the below mentioned table:

Size of pipe		20°C	49°C	71°C	82°C
Inch	Ft.	Ft.	Ft.	Ft.	
½"	5.5	4.5	3.0	2.5	
¾"	5.5	5.0	3.0	2.5	
1"	6.0	5.5	3.5	3.0	
1¼"	6.5	6.0	3.5	3.5	
1½"	7.0	6.0	3.5	3.5	
2"	7.0	6.5	4.0	3.5	

4.7. Anchor Fasteners

4.7.1 All pipe supports, hangers and clamps to be fixed on RCC walls, beams, columns, slabs and masonry walls 230mm thick and above by means of galvanised expandable anchor fasteners in drilled holes of correct size and model to carry the weight of pipes. Drilling

shall be made only by approved type of power drill as recommend and approved by manufacturer of the anchor fasteners. Failure of any fastening devices shall be the entire responsibility and contractor shall redo or provide additional supports at his own cost. He shall also compensate the OWNER'S for any damage that may be caused by such failures.

4.8 Unions

Contractor shall provide adequate number of unions on all pipes to enable easy dismantling later when required. Unions shall be provided near each gunmetal valve, stop cock, or check valve and on straight runs as necessary at appropriate locations as required and/or directed by Project Manager.

4.9 Flanges

Flanged connections shall be provided on pipes as required or where shown on the drawings, all equipment connections as necessary and required or as directed by the Project Manager. Connections shall be made by correct number and size of GI nuts, bolts & washers with 3 mm thick gasket. Where hot water connections are made insertion gasket shall be of suitable high temperature grade and quality approved by the Project Manager. Bolt hole dia for flanges shall conform to match the specification for C.I. sluice valve to I.S. 780. and C.I. butterfly valve to IS: 13095.

4.10 Painting (Painting for PP-R & CPVC pipes not required) Pipe protection (Protection for CPVC pipes not required)

4.11 G.I. Pipes and Fittings. (For risers and terrace when specified)

4.11.1 All pipes inside the buildings and where specified, outside the building shall be galvanized steel tubes conforming to I.S. 1239 of class specified in the schedule of quantities. When class is not specified they shall be heavy class.

4.11.2 Fittings shall be of malleable iron galvanized of approved make. Each fitting shall have manufacturer's trade mark stamped on it. Fittings for G.I. pipes shall include couplings, bends, tees, reducers, nipples, unions, and bushes. Fittings shall conform to I.S.1879- (Part I to X).

4.11.3 Pipes and fittings shall be jointed with screwed joints. After cutting a pipe with a hacksaw or a cutting machine care shall be taken to remove burr from the end of the pipe after reaming with a proper file.

4.11.4 Pipe threaded joints will be made by applying suitable grade of pipe sealing cord non toxic pipe sealant used for drinking water supply. (Use of red or white lead and sutli will not be permitted for screwed joints).

4.11.5 All pipes shall be fixed in accordance with layout and alignment shown on the drawings. Care shall be taken to avoid air pockets. G.I. pipes inside toilets shall be fixed in wall chases well

above the floor. No pipes shall be run inside a sunken floor as far as possible. Pipes may be run under the ceiling or floors and other areas as shown on drawings.

4.12 Clamps

G.I. Pipes in shafts and other locations shall be supported by galvanized M.S. clamps of design approved by Project Manager. Pipes in wall chases shall be anchored by G.I. hooks. Pipes at ceiling level shall be supported on structural clamps fabricated from M.S. structurals. Pipes in typical shafts shall be supported on slotted angles/channels as per standard drawings.

4.12.1 For sleeves, anchor fasteners and clamp spacing chart (See 4.2 for clamp spacing chart Section 3 above) .

4.13 Unions

Contractor shall provide adequate number of unions on pipes 40 mm and below to enable easy dismantling later when required. Unions shall be provided near each gunmetal valve, stop cock, or check valve and on straight runs as necessary at appropriate locations as required and/or directed by PMC.

5 Flanges

5.1 Flanged connections shall be provided on pipes 65 mm and above as required or where shown on the drawings generally as follows:

- a) On straight runs not exceeding 30 m, near bends and at connections to main branch lines.
- b) On all valves ends
- c) On equipment /pump connections as necessary and required or as directed by PMC.

5.2 Flanged connections shall be made by the correct number and size of the bolts and made with

3 mm thick insertion neoprene gaskets Bolt hole dia for flanges shall conform to match the specification for C.I. sluice valve to I.S. 780. and C.I. butterfly valve to IS: 13095.

5.3 Trenches

All water supply pipes below ground shall be laid in trenches with a minimum cover of 60 cms. The width and depth of the trenches shall be as follows:-

5.4 Dia of pipe	Width of trench	Depth of trench
15 mm to 50 mm	30 cms	75 cms
65 mm to 100 mm	45 cms	100 cms

5.5 Sand filling

All G.I./PVC/M.S. pipes in trenches shall be protected with fine sand 15 cms. all-round before filling in the trenches.

5.6 Where shown on the drawings main pipe lines may be run in masonry trenches from the pump house to the buildings, filled up with sand and buried in ground as per architectural /landscape details.

5.7 Painting

5.7.1 All pipes above ground shall be painted with one coat of primer and two coats of synthetic enamel paint of approved shade and quality. Pipes shall be painted to standard colour code specified in Section 7.

5.8 Pipe protection

5.8.1 All pipes in chase or below floor shall be protected against corrosion by the application of two coats of bitumen paint covered with bitumen tape and a final coat of bitumen paint before covering up the pipe.

5.8.2 All G.I. & M.S. water supply pipes below ground shall be protected against corrosion by applying one layer of 4 mm thick multilayer anticorrosive polymeric mix tape applied over a coat of primer as per recommendations of the manufacturers. (Pytekote)

6 Insulation (not required for CPVC & PPR pipes)

Hot water pipes in exposed shall be insulated with 13 mm thick “Vidoflex/Kaiflex” pre formed insulation to be installed as per manufacturer’s instruction.

7. Valves

7.1 Ball Valves

Valves upto 40 mm dia. shall be screwed type Ball Valves with stainless steel balls, spindle, teflon seating and gland packing tested to a hydraulic pressure of 500 psig, and accompanying couplings and steel handles.(to BS 5351)

7.2. Butterfly Valves

7.2.1 Valves 50 mm dia and above shall be cast iron butterfly valve to be used for isolation. The valves shall be bubble tight, resilient seated suitable for flow in either direction and seal in both direction with accompanying flanges and steel handle.

7.2.2 Butterfly valve shall be of best quality conforming to IS: 13095.

7.3 Non Return Valve (Slim Type)

Where specified non return valve (dual plate slim type) shall be provided through which flow can occur in one direction only. It shall be single door swing check type of best quality.

7.3.1 Each Butterfly and Slim Type Check (NRV) Valve shall be provided with a pair of flanges screwed or welded to the main line and having the required number of galvanised nuts, bolts and washers of correct length.

7.3.2 Storage tanks Underground & Overhead Tank. (Accessories & Connections)

7.3.3 Storage tanks for water supply shall be in reinforced cement concrete built by the building Contractor.

7.3.4 Each tank shall be provided with lockable type manhole cover fabricated from M.S. sheets. Manhole covers shall be 450-500 mm dia and fully galvanised after fabrication or as approved by the Project Manager.

7.4 Storage Tanks

7.4.1 Underground

Underground storage tanks for water supply shall be reinforced cement concrete built by the building contractor.

Each tank shall be provided with lockable type manhole cover fabricated from M.S. sheet or standard cost iron tank covers. Manhole covers shall be 450-500 mm dia or as approved by local municipal authority.

7.5 Outlets and overflow

All nozzles for puddle flanges in RCC tank for inlet, outlet, overflow and scour etc. shall be provided by civil contractor or as given in the Schedule of Quantities. Further connections and accessories shall be provided under this contract.

7.5 Testing

7.5.1 All pipes, fittings and valves after fixing at site, shall be tested by hydrostatic pressure of 1.5 times the working pressure or 10 kg/cm² whichever is more.

Pressure shall be maintained for a period of at least thirty minutes without any drop.

A test register shall be maintained and all entries shall be signed and dated by Contractor (s) and Project Manager.

7.5.2 In addition to the sectional testing carried out during the construction, Contractor shall test the entire installation after connections to the overhead tanks or pumping system or mains. He shall rectify all leakages and shall replace all defective materials in the system. Any damage done due to carelessness, open or burst pipes or failure of fittings, to the building, furniture and fixtures shall be made good by the Contractor during the defects liability period without any cost.

7.5.3 After commissioning of the water supply system, Contractor shall test each valve by closing and opening it a number of times to observe if it is working efficiently. Valves which do not effectively operate shall be replaced by new ones at no extra cost and the same shall be tested as above.

7.6 Measurement

a) PP-R / CPVC / uPVC or G.I. pipes above ground shall be measured per linear meter (to the nearest cm) and shall be inclusive of

i) all fittings e.g. coupling, tees, bends, elbows, unions, flanges and U clamps with nuts, bolts & washers fixed to wall or other standard supports.

ii) Jointing with teflon tape, white lead and insertion gasket of appropriate temperature grade.

iii) Cutting holes, and chases in walls, floors, any pipe support required for pipes below ground & making good the same.

iv) Excavation, back filling, disposal of surplus earth and restoring the ground & floor in original condition.

7.7 Pipe Supports.

a) Fabricated and galvanised supports shall be measured by weight. Weight for each type of clamp shall be calculated on basis of the quantity of structural and MS used from the theoretical weight calculated on basis of the components theoretical weight of the sections.

7.7.1 Rate quoted for supports & hangers shall be inclusive of:-

- a) Expandable anchor fastens.
- b) Galvanising of all supports & hangers.
- c) Cutting holes in walls, ceilings on floors and making good where permitted.
- d) Nuts, bolts and washers for fixing and assembling.
- e) Wooden/PVC pipe saddles for vertical or horizontal runs.

7.7.2 Valves

Gunmetal, cast iron, butterfly and non return valves and puddle flanges shall be measured by numbers and shall include wheels/caps, GI nuts, bolts, washers and insertion gasket.

7.7.3 Painting/pipe protection/insulation

Painting/pipe protection/insulation for pipes shall be measured per linear metre over finished surface and shall include all valves and fittings for which no deduction shall be made. No extra payment shall be made for fittings, valves or flanges.

SECTION E: DRAINAGE (SEWERS & STORM WATER DRAINS)

1 Scope of work

1.1 Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install all the drainage system as required by the drawings and specified hereinafter or given in the Schedule of Quantities.

1.2 Without restricting to the generality of the foregoing, the drainage system shall include:-

a) Sewer lines including excavations, pipe lines, manholes, drop connections and connections to the Sewage Treatment Plant.

b) Storm water drainage, excavation, pipe lines, manholes, catch basins, drain channels, recharging pits and overflows to external low areas

2 General requirements

2.1 All materials shall be new of the best quality conforming to specifications and subject to the approval of the

2.2 Drainage lines and open drains shall be laid to the required gradients and profiles.

2.3 All drainage work shall be done in accordance with the local municipal bye-laws.

2.4 Contractor shall obtain necessary approval and permission for the drainage system from the municipal or any other competent authority.

2.5 Location of all manholes, etc. shall be as per site plan drawings. No drains or sewers shall be laid in the middle of road unless otherwise specifically shown on the drawings or directed by the Project Manager.

3 Excavation

3.1 Alignment and grade

The sewer pipes shall be laid to alignment and gradient shown on the drawings but subject to such modifications as shall be ordered by the Project Manager. No deviations from the lines, depths of cutting or gradients of sewers shown on the plans and sections shall be permitted except by the express direction in writing of the Project Manager.

3.2 Excavation in tunnels

The excavation for sewer works shall be open cutting unless the permission of the Project Manager is obtained for laying pipes in tunnel where sewers have to be constructed along narrow passages or difficult ground.

3.3 Opening out trenches

In excavating the trenches, etc. the solid road metalling, pavement, kerbing, etc. and turf is to be placed on one side and preserved for reinstatement when the trenches or other excavation shall be filled up. Before any road metal is replaced, it shall be carefully sifted. The surface of all trenches and holes shall be restored and maintained to the satisfaction of the Project Manager.

The Contractor shall grub up and clear the surface over the trenches and other excavations of all trees, stumps roots and all other encumbrances affecting execution of the work and shall remove them from the site to the approval of the Project Manager.

3.4 Obstruction of roads

The Contractor shall not occupy or obstruct by his operation more than one half of the width of any road or street and sufficient space shall then be left for public and private transit,

he shall remove the materials excavated and bring them back again when the trench is required to be refilled. The Contractor shall obtain the consent of the Project Manager.

3.5 Removal of filth

All night soil, filth or any other offensive matter met with during the execution of the works, immediately after it is taken out of any trench, sewer or cess pool, shall not be deposited on to the surface of any street or where it is likely to be a nuisance or passed into any sewer or drain but shall be at once put into the carts and removed to a suitable place to be provided by the Contractor.

3.6 Excavation to be taken to proper depths

The trenches shall be excavated to such a depth that the sewer shall rest on concrete as described in the several clauses relating there to and so that the inverts may be at the levels given in the sections.

3.7 Refilling

After the sewer or other work has been laid and proved to be water tight, the trench or other excavations shall be refilled. Utmost care shall be taken in doing this, so that no damage shall be caused to the sewer and other permanent work. The filling in the haunches and upto 75 cms above the crown of the sewer shall consist of the finest selected materials placed carefully in 15 cms layers and flooded and consolidated. After this has been laid, the trench and other excavation shall be refilled carefully in 15 cms layers with materials taken from the excavation, each layer being watered to assist in the consolidation..

3.8 Contractor to restore settlement and damages

The Contractor shall, at his own costs and charges, make good promptly during the whole period the works are in hand, any settlement that may occur in the surfaces of roads, berms, footpaths, gardens, open spaces etc. whether public or private caused by his trenches or by his other excavations and he shall be liable for any accidents caused thereby. He shall also, at his own expense and charges, repair and make good any damage done to buildings and other property if in the opinion of the Project Manager the damage is due to his negligence.

3.9 Disposal of surplus soil

The Contractor shall at his own costs and charges provide places for disposal of all surplus materials not required to be used on the works. As each trench is refilled the surplus soil shall be immediately removed, the surface properly restored and roadways and sides left clear.

3.10 Timbering of sewer and trenches

a) The Contractor shall at all times support efficiently and effectively the sides of the sewer trenches and other excavations by suitable timbering, piling and sheeting and they shall be closed timbered in loose or sandy strata and below the surface of the sub soil water level.

b) All timbering, sheeting and piling with their walling and supports shall be of adequate dimensions and strength and fully braced and strutted so that no risk of collapse or subsidence of the walls of the trench shall take place.

c) The Contractor shall be held responsible and will be accountable for the sufficiency of all timbering, bracings, sheeting and piling used as also for, all damage to persons

and property resulting from improper quality, strength, placing, maintaining or removing of the same.

3.11 Shoring of buildings

The Contractor shall shore up all buildings, walls and other structures, the stability of which is liable to be endangered by the execution of the work and shall be fully responsible for all damages to persons or property resulting from any accident.

3.12 Removal of water from sewer, trench etc.

a) The Contractor shall at all times during the progress of the work keep the trenches and excavations free from water which shall be disposed of by him in a manner as will neither cause injury to the public health nor to the public or private property nor to the work completed or in progress nor to the surface of any roads or streets, nor cause any interference with the use of the same by the public.

b) If any excavation is carried out at any point or points to a greater width than the specified cross section of the sewer with its envelope, the full width of the trench shall be filled with concrete by the Contractor at his own expenses and charges to the requirements of the Project Manager.

3.13 Width of trench

3.13.1 Recommended width of trenches at the bottom shall be as follows:- 100 mm dia pipe 55 cms

150 mm dia pipe 55 cms

225-250 mm dia pipe 60 cms

300 mm dia pipe 75 cms

Maximum width of the bed concrete shall also be as above. No additional payment is admissible for widths greater than specified.

4 Salt glazed stoneware pipes

4.1 Stoneware pipes shall be of first class quality salt glazed and free from rough texture inside and outside and straight. All pipes shall have the manufacturers name marked on it and shall comply with I.S. 651 approved makes.

4.2 Laying and jointing of stoneware salt glazed pipes

a) Pipes are liable to be damaged in transit and notwithstanding tests that may have been made before despatch each pipe shall be examined carefully on arrival at site. Each pipe shall be rung with a wooden hammer or mallet and those that do not ring true and clear shall be rejected. Sound pipes shall be carefully stacked to prevent damage. All defective pipes should be segregated, marked in a conspicuous manner and their use in the works prevented.

b) The pipes shall be laid with sockets leading uphill and rest on solid and even foundations for the full length of the barrel. Socket holes shall be formed in the foundation sufficiently deep to allow the pipe jointer room to work right round the pipe and as short as practicable to admit the socket and allow the joint to be made.

c) Where pipes are not bedded on concrete the trench bottom shall be left slightly high and carefully bottomed up as pipe laying proceeds so that the pipe barrels rest on firm ground. If excavation has been carried too low it shall be made up with cement concrete at the Contractor's cost and Charges. If the bottom of the trench consists of rock or very hard ground that cannot be easily excavated to a smooth surface, the pipes shall be laid on cement concrete bed to ensure even bearing.

4.3 Jointing of pipes

a) Tarred gaskin shall first be wrapped round the spigot of each pipe and the spigot shall then be placed into the socket of the pipe previously laid, the pipe shall then be adjusted and fixed in its correct position and the gaskin caulked tightly home so as to fill not more than one quarter of the total length of the socket.

b) The remainder of the socket shall be filled with stiff mix of cement mortar (1 cement : 1 clean sharp washed sand). When the socket is filled, a fillet should be formed round the joint with a trowel forming an angle of 45° with the barrel of the pipe. The mortar shall be mixed as needed for immediate use and no mortar shall be beaten up and used after it has begun to set.

c) After the joint has been made any extraneous materials shall be removed from inside of the joint with a suitable scraper of "badger". The newly made joints shall be protected until set from the sun, drying winds, rain or dust. Sacking or other materials which can be kept damp shall be used. The joints shall be exposed and space left all round the pipes for inspection by the Project Manager. The inside of the sewer must be left absolutely clear in bore and free from cement mortar or other obstructions throughout its entire length, and shall efficiently drain and discharge.

4.4 Testing

a) All lengths of the sewer and drain shall be fully tested for water tightness by means of water pressure maintained for not less than 30 minutes. Testing shall be carried out from manhole to manhole. All pipes shall be subjected to a test pressure of at least 1.5 metre head of water. The test pressure shall, however, not exceed 6 meter head at any point. The pipes shall be plugged preferably with standard design plugs with rubber plugs on both ends. The upper end shall, however, be connected to a pipe for filling with water and getting the required head.

b) Sewer lines shall be tested for straightness by:

(i) inserting a smooth ball 12 mm less than the internal diameter of the pipe. In the absence of obstructions such as yarn or mortar projecting at the joints the ball should roll down the invert of the pipe and emerge at the lower end,

(ii) means of a mirror at one and a lamp at the other end. If the pipe line is straight the full circle of light will be seen otherwise obstruction or deviation will be apparent.

c) The Contractor shall give a smoke test to the drains and sewer at his own expense and charges, if directed by the Project Manager.

d) A test register shall be maintained which shall be signed and dated by Contractor,

5 Salt glazed stoneware pipes

5.1 Stoneware pipes shall be of first class quality salt glazed and free from rough texture inside and outside and straight. All pipes shall have the manufacturers name marked on it and shall comply to I.S. 651.

5.2 Laying and jointing of stoneware salt glazed pipes

a) Pipes are liable to be damaged in transit notwithstanding tests that may have been made before despatch each pipe shall be examined carefully on arrival at site. Each pipe shall be rung with a wooden hammer or mallet and those that do not ring true and clear shall be rejected. Sound pipes shall be carefully stacked to prevent damage. All defective pipes should be segregated, marked with permanent marker in a conspicuous manner and their use in the works prevented.

All stoneware pipes should be fitted together on the surface of the ground to ensure proper fit before they are lowered. The barrels, spigots and sockets are properly cleaned and brushed.

b) The pipes shall be laid with sockets leading uphill and rest on solid and even foundations for the full length of the barrel. Socket holes shall be formed in the foundation sufficiently deep to allow the pipe jointer room to work right round the pipe and as short as practicable to admit the socket and allow the joint to be made.

Pipes shall be laid carefully to the alignment, levels and gradient as per drawings, specifications and as directed by PMC and care shall be taken to prevent any sand, earth or other matter from entering the pipes during laying. The pipes between manholes shall be laid truly in straight line. The alignment shall be done by suitable ranging rods and levels established by proper levelling instrument.

c) Where pipes are not bedded on concrete the trench bottom shall be left slightly high and carefully bottomed up as pipe laying proceeds so that the pipe barrels rest on firm ground. If excavation has been carried too low it shall be made up with cement concrete of the same mix as specified for pipe bedding at the Contractor's cost and Charges.

d) If the bottom of the trench consists of rock or very hard ground that cannot be easily excavated to a smooth surface, the pipes shall be laid on cement concrete bed to ensure even bearing.

5.3 Jointing of pipes

a) A gasket of Tarred yarn shall be wrapped round the spigot of each pipe and the spigot shall then be placed into the socket of the pipe previously laid, the pipe shall then be adjusted and fixed in its correct position and the gasket caulked tightly home so as to fill not more than one quarter of the total length of the socket. The yarn will be moistened to avoid absorption of water from the mixed cement mortar.

b) The remainder of the socket shall be filled with stiff mix of cement mortar (1 cement: 1 clear sharp washed sand). When the socket is filled, a fillet should be formed round the joint with a trowel forming an angle of 45 degrees with the barrel of the pipe. The mortar shall be mixed as needed for immediate use and no mortar shall be beaten up and used after it has begun to set.

c) After the joint has been made any extraneous materials shall be removed from inside of the joint with a suitable scraper of "badger". The newly made joints shall be protected until set from the sun, drying winds, rain or dust. Sacking or other materials which can be kept damp shall be used. The joints shall be exposed and space shall be left all round the pipes for inspection by the PMC. Inside of the sewer must be left absolutely clear in bore and free from cement mortar or other obstructions throughout its entire length, and shall efficiently drain and discharge.

Depths of yarn and cement mortar paste for different sizes of pipe joints are given below:

Internal dia of			
pipe (mm)		Depth of	
socket (mm)		Depth of	
yarn	Depth of		
mortar			
100	50	22	28
150	60	28	28
250	65	32	32

5.4 Testing

a) All lengths of the sewer and drain shall be fully tested for water tightness by means of water pressure maintained for not less than 30 minutes. Testing shall be carried out from manhole to manhole. All pipes shall be subjected to a test pressure of at least 1.5 metre head of water. The test pressure shall, however, not exceed 6 meter head at any point. The pipes shall be plugged preferably with standard design plugs with rubber plugs on both ends. The upper end shall, however, be connected to a pipe for filling with water and getting the required head.

b) Sewer lines shall be tested for straightness by:

- inserting a smooth ball of dia 12 mm less than the internal diameter of the pipe. In the absence of obstructions such as yarn or mortar projecting at the joints the ball should roll down the invert of the pipe and emerge at the lower end,
- means of a mirror at one and a lamp at the other end. If the pipe line is straight the full circle of light will be seen otherwise obstruction or deviation will be apparent.

c) The Contractor shall give a smoke test to the drains and sewer at his own expense and charges, as directed by the PMC.

d) A test register shall be maintained by the contractor and jointly signed and dated by Contractor and PMC.

5.5 Gully traps

Gully traps shall be of the same quality as described for stoneware pipes in clause 4.1 above and used where shown on drawings.

Gully traps shall be fixed in cement concrete 1:5:10 mix and a brick masonry chamber 30x30 cms inside in cement mortar 1:5 with 15x15 cms grating inside and 30x30 cms C.I. sealed cover and frame weighing not less than 7.3 kg to be constructed as per standard drawing. Where necessary, sealed cover shall be replaced with C.I. grating of the same size (1 cement : 5 coarse sand : 10 stone aggregate 40 mm nominal size)

6 Reinforced cement concrete pipes

6.1 All underground storm water drainage pipes and sewer lines where specified (other than those specified cast iron) shall be centrifugally spun S & S RCC pipes of specified class. Pipes shall be true and straight with uniform bore, throughout. Cracked, warped pipes shall not be used on the work. All pipes shall be tested by the manufacturer and the Contractor shall produce, when directed a certificate to that effect from the manufacturer.

6.2 Laying

R.C.C. spun pipes shall be laid on cement concrete bed or cradles as specified and shown on the detailed drawings. The cradles may be precast and sufficiently cured to prevent cracks and breakage in handling. The invert of the cradles shall be left 12 mm below the invert level of the pipe properly placed on the soil to prevent any disturbance. The pipe shall then be placed on the bed concrete or cradles and set for the line and gradient by means of sight rails and bonding rods etc. Cradles or concrete bed may be omitted, if directed by the Project Manager.

6.3 Jointing

After setting out the pipes the socket shall be centred over the spigot and filled in with tarred gaskin, so that sufficient space is left on either side of the collar to receive the mortar. The space shall then be filled with cement mortar 1:2 (1 cement: 2 fine sand) and caulked by means of proper tools. All joints shall be finished at an angle of 45° to the longitudinal axis of the pipe on both sides of the collars neatly.

6.4 Testing

All pipes shall be tested to a hydraulic test of 1.5 m head for at least 30 minutes at the highest point in the section under test. Test shall also be carried out similar to those for stoneware pipes given above the smoke test shall be carried out by the Contractor, if directed by the A test register shall be maintained which shall be signed and dated by Contractor,/ Project Manager.

7 Cement concrete and masonry works (for manholes and chambers etc.)

7.1 Materials

a) Water

Water used for all the constructional purposes shall be clear and free from oil, acid, alkali, organic and other harmful matters, which shall deteriorate the strength and/or durability

of the structure. In general, the water suitable for drinking purposes shall be considered good enough for constructional purpose.

b) Aggregate for concrete

The aggregate for concrete shall be in accordance with I.S.383 and I.S. 515. In general, these shall be free from all impurities that may cause corrosion of the reinforcement. Before actual use these shall be washed in water, if required as per the direction of Project Manager. The size of the coarse aggregate shall be done as per I.S.383.

c) Sand

Sand for various constructional purposes shall conform to IS : 2687 and its grading shall comply in all respects with I.S. 2116 and I.S. 1542. It shall be clean, coarse hard and stone, sharp, durable, uncoated, free from any mixture of clay, dust, vegetable matters, mica, iron impurities soft or flaky and elongated particles, alkali, organic matters, salt, loam and other impurities which may be considered by the Project Manager.

d) Cement

The cement used for all the constructional purposes shall be ordinary Portland cement or rapid hardening Portland cement conforming to I.S.269.

d) Mild steel reinforcement

The mild steel for the reinforcement bars shall be in the form of round bars conforming to all requirements of I.S. 432 Grade I.

f) Bricks

Brick shall have uniform colour, thoroughly burnt but not over burnt, shall have plain rectangular faces with parallel sides and sharp right angled edges. They should give ringing sound when struck. Brick shall not absorb more than 20% to 22% of water, when immersed in water for 24 hours. Bricks to be used shall be approved by the Project Manager.

The bricks used for construction of sewer manholes shall conform to IS : 4885.

g) Other materials

Other materials not fully specified in these specifications and which may be required in the work shall conform to the latest I.S. All such materials shall be approved by the Project Manager.

7.2 Cement concrete (plain or reinforced)

a) Cement concrete for pipes bedding, cradles, foundations and R.C.C. slabs for all works shall be mixed by a mechanical mixer where quantities of the concrete poured at one time permit. Hand mixing on properly constructed platforms may be allowed for small quantities by the Project Manager. Rate for cement concrete shall be inclusive of all shuttering and centring at all depth and heights.

b) Concrete work shall be of such thickness and mix as given in the Schedule of Quantities.

c) All concrete work shall be cured for a period of at least 7 days. Such work shall be kept moist by means of gunny bags at all times.

7.3 Masonry work

Masonry work for manholes, chambers, septic tanks, and such other works as required shall be constructed with bricks as specified in the Schedule of quantities in cement mortar of mix as specified in schedule of quantities. All joints shall be properly raked to receive plaster.

7.4 Cement concrete for pipe support

a) Wherever specified or shown on the drawings, all pipes shall be supported in bed all round or haunches. The thickness and mix of the concrete shall be given in the Schedule of Quantities. Width of the bedding shall be the width of the trench as specified.

b) Unless otherwise directed by the Project Engineer, cement concrete for bed, allround or in haunches shall be laid as follows :-

	upto 1.5 m	upto 3 m
depth	depth	beyond 3 m
depth		
Mix of concrete (no sub soil water)	(1:4.8)	(1:4:8)(1:4:8)
Stone ware pipes	All round	upto HaunchesAll round
RCC Pipes	All round	upto Haunchesupto Haunches)
Under sub-soil water		
Mix of concrete		
R.C.C. Pipes or SW.pipes	(1:3:6)	
All round	(1:3:6)	
All round	(1:3:6)	
All round		
Under the building RCC Pipes or SW pipes		
(1:3:6)		
All round	All round	
(1:3:6)		
(1:3:6)		
All round		

(Concrete mix refer to cement : coarse sand: stone aggregate 40 mm nominal size)

c) R.C.C. pipes or C.I. pipes may be supported on brick masonry or precast R.C.C. or in situ cradles. Cradles shall be as shown on the drawings.

d) Pipes in loose soil or above ground shall be supported on brick or stone masonry pillars as shown on the drawings.

8 Manholes and chambers

8.1 All manholes, chambers and other such works as specified shall be constructed in brick masonry in cement mortar 1:5 (1 cement : 5 coarse sand) or as specified in the Schedule of Quantities.

8.2 All manholes and chambers etc. shall be supported on base of cement concrete of such thickness and mix as given in the Schedule of Quantities or shown on the drawings.

Where not specified manholes shall be constructed as follows:- (all dimensions internal clear in cms)

Size of manhole		90x80	120x90	90 dia at bottom		122 dia at bottom	
type	Rect.	Rect.	Conical	Conical			
Maximum depth			150	240	167	239	

Average thickness

of R.C.C slab	15	15	-	-

Size of cover and frame mm	60x45	50 dia	50 dia	50 dia
	116 or	116 or	116 or	

Weight of cover and frame	38 kg	225 kg	225 kg	225 kg

8.3 All manholes shall be provided with cement concrete benching in 1:2:4 mix (1 cement : 2 coarse sand : 4 stone aggregate 20 mm nom. Size) The benching shall have a slope of 10 cms towards the channel. The depth of the channel shall be full diameter of the pipe. Benching shall be finished with a floating coat of neat cement. as per standard details.

8.4 All manholes shall be plastered with 12/15 mm thick cement mortar 1:3 (1 cement : 3 coarse sand) and finished with a floating coat of neat cement inside. Manhole shall be plastered outside as above but with rough plaster mixed with water proofing compound.

8.5 All manholes with depths greater than 0.8m shall be provided with 20 mm square or 25 mm round rods aoristic coated catch rings set in cement concrete blocks 25x10x10 cms in 1:2:4 mix 30 cms vertically and staggered. Foot rests shall be coated with coal tar before embedding.

8.6 All manholes shall be provided with cast iron/steel fibre reinforced plastic (SFRC) covers and frames and embedded in reinforced cement concrete slab. Weight of cover, frame and thickness of slab shall be as specified in the Schedule of Quantities or given above.

8.7 Road gullies, ramp drains, gratings in basement shall be cast iron with M.S. frame or Steel Fibre Reinforced Concrete (SFRC) with frame as specified in the Schedule of Quantities.

9 Making connections

9.1 Contractor shall connect the sewer line of the building to the main manhole by providing making holes and channels etc.

10. Measurement

10.1 Excavation

10.1.1 Measurement for excavation of pipe trenches shall be made per linear metre correct upto 1 cm.

Separately for

- a) all soil
- b) rocks

10.1.2 Trenches shall be measured between outside walls of manholes at top and the depth shall be the average depth between the two ends to the nearest cm. The rate quoted shall be for a depth upto

1.5 m or as given in the Schedule of Quantities.

10.1.3 Payment for trenches more than 1.5 m in depth shall be made for extra depth as given in the schedule of quantities and above the rate for depth upto 1.5 m.

10.1.4 Timbering and Shoring

Timbering and shoring as described above shall be measured per m² and paid for as per the type of timbering of shoring done at site and as per the relevant item in the Schedule of Quantities. Rate for timbering and shoring shall be for all depths and types of soil classifications including saturated soil.

10.1.5 Saturated Soil

No extra payment for pumping and bailing out water shall be made for excavation with an average depth of 1.5 m in saturated soil, surface water from rain falls or broken pipes lines, or sieves and other similar sources. An extra rate as quoted in the schedule of quantities shall be paid for excavation in saturated soil for pipe trenches above average depth of 1.5 m. No payment is admissible for water collected from surface sources and broken pipe lines or sewers.

10.1.6 Refilling, Consolidation and Disposal of Surplus Earth

Rate quoted for excavation of trenches shall be inclusive of refilling, consolidation and disposal of surplus earth within a lead of 200 m.

10.2 Stoneware Pipes/RCC/C.I. pipes

Stoneware R.C.C./C.I. pipes shall be measured for the finished length of the pipeline in running metres nearest to a centimetre.

(a) Lengths between manholes shall be recorded from inside of one manhole to inside of other manhole,

(b) Length between gully trap and manhole shall be recorded between socket of pipe near gully trap and inside of manhole. Rate shall include all items given in the schedule of quantities and specifications.

10.3 Gully Traps

Gully traps shall be measured by the number and rate shall include all excavation, foundation, concrete brick masonry, cement plaster inside and outside, C.I. grating and sealed cover and frame.

10.4 Cement Concrete for Pipes

Cement concrete in bed and all round or in haunches shall be paid per running metre between the outside wall of manholes at bottom of the trench. No additional payment is admissible in respect of concreting done for widths greater than specified, for shuttering or centering and concreting in sub soil water conditions.

10.5 Manholes, Catch basins & Ramp drains

a) All manholes and catch basins shall be measured by numbers and shall include all items specified above and necessary excavation, refilling & disposal of surplus earth.

b) Manholes with depths greater than specified under the main item shall be paid for under "extra depth" and shall include all items as given for manholes. Measurement shall be done to the nearest cm. Depth of the manholes shall be measured from top of the manhole cover to bottom of channel.

c) Ramp drains shall be measured per metre length.

10.6 Making Connections

Item for making connection to municipal sewer shall be paid for by number and shall include all items given in the Schedule of Quantities and specifications.

END OF SECTION E: DRAINAGE (SEWER & STORM WATER DRAINS)

SECTION F: GARDEN IRRIGATION SYSTEM

1 Scope of work

1.1 Work under this section consists of furnishing all labour, materials equipment and appliances necessary and required to install garden hydrants and sprinklers and drip irrigation water supply system as required by the drawings, specified hereinafter and given in the Schedule of Quantities.

1.2 Without restricting to the generality of the foregoing, the water supply system shall include the following:-

- a) Pipe work with connections to hydrants.
- b) Garden hydrants.
- c) Excavation and refilling of pipes trenches.

- d) Control valves, masonry chambers and other appurtenances.
- e) Connections to all pumps & appliances.

2 The System

2.1 The garden hydrant system should be executed for a total working system.

2.2 System components shall be pipes, valves, controllers, various types of sprinklers and drip irrigation lines with emitters as approved by the Project Manager.

3 General requirements

3.1 All materials shall be new of the best quality conforming to specifications. All works executed shall be to the satisfaction of the Project Manager.

3.2 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner.

3.3 Short or long bends shall be used on all main pipe lines as far as possible. Use of elbows shall be restricted for short connections.

3.4 Pipes shall be laid in a manner as to provide as far as possible easy accessibility for repair and maintenance. Pipes under roads shall be laid in RCC pipe sleeves.

3.5 Valves and other appurtenances shall be so located as to provide easy accessibility for operations, maintenance and repairs.

4 uPVC Pipes & Fittings

4.1 Garden hydrant mains shall be rigid uPVC pipes conforming to IS: 4985 of class specified. If class is not mentioned in the schedule of quantities the same shall be class IV (10 kg/cm²).

4.2 Fittings for uPVC pipes shall be injection moulded fitting with spigot & sockets suitable for solvent weld joints. Fittings must have suitable provision for expansion.

4.3 Solvent shall be of make and type approved by pipe and fittings manufacturer. Joint shall be made in an approved manner as recommended by the manufacturer.

4.4 uPVC flanges at intervals of 20-25 m for all pipes 65 mm dia and above shall be provided for easy maintenance.

4.5 Suitable uPVC thread adapter for connection between pipes & valves shall be provided.

4.6 Cement concrete supports and anchor blocks shall be provided at all bends, tees and other locations as directed by the Project Manager. Connections at garden hydrant outlet, near valves must also be anchored.

4.7 G.I. Pipes & Fittings

Vertical connection for garden hydrant points shall be galvanised steel tubes to IS: 1239 (medium class) with matching malleable iron fittings of approved make.

5. Garden Hydrants

Garden hydrants shall be 25 mm dia gunmetal valves installed on G.I. pipes as per details.

6 Valves

Valves shall be as specified in section for Water Supply.

7. Trenches

All pipes below ground shall be laid in trenches with a minimum cover of 100 cms. The width and depth of the trenches shall be as follows:-

Dia of pipe	Width of trench	Depth of trench
15 mm to 50 mm	30 cms	100 cms
65 mm to 100 mm	45 cms	100 cms

This will not apply to drip irrigation pipes which may be laid just below the surface or on surface.

8. Testing

8.1 All pipes, fittings and valves, after fixing at site, shall be tested by hydrostatic pressure of 7 kg/cm² or 1.5 times the working pressure, whichever is higher. Pressure shall be maintained for a period of at least thirty minutes without any drop. A test register shall be maintained and all entries shall be signed and dated by Contractor(s) and the Project Manager.

8.2 In addition to the sectional testing carried out during the construction, Contractor shall test the entire installation after connections to the pumping system. He shall rectify all leakages and shall replace all defective materials in the system. Any damage done due to carelessness, open or burst pipes or failure of fittings, to the building, furniture and fixtures shall be made good by the contractor during the defects liability period without any cost.

8.3 After commissioning of the water supply system, Contractor shall conduct performance test to ensure that the system operates as specified. The test shall be conducted over a period of 15 days.

9. Measurement

9.1 Pipes shall be measured in running meter (to the nearest cm) and shall be inclusive of fittings, e.g. couplings, tees, bends, elbows, unions. Deductions for valves shall be made. Rates quoted shall be inclusive of all fittings.

9.2 Excavation, back filling & disposal of surplus earth is included in the rates for laying pipes.

9.3 Gunmetal, cast iron valves, sprinklers, emitters and masonry chambers shall be paid by numbers.

SECTION G: PIPE COLOUR CODE

This Colour Code is as per I.S. 2379.

Ground Colour 1st Colour Band 2nd Colour band

Proportional width of band 4:1

Note:-Arrow indicating the direction of flow.

Pipe lines	Ground Colour	1st Colour	2nd Colour
Band	Band		

1. Drinking water

(all cold water Sea green French blue Signal red
lines after filter)

2. Treated water Sea green Light orange
(soft water)

3. Domestic hot Sea green Light grey
water

4. Drainage Black Sewer /SWD

5. Fire Services Fire red This Colour Code is as per I.S. 2379.

Final design for colour coding will be of OWNER'S only

SECTION H: I.S. CODES AND REFERENCE STANDARDS.

A. Codes and reference standards referred to in the contract shall be understood to form a part of the contract.

B. Alternative reference standards produced by different standards authorities may be specified in a Section. Standards of any of the specified authorities may be acceptable,

however, materials specified in the Section shall be incorporated in the works from only one of the specified standards authority to ensure compatibility in the performance of the materials.

C. The contractor shall be responsible for adherence to reference standard requirements by subcontractors and suppliers.

D. Where edition date is not specified, consider that reference to manufacturer's and published codes, standards and specifications are made to the latest edition (revision or amendment) approved by the issuing organization current at issue date of the Tender.

E. The specified reference standards are INDIAN STANDARD CODES and are intended to establish the quality of materials and workmanship required for the works. Reference standards published in other countries may, in the sole judgement of the owner's consultant, also be acceptable providing that the Contractor furnishes sufficient data for the Owner's Consultant to determine if the quality of materials and workmanship at least equals or exceeds all tests prescribed by the specified reference Indian Standards codes.

Such other reference standards published by the following will be considered ; BSI
: British Standards Institute

AFNOR : Association Francaise de Normalisation
(French Standards Institute)

DIN : Deutsche Industries Normen (German Standards) ANSI :
American National Standards Institute

ASTM : American Society for Testing and Materials

F. Reference standards and specifications are quoted in the specification to establish minimum standards. Works of quality or of performance characteristics that exceed these minimum standards will be considered to confirm.

Should regulatory requirements or the contract conflict with specified reference standards or specifications, the more stringent in each case shall govern.

G. Where reference is made to manufacturer's directions, instructions or specifications they shall include full information on storing, handling, preparing, mixing, installing, erection, applying or other matters concerning the materials pertinent to their use in the works and their relationship to materials with which they are incorporated.

H. Obtain copies of codes applying to the Work, manufacturer's directions and reference standards referred to in the contract within 90 days of signing the contract.

I. Submit a copy of each code, reference standard and specification, and manufacturer's directions, instructions and specifications, to which reference is made in the specification to the Owner's Authorized Representative's.

J. LIST OF CODES (INDIAN STANDARD CODES)

Standards, specifications, associations, and regulatory bodies are generally referred to throughout the specifications by their abbreviated designations. The materials workmanship shall be in accordance with the requirement of the appropriate CP, I.S code

wherever applicable together with any building regulations or bye-laws governing the works.

The following list is included for guidance only and the omission of any CP, I.S. codes from the list does not relieve the contractor from compliance therewith:

The more important Codes, Standards and Publications applicable to this section are listed hereinafter:

1. General

IS 1200 Mode of Measurement

IS 12183(Part 1) Code of practice for plumbing in multi-storeyed buildings (Water Supply)

IS 12251 Code of practice for drainage of building basements IS 3844
Code of practice for installation and maintenance of internal

fire hydrants and hose reel on premises

SP 7 National building code of India (Part IX plumbing services)

IS 27 Pig Lead

IS 325 Three phase induction motors

IS 554 Dimensions for pipe threads where pressure light joints are required on the threads

IS 694 PVC insulated cables for working voltages upto and including 1100 V.

IS 779 Specification for water meters (domestic type)

IS 1172 Code of Basic requirements for water supply drainage and sanitation

IS 1367 Technical supply conditions for threaded

(Part 1) steel fasteners: Part I Introduction and general information IS 1367
Technical supply conditions for threaded

(Part 2) steel fasteners: Part 2 Product grades and tolerances. IS 1554
PVC insulated (heavy duty) electric cables:

(Part 1) Part 1 For working voltages upto and including 1100 V.

IS 1554 PVC insulated (heavy duty) electric cables:

(Part 2) Part 2 For working voltages from 3.3 KV upto and including 11 kV.

IS 1726 Specification for cast iron manhole covers and frames IS 1979
High test line pipe

IS 1742 Code of practice for building drainage

IS 2064	Selection, installation and maintenance of sanitary appliances- Code of practice
IS 2065	Code of practice for water supply in buildings
IS 2643	Dimensions for pipe threads for fastening
(Part 1)	purposes: Part 1 Basic profile and dimensions
IS 2643	Dimensions for pipe threads for fastening
(Part 2)	purposes: Part 2 Tolerances
IS 2643	Dimensions for pipe threads for fastening
(Part 3)	purposes: Part 3 Limits of sizes
IS 2104	Specification for water meter boxes (domestic type)
IS 2373	Specification for water meters (bulk type)
IS 2379	Colour code for the identification of pipe lines.
IS 7558	Code of practice for domestic hot water installations
IS 5329	Code of practice for sanitary pipe work above ground for buildings
IS 2527	Code of practice for fixing rainwater gutters and down pipes for roof drainage
IS 9668	Code of practice for provision and maintenance of water supplies and fire fighting.

2. Pipes and Fittings

IS 1536 Centrifugally cast (spun) iron pressure pipes for water, gas and sewage

IS 7181 Specification for horizontally cast iron double flanged pipes for water, gas and sewage.

IS 1729 Sand cast iron spigot and socket soil, waste and ventilating pipes, fittings and accessories

IS 3989 Centrifugally cast (spun) iron spigot and socket soil, waste and ventilating pipes, fittings and accessories

IS 3486 Cast iron spigot & socket pipes IS 1879 Malleable cast iron pipe fittings (Parts 1 to 10)

IS 1538 Cast iron fittings for pressure pipes for water, gas and sewage (Parts 1 to 23)

IS 6418 Cast iron and malleable cast iron flanges for general engineering practice.

IS 3589 Seamless or electrically welded steel pipes for water, gas and sewage (168.3 mm to 2032 mm outside diameter)

IS 1239 Mild steel tubulars and other wrought steel pipe fittings. Part 1 Mild steel tubes

Part 2 Mild steel tubulars and other wrought steel pipe fittings.

IS 458 Specification for pressure concrete pipes (with and without reinforcement)

IS 2501 Copper tubes for general engineering purposes IS 651 Salt glazed stone-ware pipes and fittings

3. Valves

IS 780 Specification for sluice valves for water works purposes (50 to 300 mm size)

IS 2906 Specification for sluice valves for water works purposes (350 to 1200 mm size)

IS 1703 Specification copper alloy float valves (horizontal plunger type) for water supply

IS 778 Specification for copper alloy gate, globe and check valves for water works purposes

IS 3950 Specification for surface boxes for sluice valves IS 5312 Specification for swing check type reflux

(Part 1) (non return) valves: Part 1 Single door pattern IS 5312 Specification for swing check type reflux

(Part 2) (non return) valves: Part 2 Multi door pattern

4. Sanitary Fittings

IS 8931 Specification for cast copper alloy fancy bib taps and stop valves for water services

IS 8934 Specification for cast copper alloy fancy pillar taps and stop valves for water services

IS 781 Specification for cast copper alloy screw down bib taps and stop valves for water services

IS 782 Specification for caulking lead

IS 2692 Specification for ferrule for water services

IS 6249 Specification for flush valves and fittings for marine use

IS 2326 Specification for automatic flushing cistern for urinals

IS 774 Specification for flushing cisterns for water closets and urinals (other than plastic cistern)

IS 775 Specification for cast iron brackets and supports for wash basins IS 6411 Specification for gel-coated glass fibre reinforced polyester resin

bath tubs

IS 771 Specification for glazed fire clay sanitary appliances (Part 1 to 6) IS 5961 Specification for cast iron gratings for drainage purposes.

IS 7231 Specification for plastic flushing cisterns for water closets and urinals

IS 2548 Specification for plastic seats and covers

(Part 1) for water closets, Thermoset seats and covers Specification for plastic seats and covers

(Part 2) for water closets, Thermoplastic seats and covers IS 2556 Specification for vitreous sanitary

(Part 1) appliances (vitreous china)

Part 1 : General requirements IS 2556 Specification for vitreous sanitary

(Part 2) appliances (vitreous china) Part 2 : Specific requirements of wash- down water closets

IS 2556 Specification for vitreous sanitary (Part 3) appliances (vitreous china)

Part 3 : Specific requirements of squatting pans

IS 2556 Specification for vitreous sanitary (Part 4) appliances (vitreous china) Part 4 : Specific requirements of wash basins

IS 2556 Specification for vitreous sanitary (Part 6 Sec 2) appliances (vitreous china) Part 6 : Specific requirements of urinals, Section 2 Half

stall urinals

IS 2556 Specification for vitreous sanitary (Part 6 Sec 4) appliances (vitreous china) Part 6 : Specific requirements of urinals, Section 4 Partition slabs

IS 2556 Specification for vitreous sanitary (Part 6 Sec 5) appliances (vitreous china) Part 6 : Specific requirements of urinals, Section 5 waste fittings

IS 2556 Specification for vitreous sanitary (Part 6 Sec 6) appliances (vitreous china) Part 6 : Specific requirements of urinals, Section 6 Water spreaders for half stall urinals

IS 2556 Specification for vitreous sanitary (Part 6 Sec 7) appliances (vitreous china) Part 7 : Specific requirements of half round channels

IS 2556 Specification for vitreous sanitary (Part 7 Sec 7) appliances (vitreous china) Part 7 : Specific requirements of half round channels.

IS 2556 Specification for vitreous sanitary (Part 8) appliances (vitreous china)

Part 8 : Specific requirements of siphonic wash down water closets.

IS 2556 Specification for vitreous sanitary (Part 11) appliances (vitreous china) Part 11: Specific requirements for shower rose

IS 2556 Specification for vitreous sanitary (Part 12) appliances (vitreous china) Part 12: Specific requirements floor traps

IS 2556 Specification for vitreous sanitary (Part 15) appliances (vitreous china) Part 15: Specific requirements of universal water closets

5. Water Quality Tolerance

IS 10500 Drinking water

IS 4764 Tolerance limits for sewage effluents discharged into inland surface waters

IS 1700 Specification for drinking fountains IS 1978 Line pipe

IS 2002 Steel plates for pressure vessels for intermediate & high temperature service including boilers

IS 2629 Recommended practice for hot dip galvanizing on iron and steel IS 2717 Glossary of terms relating to vitreous enamelware and ceramic-

metal systems

IS 2825 Code for unfired pressure vessels

IS 2963 Specifications for copper alloy waste-fittings for wash basins and sinks

IS 3025 Method of sampling and test (physical and (Part 1 to 44) chemical) for water and waste water

IS 3114 Code of practice for laying of cast iron pipes

IS 3311 Specification for waste plug and its accessories for sinks and wash basins.

IS 3468 Pipe nuts

IS 3589 Seamless or electrically welded pipes for water, gas and sewage IS 4127 Code of practice for laying glazed stoneware pipes

IS 4346 Specifications for washers for use with fittings for water services IS 4711 Methods of sampling steel pipes, tubes and fittings

IS 4853 Recommended practice for radiographic inspection of fusion welded butt joints in steel pipes

IS 6159 Recommended practice for design and fabrication of material prior to galvanizing.

IS 6411 Specification for gel-coated glass fibre reinforced polyester resin baths

IS 8090 Specification for coupling, branch pipe, nozzle, used in hose reel tubing for fire fighting

IS 8321 Glossary of terms applicable to plumbing work

IS 8419 Requirements for water filtration equipment (Part 1) Part 1

Filtration media-sand and gravel requirements for rapid sand gravity filtration equipments.

IS 8419 Requirements for water filtration equipment (Part 2) Part 2 Under drainage system

IS 6392 Steel pipe flanges

IS 9758 Specification for flush valves and fitting for water closets and urinals

IS 9842 Preformed fibrous pipe insulation

IS 9912 Coal tar based coating materials and suitable primers for protecting iron and steel pipe lines

IS 10221 Code of practice for coating and wrapping of underground mild steel pipelines

IS 10234 Recommendations for general pipeline welding

IS 10446 Glossary of terms relating to water supply and Sanitation IS 11149 Rubber Gaskets

IS 11790 Code of practice for preparation of butt-welding ends for pipes, valves flanges and fittings

IS 12011 Code of safety practice for domestic LPG installation

Part B:- TECHNICAL SPECIFICATIONS FOR FIRE SUPPRESSION WORKS.

Section 1. General Instructions

1.1 Fire suppression works specified in the tender have to be executed in accordance with:

1.1.1 The rules and regulations of Local Fire Authority as per the statutory regulations applicable for obtaining the occupation certificate from the Local Development / Fire Authority.

1.1.2 The contractor has also to ensure compliance of the Rules of the Tariff Advisory Committee (TAC) of the Insurance Association of India, as amended up to date to enable the Project Managers to apply for getting the maximum rebate on insurance premium for the building. Contractor's responsibility for compliance will be only with respect to the items of work put to tender. He will prepare and submit a set of drawings and calculations and such other information as required for making the application. He will also assist the Project Managers in providing all technical clarifications, corrections to drawings and calculations as required by the TAC.

1.1.3 Applicable norms laid down by the National Building Code of Bureau of Indian Standards (B.I.S.) shall be followed as applicable.

1.1.4 The codes of the National Fire Protection Association of USA (N.F.P.A.) shall used as a general guide for good engineering practice, design and workmanship norms. No certificate of compliance to NFPA codes will be required.

1.2 All materials used in the works shall have Bureau of Indian Standards valid certification stamped, marked or cast on the material in an acceptable and approved manner.

1.3 It is the contractor's responsibility to ensure the competence of design to meet the above requirements.

1.4 Drawings issued with the tenders are schematic and indicate the concept. Contractor shall make his shop drawings on basis of Architectural and Interior design drawings issued by the Engineer-in-Charge. Work will be executed only as per approved shop drawings.

1.5 Quantities in the tender document are approximate worked out on the tender drawing issued.

1.6 Contractors are invited to highlight any aspects of the contract document that may need revision or reconsideration before the work is started. He must furnish a details of any variations in the specifications or the quantities that may be necessary for him to comply with the Code and statutory requirements. These may be identified and approval of the Project managers taken before the start of the work.

1.7 Contractors shall furnish detailed Shop drawings, hydraulic and other design calculations for submission and approval of the Local Fire Authority and for Insurance Companies

1.8 It is the sole responsibility of the contractor to get the approval of the Local Fire Authority for the work done by him and nothing extra shall be payable including the official and other charges.

2. System Design

2.1 Fire suppression system for the building is based on the concept of "total protection" by the wet riser hydrant and sprinkler system for the entire premises with excepted areas identified on the drawings or as instructed by the Project Managers.

2.2 Water Storage & Pump House

2.2.1 A static underground RCC water storage tank having capacity of 150 KL will be provided. The tank will be provided with manholes, inserts, puddle flanges, ladders inside and outside the tanks.

2.2.2 One or more over head water storage tank of on terrace in each building . as a secondary water source for the sprinkler / hydrant system will be provided on the terrace.

2.2.3 The pump house is located in basement so as to provide net positive suction to all pumps. Test lines from pumps shall discharge back into the fire tank to conserve water.

2.2.4 Configuration and operating conditions of pumps are given in the Specifications.

2.3. Down comer System

2.3.1 The building will be provided with a down comer system.

2.4. Sprinkler System

2.4.1 A separate and independent riser fire sprinkler shall be provided as shown on the drawings. The system will be divided in several zones (block and floor wise) with their own installation valves, located in the basement or near the fire pump room.

2.4.2 The building > 45 mtr and entire basement shall be protected with automatic sprinkler system with permitted exceptions e.g. electrical switch rooms, power transformers and D.G. rooms plant rooms as identified.

2.4.3 Types of sprinklers to be used shall be as given in specifications, BOQ and approved by the Project Managers

2.5. Pumping System

2.5.1 The pumping system shall provide the water supply and pressure to the wet riser fire and sprinkler mains. Diesel Engine will be a common stand by.

2.5.3 Two sets of pumps are proposed one for tower A and another for Tower Band C.

2.5.2 Provide a full bore test valve on the by pass line with rate of flow meter on the common pump header to discharge in the water tank. Also provide an isolation valve on headers outlet to each circuit to enable pressure setting and testing of pumps.

Section 2. Fire Hydrant & Automatic Sprinkler System

2.1 Scope of work

2.1.1 Wet riser fire hydrant system (internal & external)

2.1.2 Automatic sprinkler system

2.1.3 Fire hydrant & sprinkler pumps.

2.1.4 Valves, suction and delivery connections and headers.

2.1.5 Hand appliances.

2.1.6 Pipe protection, painting, sleeves & minor civil works other than specifically mentioned in the tender.

2.1.7 Electrical installations.

2.1.8 Specialized protection as specified.

2.1.9 Testing and commissioning.

2.2. General Requirements

2.2.1 All materials shall be new of the best quality conforming to the specifications and subject to the approval of the Project Managers.

2.2.2 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner.

2.2.3 Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.

2.2.4 Pipes shall be securely fixed to walls, and ceilings by suitable clamps at intervals specified. Only approved type of anchor fasteners shall be used for RCC ceilings and walls.

2.2.5 Valves and other appurtenances shall be so located that they are easily accessible for operations, repairs and maintenance.

2.3 Pipes

2.3.1 All pipes within and outside the building in exposed locations and shafts including connections buried under floor shall be M.S. Pipes as follows:

2.3.1 Pipes 150 mm dia and below IS: 1239 Heavy Class

2.3.2 Pipe 200 mm dia and above IS 3589 of thickness specified.

2.4 Pipe Fittings.

2.4.1 Pipes and fittings means tees, elbows, couplings, flanges, reducers etc. And all such connecting devices that are need to complete the piping work in its totality.

2.4.2 Screwed fittings shall be approved type malleable or forged type with reinforced ring on edges of the fittings suitable for screwed joints.

2.4.3 Forged steel fittings of approved type with "V" groove for welded joints.

2.4.4 Fabricated fittings shall not be permitted for pipe diameters 40 mm and below.

2.4.5 When used, they shall be fabricated, welded and inspected in workshops under supervision of Project Managers whose welding procedures have been approved by the TAC as per TAC rule 4102 for sprinkler system and applicable to hydrant and sprinkler system. For "T" connections, pipes shall be drilled and reamed. Cutting by gas or electrical welding will not be appreciated.

2.5 Jointing

2.5.1 Screwed (40 mm dia pipes and below)

Joint for black steel pipes and fittings shall be metal-to-metal thread joints. A small amount of red lead may be used for lubrication and rust prevention. Joints shall not be welded or caulked.

2.5.2 Welded (50 mm dia and above)

Joints between M.S. and pipes and fittings shall be made with the pipes and fittings having "V" groove and welded with electrical resistance welding in an approved manner. Butt-welded joints are not acceptable. Buried pipes will be subject to X Ray test from an approved agency as per the TAC norms at the cost of contractor.

2.5.3 Flanges.

Flanged joints shall be provided on :

- a) not Straight runs exceeding 30 m on pipelines 80 mm dia and above.

b) Both ends of fabricated fittings e.g. bends, tees etc. of 65 mm dia or larger diameter.

c) For jointing all types of valves, appurtenances, pumps, connections With other type of pipes, to water tanks and other places necessary and required as good for engineering practice.

d) Flanges shall be as per I.S. with appropriate number of G.I. nuts and bolts, 3 mm insertion neoprene gasket complete.

2.5.4 Unions

Provide approved type of dismountable unions on pipes lines 65 mm and below in similar places as specified for flanges.

2.6 Excavation

2.6.1 Excavation for pipe lines shall be in open trenches to levels and grades shown on the drawings or as required at site. Pipe lines shall be buried to a minimum depth of 1.2 meter or as shown on drawings.

2.6.2 Wherever required contractor shall support all trenches or adjoining structures with adequate timber supports.

2.6.3 On completion of testing and pipe protection, trenches shall be refilled with excavated earth in 15 cms layers and consolidated.

2.6.4 Contractor shall dispose off all surplus earth with in a lead of 200 m or as directed by Project Manager.

2.7 Anchor Thrust Blocks

a) Contractor shall provide suitably designed anchor blocks in cement concrete to encounter excess thrust due to water hammer & high pressure.

b) Thrust blocks shall be provided at all bends & tees & such other location as determined by the Project Manager.

c) Exact location, design, size and mix of the concrete block shall be approved by the Project Manager prior to execution of work.

2.8 Valves

2.8.1 Ball Valves

a) Valves 40 mm dia & below shall be heavy type nickel plated Brass body screwed type, with chromium plated brass balls, PTFE Teflon seating and gland packing tested to a hydraulic pressure of 20 kg/sq cm including coupling and gunmetal handle conforming to

B.S. 5351 with female screwed ends.

b) All valves shall be approved by the Project Manager before they are allowed to be used on work.

2.8.2 Butterfly Valves

Butterfly Valves shall be cast iron body IS-2010 and shall be of class P.N. 1.6 tested to 20 kg/cm² with following details :-

- a) Disc shall be CI heavy duty electrolyses nickel plated abrasion resistant.
- b) The shaft be EN-8 Carbon Steel with low friction nylon bearings.
- c) The seat shall be drop tight constructed by bonding resilient elastometer inside a rigid backing.
- d) Built in flanged rubber seals.
- e) Actuator to level operated for valves above ground and T Key operated for valves below ground.
- f) Built in flanges for screwed on flanged connections. Manufacturer's details on fixing and installation will be followed.

2.8.3 Non Return Valves (NRV)

Where specified non return valve (dual swing check type) shall be C.I. / MS. Wafer type, suitable for PN-1.6 pressure, EPDM / Nitrile seat, provided through which flow can occur in one direction only. It shall be of best quality.

2.8.4 Air Cushion tank.

a) Air cushion tank shall be of size and capacity indicated in schedule of quantities. It shall be provided at the top most point/points and/or in pump house (as specified). The tank shall be complete with 20 mm dia. Brass Air Valve (Ball type), Stop Valve (20mm dia), Drain valve (20mm dia) and pressure gauge including 20 mm dia. Mild Steel Galvanised pipes and fittings, unions, etc. as required to complete the work as per site conditions.

2.8.5 Air Cushion tank shall be measured by numbers and shall include Air Valve, Pressure Gauge, Globe Valves for testing and draining, M.S. Clamps, Pipes, Fittings, Tees Elbows Union and all other items required to complete the work.

2.8.6 Orifice Flanges

Provide orifice flanges fabricated from 6 mm thick stainless steel plate to reduce pressure on individual hydrants to restrict the operating pressure to a maximum of 7.0 Kg/sq.cm. and allow full discharge. The contractor shall submit design of the orifice flanges for approval before installation

2.8.7 Drain Valve

Provide 25 mm dia black steel pipe to IS: 1239 (heavy class) with 25 mm Ball valve for draining any water in the system in low pockets.

2.8.8 Inspection & testing assembly

Inspection and testing of the sprinkler system shall be done by providing an assembly consisting of gunmetal valves, gunmetal sight glass, bye-pass valve. The drain pipe beyond the valve upto the drainage point shall be measured with the pipe.

2.8.9. Pump test assembly

Provide on the main fire sprinkler header a 150 mm dia bye pass valve located in an

accessible manner along with a rate of flow rotometer calibrated in lpm and able to read 200 % of the rated pump capacity. The delivery shall be connected to the fire tank.

2.8.9 Pressure Gauge

Pressure gauge shall be provided near all connections to hydrant system and isolation valves of sprinkler system and where required. Pressure gauge shall be 100 mm dia gunmetal Bourden type with gunmetal isolation cock, tapping and connecting pipe and nipple. The gauge shall be installed at appropriate level and height for easy readability.

2.9 Hydrant/valve chambers

2.9.1 Contractor shall provide suitable brick masonry chambers (wherever required) in cement mortar 1:5 (1 cement: 5 coarse sand) on cement concrete foundations 150 mm thick 1:5:10 mix (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size) 15 mm thick cement plaster inside and outside finished with a floating coat of neat cement inside with cast iron surface box approved by fire brigade including excavation, back filling complete.

2.9.2 Valve chambers shall be 60x60 cms. for depths up to 100 cms.

2.10 Flow switch

a) Flow switches shall be provided on sectional mains and branch lines of sprinkler systems where indicated on drawings, or necessary and required and directed by the Project Manager.

b) Flow switch should be suitable to actuate for opening of a single sprinkler and shall be suitable for connection to a central annunciation panel.

2.11 Fire brigade connections

Provide as shown on drawings separate gunmetal 4 way collecting head with four 63 mm instantaneous type inlets with built in check valves and 150 mm dia outlet connected to the fire or / and sprinkler main . Collecting head shall be installed on a stand post and provided with horizontal C.I. non return valve and location to be approved by Project Manager. Provide etched gunmetal label plates with 50 mm height letter. The plates should be firmly fixed to the FB connection and any support system.

2.12 Fire hydrants

2.12.1 External hydrants

a) Contractor shall provide external hydrants. The hydrants shall be controlled by a cast iron butterfly valve installed in underground lockable chambers. Hydrants shall have instantaneous type 63 mm dia outlets. The hydrants shall be single outlet conforming to

I.S. 5290-1969 with C.I duck foot bend and flanged riser of required height to bring the hydrant to correct level above ground.

b) Contractor shall provide for each external fire hydrant two numbers of 63 mm dia. 15 m long rubberized perm line hose pipe with gunmetal male and female instantaneous type couplings machine wound with G.I. wire (hose to I.S. 8423 and couplings to I.S. 903 with M.S. Certification), gunmetal branch pipe with nozzle to I.S. 903.

2.12.2 Internal hydrants

a) Contractor shall provide on each landing and other locations as shown on the drawings one single headed Stainless Steel (S.S) landing valve with 63 mm dia outlet mounted on a common 80 mm inlet (I.S.5290-1969). Landing valve shall have flanged inlet and instantaneous type outlets as shown on the drawings.

b) Instantaneous outlets for fire hydrants shall be of standard pattern approved and suitable for fire brigade hoses.

a) Contractor shall provide for each internal fire hydrant station two numbers of 63 mm dia. 15 m long rubberized fabric linen hose pipes with SS male and female instantaneous type coupling machine wound with G.I. wire (hose to I.S. 636 Type 2 and couplings to I.S.903 with I.S. Certification), fire hose reel, SS branch pipe with nozzle I.S. 903 and Fire man's axe.

b) Each hose box shall be conspicuously painted with the letters "FIRE HOSE".

2.13 Fire hose reels

Contractor shall provide standard fire hose reels with 20 mm dia high pressure rubber hose

36.5 m long with gunmetal nozzle and control valve, shut off valve, all mounted on circular hose reel of heavy duty mild steel construction and cast iron brackets. Hose reel shall be connected directly to the wet riser. Hose reel shall conform to IS: 884-1969 and rubber hose to IS: 5132.

2.14 Hose Cabinets

2.14.2 Provide hose cabinets or door shutter with frame as the case may be for all internal fire hydrants. Hose cabinets shall be fabricated from 16 gauge M.S. sheet of fully welded construction with hinged double front door partially glazed (4 mm thick glass) with locking arrangement, stove enameled fire red paint with "FIRE HOSE" written on it prominently.(Size as given in the Bill of Quantities).

2.15 Pipe protection

a) All pipes above ground and in exposed locations shall be painted with one coat of zinc chromate primer and two or more coats of synthetic enamel paint of approved shade.

b) Pipes in chase or buried underground shall be painted with two coats of zinc chromate primer and wrapped with one layer of 4 mm thick PYPCOAT or equivalent multi layer sheet as per standard manufacturer's specifications.

2.16 Pipe Supports

2.16.1 All pipe clamps and supports shall be galvanised steel. When fabricated from M.S. steel sections, the supports shall be factory galvanised before use at site. Welding of galvanised clamps and supports will not be permitted.

2.16.2 Pipes shall be hung by means of expandable anchor fastner of approved make and design (Dash Fastners or equivalent). The hangers and clamps shall be fastened by means of galvanised nuts and bolts. The size/diameter of the anchor fastner and the clamp shall be suitable to carry the weight of water filled pipe and dead load normally accounted.

Pipe Spacing Table

< Pipe commercial dia.



S.No.	Pipes & Position	15/20	20/25	32/40	50	75/80	100/110
150/160	200						

1

Vertical

3

3.6

4.5

4.5

1.1	GI /MS	2.4	2.4				5.4	5.4

1.2	CI Pipes IS 1729/3989	x	X	<----- 3 m -----				

----- - □

1.3	CI Heavy Duty IS 1536	x	X	<----- 3.6 m -----				

----- - □

1.4	uPVC SWR Systems	x	X	0.5	0.7	0.9	0.9	1.0

1.5	uPVC Water Supply							

1.6	Polybutylene	<--- As per manufacturer's Reccomendations-----								-----
---	-	□								
1										
Horizontal										
1.1	GI /MS	2.0	2.0	2.4	3.0	3.6	4.0	4.5	4.5	
1.2	CI Pipes IS 1729/3989	<----- 3 m						>		
1.3	CI Heavy Duty IS 1536							3.0	3.6	3.6
4.5										
1.4	uPVC SWR Systems					1.2	1.8	1.8	1.8	
1.5	uPVC Water Supply									
1.6	Polybutylene	<----- As per manufacturer's								
	recommendations	>								

2.17. Installation Valve

2.17.1 Installation valves shall be installed on the sprinkler circuits as shown on the drawings.

2.17.2 Contractor shall submit his detailed shop drawings showing the exact location, details of installation of the valve and alarm in all its respects.

2.17.3 Installation valve shall comprise of a 150 mm dia vertical alarm valve complete with 50 mm dia drain and 15mm dia test valve with a provision to install water operated turbine alarm and an electrical alarm bell. A 150 mm dia slim seal butterfly valve shall be provided on up stream of alarm valve, double seated clapper check valves as alarm valve with pressure gauge and orifice assembly and drain pipe with bye pass on check valve to regulate differential pressure and false alarm, one water operated turbine alarm motor including all accessories necessary and required and as supplied by original equipment manufacturer and required for full and satisfactory performance of the system.

2.18 Sprinkler Heads

2.18.1 Sprinkler heads shall be provided at appropriate spacing to cover 9-12 m2 per sprinkler head in the basements and 12 m2 per sprinkler on upper floors. The spacing shall however be in conformity with the drawings and properly co-ordinated with electrical fixtures, ventilation ducts, grills, etc., The deflector of the sprinkler shall be provided not more than 150 mm from the ceiling

2.18.2 Sprinkler heads shall be quartzoid bulb type with a temp. rating of 68deg. C. with gunmetal body fully approved and having current certification of the fire laboratory of the

C.B.R.I. Roorkee, Underwriter's laboratory (UL) and under the approved certified list of the Fire Office Committee (FOC) of U.K. or NFPA of USA. Any one of the certification as

acceptable to the local fire authorities obtained prior to the procurement and approved and accepted by the Project Manager.

2.18.2 Sprinkler heads shall be installed in conformity with approved shop drawings and in co-ordination with electrical fixtures, ventilation ducts, cable galleries and other services along the ceiling.

2.18.3 Following type of sprinklers shall be used:

S.No.	Type of Sprinkler	Temp rating

1.	Conventional, Pendant, or Upright	680 C

2.	Special application side wall type with throw suitable for 8 m length (Extended throw type)	680 C room size of 8

3.	Pendent type (recessed / rosette)	680C

4.	High temperature (for kitchen)	720C

2.18.4 Spacing and coverage of sprinkler shall be in accordance with risk classification of area in which they are installed, design density and TAC regulation.

2.19 Spare Sprinklers

2.19.1 Provide a lockable enamel painted steel cabinet including following type of spare sprinklers

a)	Conventional/Pendent type	20

b)	Upright	10

c)	Semi concealed.	0

d)	Sidewall	10

b) The cabinet should also contain one pair of wrenches (of each size of the same are different) for the sprinklers.

c) Spare sprinklers shall be of the same specifications as that of the original sprinklers specified.

2.20 Testing

2.20.1 All piping in the system shall be tested to a hydrostatic pressure of 1.5 times the working pressure or 14 kg/sq.cm (whichever is more) without drop in pressure for at-least 2 hours.

2.20.2 Rectify all leakages, make adjustments and retest as required and directed.

2.21 Cables

2.21.1 Contractor shall provide control cables from supervisory valves and switches to the annunciation panels.

2.21.2 All control cables shall be copper conductor PVC insulated armoured and PVC sheathed 1100 volt grade.

2.21.3 All cables shall have stranded conductors. The cables shall be in drums as far as possible and bear manufacturer's name.

2.21.3 All cable joints shall be made in an approved manner as per standard practice.

2.22 Cable Trays

2.22.1 All cables shall be routed in approved locations in coordination with all other services in a proper manner.

2.22.2 Cable trays shall be of galvanized steel and hung from the ceiling by galvanised rods supported by appropriate size and type of expandable expansion fasteners drilled into the slabs and walls by an electric drill.

2.23 Annunciation Panel

a) Provide one solid state electronic annunciation panel, fully wired with visual display unit to indicate:

b) Flow condition in any flow indicating valve

c) The panel should give a visual and audible alarm for any of the above conditions.

d) The panel should be standard manufacturer's factory made. All details shall be submitted with the tender.

2.24. Measurement

2.24.1 Mild steel pipes shall be measured per linear meter of the finished length and shall include all fittings, flanges, welding, jointing, clamps for fixing to walls or hangers, anchor fasteners, painting and testing complete in all respects.

2.24.2 Sluice and fullway valves, check valves, installation valves, air valves & flow switches shall be measured by numbers and shall include all items necessary and required for fixing and as given in the specifications and bill of quantities.

2.24.3 Fire hydrants, hose reels, fire brigade connections, orifice flanges shall be measured by number and include all items given in the specifications and bill of quantities.

2.24.4 Fire hose and boxes specified shall be measured by number and include all items given in specifications and Bill of Quantities.

2.24.5 Fire extinguishers shall be measured by number and shall include full charge.

2.24.6 Spare sprinkler cabinets with spare sprinklers specified and spanners shall be measured as per actual item given in the specifications and Bill of Quantities.

2.24.7 Sprinkler heads shall be measured by numbers.

2.24.8 Cables and cable trays shall be measured per linear meter shall include clamps, hangers, anchor fasteners complete in all respects.

Section3 Fire Pumps & Ancillary Equipment

3.1. Scope of Work

3.1.1 Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install electrically operated and diesel driven pumps as required by the drawings and specified hereinafter or given in the schedule of quantities.

3.1.2 Without restricting to the generality of the foregoing, the pumps and ancillary equipment shall include the following:-

- a) Electrically operated and diesel driven pumps with motors, base plates and accessories.
- b) Alarm system with all accessories wiring and connections
- c) Pressure gauges with isolation valves & piping, bleed and block valves.
- d) M.S. pipes, valves, suction strainers, delivery headers & accessories.
- e) Foundations, vibration eliminator pads and foundation bolts.

3.2 General Requirements

3.2.1 Pumps shall be installed true to level on suitable concrete foundations. Base plate shall be firmly fixed by foundation bolts properly grouted in the concrete foundations.

3.2.2 Pumps and motors shall be truly aligned by suitable instruments.

3.2.3 All pump connections shall be standard flanged type with appropriate number of bolts. In case of non standard flanges companion flanges shall be provided with the pumps.

3.2.4 Manufacturer's instructions regarding installation, connections and commissioning shall be followed with respect to all pumps and accessories.

Contractor shall provide necessary test certificates and performance charts with NPSH requirement of the pumps from the manufacturer. The Contractor shall provide facilities to the Project Manager or their authorised representative for inspection of equipment during manufacturing and also to witness various tests at the manufacturers works without any cost to the owners.

Each pump shall be provided with a 150 mm dia pressure gauge, isolation cock and connecting piping, bleed and block valve.

Provide vibration eliminating pad and connectors for each pump.

3.2.8 The Contractor shall submit with this tender a list of recommended spare parts for two years of normal operation and quote the prices for the same.

3.3 Fire, Sprinkler & Jockey Pumps

3.3.1 Pumping Sets

Pumping sets shall be single stage horizontal centrifugal single outlet with cast iron body and bronze dynamically balanced impellers. Connecting shaft shall be stainless steel with bronze sleeve and grease lubricated bearings.

Pumps shall be connected to the drive by means of spacer type love joy couplings which shall be individually balanced dynamically and statically.

3.3.2 The coupling joining the prime movers with the pump shall be provided with a sheet metal guard.

3.3.3 Pumps shall be provided with approved type of mechanical seals.

3.3.4 Pumps shall be capable of delivering not less than 150% of the rated capacity of water at a head of not less than 65% of the rated head. The shut off head shall not exceed 120% of the rated head.

3.3.5 The pump shall meet the requirements of the Tariff Advisory Committee and the unit shall be design proven in fire protection services.

3.4 Electric drive

3.4.1 Electrically driven pumps shall be provided with totally enclosed fan cooled induction motors. For fire pumps the motors should be rated not to draw starting current more than 3 times normal running current.

3.4.2 Motors for fire protection pumps shall be at least equivalent to the horse power required to drive the pump at 150% of its rated discharge and shall be designed for continuous full load duty and shall be design proven in similar service.

3.4.3 Motors shall be wound for class B insulation and winding shall be vacuum impregnated with heat and moisture resistant varnish glass fiber insulated.

3.4.4 Motors for fire pumps shall meet all requirements and specifications of the Tariff Advisory Committee.

3.4.5 Motors shall be suitable for $415 \pm 10\%$ volts, 3 phase 50 cycles a/c supply and shall be designed for 40 deg C ambient temperature. Motors shall conform to I.S. 325.

3.4.6 Motors shall be designed for two start system.

3.4.7 Motors shall be capable of handling the required starting torque of the pumps.

3.4.8 Contractor shall provide inbuilt heating arrangements for the motors for main pumps to ensure that motor windings shall remain dry.

3.4.9 Speed of the motor shall be compatible with the speed of the pump.

3.5 Diesel Engine

3.5.1 Diesel engine shall be of 6 cylinders with individual head assemblies. The engine shall be water cooled and shall include heat exchanger and connecting piping, strainer, isolating & pressure reducing valves, bye-pass line complete in all respects.

3.5.2 Engine shall be direct injection type with low noise and exhaust emission levels.

3.5.3 The speed of the engine shall match the pump speed for direct drive.

3.5.4 The engine shall be capable of being started without the use of wicks, cartridge heater, plugs or either at engine room temperature of 7 deg.C. and shall take full load within 15 seconds from the receipt of the signal to start.

3.5.5 The engine shall efficiently operate at 38 deg.C ambient temperature at 50 metres above mean sea level.

3.5.6 Noise level of the engine shall not exceed 105 DBA (free field sound pressure) at 3 meters distance.

3.5.7 The engine shall be self starting type upto 4 deg C and shall be provided with one 24 volts heavy duty DC battery, starter, cut-out, battery leads complete in all respects. One additional spare battery shall be provided. The battery shall have a capacity of 180 to 200 ampere hours and 640 amps cold cranking amperage.

3.5.8 A battery re-charger of 10 to 15 amperes capacity with trickle and booster charging facility and regulator shall be provided.

3.5.9 The engine shall be provided with an oil bath or dry type air cleaner as per manufacturer's design.

3.5.10 Engine shall be suitable for running on high speed diesel oil.

3.5.11 The system shall be provided with a control panel with push button starting arrangement also and wired to the engine on a differential pressure gauge.

3.5.12 The entire system shall be mounted on a common structural base plate with ant vibration mountings and flexible connections on the suction and delivery piping.

3.5.13 One self supported one day oil tank fabricated from 5 mm thick MS sheet electrically welded with a capacity of 8 hours working load but not less than 200 lit shall be provided. Level indicating gauge glass on the day oil tank and low fuel level indication on the control panel shall also be provided.

3.5.14 One exhaust pipe with suitable muffler (residential type) to discharge the engine gases to outside open air as per site conditions shall be provided.

3.5.15 All other accessories fittings & fixtures necessary and required for a complete operating engine set shall be provided.

3.5.16 Contractor shall indicate special requirements, if any, for the ventilation of the pump room.

3.5.17 The materials of construction for the major components are as follows: Casting : Cast iron

Impeller : Bronze

Shaft : EN-8

Wear Rings : Bronze Gland Packing : Graphite Asbestos

Type of Bearing : Ball bearing/Roll Bearing Type of coupling : Flexible couplings

3.5.18 Instrumentation

The diesel engine shall be provided with the following instrumentation:

- a) Temperature indicator in cooling water inlet and outlet
- b) Temperature indicator in lubricating oil outlet from the oil cooler
- c) Pressure gauge for lubricating oil system
- d) Speed indicator

- e) Lubricating oil sump level indicator
- f) Fuel oil tank level indicator
- g) Voltmeter and ammeter in battery charging circuit
- h) Cooling water high temperature alarm
- i) Oil pressure low alarm

A local instrument panel shall be provided with the engine for mounting all the above instruments and annunciation.

3.5.19 Pumps and motor engine shall be mounted on a common base frames fabricated from M.S. structural and placed in suitable concrete foundations with the help of approved cushy foot mountings (Anti-vibration pads) to avoid vibrations. The anti vibration pads shall be of heavy duty type.

3.6 Air Vessel

3.6.1 Provide one air vessel fabricated from 10 mm M.S. plate with dished ends and suitable supporting legs. Air vessel shall be provided with a 100 mm dia flanged connection from pump, one 25 mm dia drain with valve, one gunmetal water level gauge and 15 mm sockets for pressure switches. The vessel shall be 450 mm dia x 2000 mm high and tested to 20 kg/sq cm pressure.

3.6.2 The fire pumps shall operate on drop of pressure in the mains as given in para 7 below. The pump operating sequence shall be arranged in a manner to start the pump automatically but should be stopped manually by starter push buttons only.

3.6.3 Operating conditions for fire & sprinkler pumps.

- a) Operating pressure 11.5 Kg/sq cm

Cut in Cut out

- b) Jockey pump Hydrant 11.15 kg/sq cm 11.5 kg/sq.cm and Sprinkler
- c) Fire Electric Hydrant Pump 10.15 Kg/sq cm manual
- d) Fire Electric Sprinkler Pump 9.15 Kg/sq cm manual
- e) Diesel Engine Driven 8.15 Kg/sq cm manual Stand by

Notes:

- a) Jockey pump shall start and stop through pressure switch automatically.
- b) Jockey pump shall stop when main pump starts.
- c) Main pump shall start automatically on fall of pressure but stopping shall be manual.

3.7 Vibration Eliminators

Provide on all suction and delivery lines double flanged reinforced neoprene flexible pipe connectors. Connectors should be suitable for a working pressure of each pump and tested

to the test pressure given in the relevant head. Length of the connector shall be as per manufactures details.

3.8 Measurements:

3.8.1 Fire, sprinkler pumps shall be measured by numbers and shall include all items as given in the specifications and schedule of quantities.

3.8.2 Air vessel, fire alarm, installation valve, sluice valves, non return valves, vibration eliminators, flanges and suction strainer shall be measured by numbers and shall include all items as given in the schedule of quantities and specifications.

3.8.3 Pump headers, shall be measured per linear metre and shall include all items given in the specifications and schedule of quantities.

Section 4 Commissioning and Guarantees

4.1 Scope of work

Work under this section shall consist of pre-commissioning, commissioning, testing and providing guarantees for all equipment, appliances and accessories supplied and

installed by the contractor under this contract.

4.2 General requirements:

4.2.1 The rates quoted in this tender shall be inclusive of the works given in this section.

4.2.2 Contractor shall provide all tools equipment, metering and testing devices required for the purpose.

4.2.3 On award of work, contractor shall submit a detailed proposal giving methods of testing and gauging the performance of the equipment to be supplied and installed under this contract.

4.3 Pre commissioning

4.3.1 On completion of the installation of all pumps, piping, valves, pipe connections, and water level controlling devices the contractor shall proceed as follows:-

A Fire protection system:

i) Check all hydrant valves and close if any valve is open. Also check that all suction and delivery connections are properly made.

ii) Test run and check rotation of each motor and correct the same if required.

B Pipe work

i) Check all clamps, supports and hangers provided for the pipes.

ii) Fill up pipes with water and apply hydrostatic pressure to the system as given in the relevant section of the specifications. If any leakage is found, rectify the same and retest the pipes.

4.4 Commissioning & testing

A. Fire hydrant system

- i) Pressurise the fire hydrant system by running the main fire pump and after attaining the required pressure shutoff the pump.
- ii) Open bypass valve and allow the pressure to drop in the system. Check that the jockey pump cuts-in and cuts out at the pre-set pressures. If necessary adjust the pressure switch for the jockey pump. Close by-pass valve.
- iii) Open hydrant valve and allow the water to flow into the fire water tank in order to avoid wastage of water. The main fire pump should cut-in at the pre-set pressure and should not cutout automatically on reaching the normal line pressure. The main fire pump should stop only by manual push button. However the jockey pump should cut-out as soon as the main pump starts.
- iv) Switch off the main fire pump and test check the diesel engine driven pump in the same manner as the electrically driven pump.
- v) When the fire pumps have been checked for satisfactory working on automatic controls, open five hydrant valves simultaneously and allow the hose pipes to discharge water into the fire tank to avoid wastage. The electrically driven pump should run continuously for eight hours so that its performance can be checked.
- vi) Check each landing valve, male and female couplings and branch pipes for compatibility with each other. Any fitting which is found to be incompatible and does not fit into the other properly shall be replaced by the contractor. Landing valves shall also be checked by opening and closing under pressure.

B. Sprinkler system:

- i) Start the pump and develop the required pressure in the sprinkler pipes.
- ii) Open the test valve to test the automatic starting of the pump. If necessary, make necessary adjustments in the setting of pressure switch. The sprinkler fire alarm should also operate when the test valve is open.
- iii) After satisfactory operation of the pump the contractor shall set up mock fire and test the system.

C. Handing over

- 1) All commissioning and testing shall be done by the contractor to the complete satisfaction of the Project Manager, and the job handed over to the Project Manager, or his authorised representative.
- 2) Contractor shall also hand over, to the Project Manager, all maintenance & operation manuals and all other items as per the terms of the contract.

D. Guarantees

- 1) The contractor shall submit a warranty for all equipment, materials and accessories supplied by him against manufacturing defects, malfunctioning or under capacity functioning.

- 2) The form of warranty shall be as approved by the Project Manager.
- 3) The warranty shall be valid for a period of one year from the date of commissioning and handing over.
- 4) The warranty shall expressly include replacement of all defective or under capacity equipment. Project Manager may allow repair of certain equipment if the same is found to meet the requirement for efficient functioning of the system.
- 5) The warranty shall include replacement of any equipment found to have capacity lesser than the rated capacity as accepted in the contract. The replacement equipment shall be approved by the Project Manager.

Section 5 Electrical Installations

5.1 Scope

The scope of this section comprises of fabrication, supply, erection, testing and commissioning of electric control panels, wiring and earthing of all air conditioning equipment, components and accessories, including supply, installation and wiring of remote control-cum-indicating light panel.

5.2 General

Work shall be carried out in accordance with the Specifications, Local Rules, Indian Electricity Act 1910 as amended upto date, and rules issued thereunder, Regulations of the Fire Insurance Company and relevant BIS Code of Practice.

5.3 Wiring System

All power wiring shall be carried out with 1100 volts grade PVC insulated, armoured, overall PVC sheathed aluminium conductor cables for sizes above 6 sq mm. Sizes 6 sqmm and below the power wiring shall be of copper conductor only. Cables shall be sized by applying proper derating factor. All control wiring shall be carried out by using 650 volts PVC insulated copper conductor wires in race ways or in conduit. Minimum size of control wiring shall be 1.5 sq.mm PVC insulated copper conductor wires. Minimum size of conductor for power wiring shall be 4 sq.mm 1100 volts grade PVC insulated copper conductor wires in conduit.

5.4 Construction Features

The control panel shall be metal enclosed sheet steel cubicle, indoor type, dead front, floor mounting / wall mounting type. The control panel shall be totally enclosed, and vermin proof. Gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust proof. Control panels shall be arranged in multi-tier formation. All doors and covers shall be suitable for double padlocking. All mild steel sheets used in the construction of control panels shall be 14 SWG thick for floor mounted and 16 SWG for wall mounting 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 grounded off and welding pits wiped smooth with Plumber metal.

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 hank nuts. Self threading screws shall not be used in the construction of control panels. Base channel of 75 mm x 75 mm x 5 mm thick shall be

provided at the bottom. Minimum clear space of 200 mm between the floor of control panel and bottom most unit (MCB or Bus Bar) shall be provided.

The control panels shall be of adequate size with a provision of 25% spare space to accommodate possible future additional switch gear. Knockout holes of appropriate size and number shall be provided in the control panels in conformity with the location of incoming and outgoing conduits / cables. All equipment such as meters and indicating lamps etc. shall be located adjacent to the unit with which it is associated and care shall be taken to achieve a neat and symmetrical arrangement. Facility shall be provided for termination of cables from top of the control panel. Clamps shall be provided to support the weight of the cables. All power wiring inside the control panel shall be colour coded and control wiring ferruled for easy identification. Circuit diagram showing the arrangement of circuits shall be pasted on the inside of panel door and covered with transparent plastic sheet and all labeling shall be provided in engraved anodized aluminium / bakelite strips on the front face of the panel board.

5.5 Circuit Compartment

Each circuit breaker, contactor and relay shall be housed in a separate compartment and shall have steel sheets on top and bottom of compartment. Sheet steel hinged lockable door shall be duly interlocked with the breaker in the 'ON' position. Safety interlocks shall be provided to prevent the breaker or contactor from being drawn out when the breaker is in 'ON' position. The door shall not form an integral part of the draw out portion of the panel. Sheet steel barriers shall be provided between the tiers in a vertical section.

5.6 Instrument Accommodation

Adequate space shall be provided for accommodating instruments, indicating lamps, control contactors and control fuses etc. These shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker and bus bar.

5.7 Bus Bars and Bus Bar Connections

The bus bar and interconnections shall be of aluminium and of rectangular cross sections suitable for full load current for phase bus bars, and half rated current for neutral bus bar and shall be extensible on either side. The bus bars and interconnections shall be insulated with PVC sleeve / tapes and shall be color coded. Alternatively special insulating paints / materials may be used for the purpose.

All bus bars shall be supported on unbreakable, non hygroscopic insulated supports at regular intervals, to withstand the forces arising in case of short circuit in the system. All bus bars shall be provided in separate chamber and properly ventilated. All bus bars connections, in main control panels shall be done by drilling holes with cadmium plated

/ hot dipped galvanized bolts, nuts and washers.

All bus bars connections in smaller control panels shall be done by drilling hole and connecting by brass bolts and nuts.

All connections between the bus bar and breaker, and between breaker and contactor shall be through copper strips of proper size to carry rated current and shall be insulated with PVC sleeves.

5.8 Raceways

A horizontal race way with screwed covers shall be provided at the top to take interconnecting control wiring between different vertical sections.

5.9 Cable compartments

Cable compartment of adequate size shall be provided in the control panels for easy termination of all incoming and outgoing cables entering from bottom or top. Adequate and proper supports shall be provided in cable compartments to support cables.

5.10 Indications

1. 'ON' lamps shall be provided on all outgoing feeders.
2. Cable alley and bus chamber shall be identified on all panels.

5.11 Rubber Mat

Rubber mat shall be provided to cover the full length of front of all panels and rear of panels where back space shall be available for working from the rear.

5.12 Materials

All materials shall be of the best quality complying with the BIS (Bureau of Indian Standards) specifications. Materials used shall be subject to the approval of the Owner's site representative and samples of the same shall be furnished where required.

a. Moulded Case Circuit Breaker

MCCB shall comprise of switching mechanism, contact system, arc extinguishing device and the tripping unit, Contained in a Compact, high strength, heat resistant, flame retardant, insulating moulded case with high withstand capability against thermal and mechanical stress.

Switching mechanism shall be of Quick Make- Quick Break type and the trip command shall override all other commands. MCCB shall employ maintenance free contact system to minimise the let thru `energies while handling abnormal currents.

The handle position shall give positive indication of 'ON' 'OFF' or tripped. MCCB shall conform to IS- 2516 (Part I & II/Sec.1) 1985.

b. Miniature Circuit Breaker

Miniature circuit breakers shall be quick make and break type, and shall conform to Relevant Indian Standards. The housing shall be heat resistant and having a high impact strength. The fault current shall not be less than 9 KA at 230 V and shall be BIS approved. MCBs shall be flush mounted and shall be provided with trip free manual operating lever and 'ON' and 'OFF' indications. The contacts shall be provided to quench the arc immediately. MCB shall be provided with magnetic thermal releases for over current and short circuit protection. The over load or short circuit device shall have a common trip bar in the case of D P, TP and TPN miniature circuit breakers.

c. Rotary Switches

Switches upto 60 amps shall be rotary type with compact and robust construction, built up from one or more stacks with contacts and a positioning mechanism with stop as required. Rotary switches shall have HRC fuse fittings of appropriate rating.

d Selector Switch

Where called for, selector switches of rated capacity shall be provided in control panels, to give the choice of operating equipment in selective mode.

e) Starters

Each motors shall be provided with a starter of suitable rating. Starters shall be in accordance with relevant BIS Codes. All Star Delta and ATS Starters shall be fully automatic. Starters 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 / Reduced Voltage Starters. The insulation for contactor coils shall be of class "B".

Operating coils of contactors shall be suitable for 230 / 415 + 10% volts AC, 50 cycles supply system. The contactors shall drop out when voltage drops to 90% of the rated voltage. The housing of the contactors shall be heat resistant and having high impact strength. Each starter shall have thermal overload protection on all three phases.

f) Over Load Relays

Contactors shall be provided with a three element, positive acting ambient temperature compensated time lagged hand-reset type thermal over load relays with adjustable setting. Hand-reset button shall be flush with the front door for resetting with starter compartment door closed. Relays shall be directly connected for motors upto 35HP capacity. C.T operated relays shall be provided for motors above 35 HP capacity. Heater circuit contactors may not be provided with overload relays.

g) Current Transformers

Current transformers shall be of accuracy class I and suitable VA burden for operation of the connected meters and relays. These shall be resin bonded and epoxy coated.

h) Single Phase Preventers

Single phase preventers shall be provided as per Bill of Quantities and shall be in conformity with relevant BIS Standards. Single phase preventers shall act when the supply voltage drops down to 90% of the rated voltage or on failure of one or more phases.

i) Time Delay Relays

Time delay relays shall be adjustable type with time delay adjustment from 0-180 seconds and shall have one set of auxiliary contacts for indicating lamp connections.

j) Indicating Led (22 mm dia) and Metering

All meters and indicating lamps shall be in accordance with BS 37 and BS 39. The meters shall be flush mounted and draw out type. The indicating lamp shall be of LED type. Each main panel shall be provided with voltmeter 0-500 volts with three way and off selector

switch, CT operated ammeter of suitable range with three Nos. CTs of suitable ratio with three way and off selector switch, phase indicating lamps, and other indicating lamps as called for. Each phase indicating lamp shall be backed up with 5 amps fuse. Other indicating lamps shall be backed up with fuses as called for.

k.) Toggle Switch

Toggle switches, where called for, shall be in conformity with relevant BIS Codes and shall be of 5 amps rating.

l). Push Button Stations

Push button stations shall be provided for manual starting and stopping of motors / equipment as called for. Green and Red colour push buttons shall be provided for

`Starting' and `Stopping' operations. `Start' or `Stop' indicating flaps shall be provided for push buttons. Push buttons shall be suitable for panel mounting and accessible from front without opening door, Lock lever shall be provided for `Stop' push buttons. The push button contacts shall be suitable for 6 amps current capacity.

m) Conduits

Conduits shall be of mild steel and shall be Hard drawn, stove enameled inside and outside with minimum wall thickness of 1.6 mm for conduits upto 32mm diameter and 2 mm wall thickness for conduits above 32 mm diameter. GI pull wires shall be installed in the conduit while laying the conduit.

n) Cables

M.V.cables shall be PVC insulated aluminium conductor and armoured cables conforming to BIS Codes. Cables shall be armoured and suitable for laying in trenches, duct, and on cable trays as required. M.V Cables shall be termite resistant. Control cables and indicating panel cables shall be multi core PVC insulated copper conductor and armoured cables.

p) Wires

1100 volts grade PVC insulated copper conductor wires in conduit shall be used.

5.13 Cable Laying

Cable shall be laid generally in accordance with BIS Code of Practice. Cables shall be laid on 14 gage perforated MS sheet cable trays, and cable drops / risers shall be fixed to ladder type cable trays fabricated out of steel angle. Access to all cables shall be provided to allow cable withdrawal / replacement in the future. Where more than one cable is running, proper spacing shall be provided to minimise the loss in current carrying capacity. Cables shall be suitably supported with Galvanized saddles when run on walls / trays. When buried, they shall be laid in 350 mm wide and 750 mm deep trench and shall be covered with 250 mm thick layer of soft sifted sand & protected with bricks, tiles. Special care shall be taken to ensure that the cables are not damaged at bends. The radius of bend of the cables when installed shall not be less than 12 times the diameter of cable. 1.1 KV cable shall be buried 600 mm below ground level.

5.14 Wire Sizes

For all single phase / 3 phase wiring, 1100 volts grade PVC insulated copper conductor wires shall be used. The equipment inside plant room and AHU room shall be connected to the control panel by means of insulated aluminium conductor wires of adequate size. An isolator shall be provided near each motor / equipment wherever the motor / equipment is separated from the supply panel through a partition barrier or through ceiling construction. PVC insulated single strand aluminium conductor wires shall be used inside the control panel for connecting different components and all the wires inside the control panel shall be neatly dressed and plastic beads shall be provided at both the ends for easy identification in control wiring.

. The minimum size of control wiring shall be 1.5 sq.mm PVC insulated stranded soft drawn copper conductor wires drawn through conduit to be provided for connecting equipment and control panels.

Power wiring cabling shall be of the following sizes :

- i. Upto 5 HP motors/5 KW 3 x 4 sq.mm copper heaters. conductor wires.
- ii From 6 HP to 10 HP motors 3 x 6 sq.mm copper 6 KW to 7.5 KW heaters. conductor wires.
- iii. From 12.5 HP to 15 HP 2 Nos. 3 x 6 sq.mm motors. copper conductor wires.
- iv. From 20 HP to 25 HP 2 Nos. 3 x 10 sq.mm motors. aluminium conductor armoured cables.
- v. From 30 HP to 35 HP 2 Nos. 3 x 16 sq.mm motors. aluminium conductor armoured cables.
- vi. From 40 HP to 50 HP 2 Nos. 3 x 25 sq.mm motors. aluminium conductor armoured cables.
- vii. From 60 HP to 75 HP 2 Nos. 3 x 50 sq.mm motors. aluminium conductor armoured cables.
- viii. 100 HP motors. 1 No. 3 x 150 sq.mm aluminium conductor armoured cables.
- ix. 150 HP motor. 1 No. 3 x 240 sq.mm aluminium conductor armoured cables.
- x. 250 HP motor. 2 Nos. 3 x 240 sq.mm aluminium conductor armoured cables.
- xi. 400 HP motor. 3 Nos. 3 x 240 sq.mm aluminium conductor armoured cables.
- xii. 600 HP motor. 3Nos. 3 x 400 sq.mm aluminium conductor armoured cables.

All the switches, contactors, push button stations, indicating lamps shall be distinctly marked with a small description of the service installed. The following

capacity contactors and overload relays shall be provided for different capacity motors.

TYPE OF	CONTACTOR	OVERLOAD RELAY
STARTER	CURRENT CAPACITY	RANGE

5 HP Motors	D O L	16 amps	6-10 amps
7.5HP Motors	D O L	16 amps	10-16 amps
10 HP Motors	D O L	32 amps	13-21 amps
12.5HP Motors	Star Delta	16 amps	10-16 amps
15 HP Motors	Star Delta	25 amps	10-16 amps
20 HP Motors	Star Delta	32 amps	13-21 amps
25 HP Motors	Star Delta	32 amps	13-21 amps
30 HP Motors	Star Delta	40 amps	20-32 amps
35 HP Motors	Star Delta	40 amps	20-32 amps
40 HP Motors	Star Delta	40 amps	28-42 amps
45 HP Motors	Star Delta	63 amps	28-42 amps
50 HP Motors	Star Delta	63 amps	28-42 amps
60 HP Motors	Auto Transformers/	125 amps	45-70 amps Reduced Voltage.
75 HP Motors	-do-	125 amps	90-150 amps
100 HP Motors	-do-	200 amps	operated Relay
135 HP Motors	-do-	300 amps	-do-
150 HP Motors	-do-	300 amps	-do-
200 HP Motors	-do-	300 amps	-do-
250 HP Motors	-do-	400 amps	-do-
300 HP Motors	-do-	400 amps	-do-
400 HP Motors	-do-	600 amps	-do-
600 HP Motors.	-do-	900 amps	-do-

5.15 Earthing

Earthing shall be copper strips / wires the main panel shall be connected to the main earthing system of the building by means of 2 Nos. 25 mm x 3 mm copper tapes. All single phase metal clad switches and control panels be earthed with minimum 2 mm diameter copper conductor wire. All 3 phase motors and equipment shall be earthed with two numbers distinct and independent copper wires / tapes as follows :

- i. Motors upto and including 2 Nos 3 mm dia copper 10 HP rating. wires.
- ii. Motors 12.5 HP to 40 HP 2 Nos.4 mm dia copper capacity. wires.
- iii. Motors 50 to 75 HP 2 Nos 6 mm dia copper capacity. wires.
- iv. Motors above 75 HP. 2 Nos 25 mm x 3 mm copper tapes.

All switches shall be earthed with two numbers distinct and independent copper wires/tapes as follows :

- i. 3 phase switches and 2 Nos 3 mm dia copper control panels upto 60 wires. amps rating.
- ii. 3 phase switches and 2 Nos 4 mm dia copper control panels 63 amps to 100 amps rating.
- iii. 3 phase switches and 2 Nos 6 mm dia copper control panels 125 amps to 200 amps rating.
- iv. 3 phase switches, control 2 Nos 3 mm x 25 mm panels, bus ducts, above copper tapes.

200 Amps rating

The earthing connections shall be tapped off from the main earthing of electrical installation. The over-lapping in earthing strips at joints where required shall be minimum 75 mm. These straight joints shall be riveted with brass rivets & brazed in approved manner. Sweated lugs of adequate capacity and size shall be used for all termination of wires. Lugs shall be bolted to the equipment body to be earthed after the metal body is cleaned of paint and other oily substance and properly tinned.

5.16 Drawings

Shop drawings for control panels and wiring of equipment showing the route of conduit/cable shall be submitted by the contractor for approval of Project Managers/ Consultant before starting the fabrication of panel and starting the work. On completion, four sets of complete "As-installed" drawings incorporating all details like, conduits routes, number of wires in conduit, location of panels, switches, junction/pull boxes and cables route etc. shall be furnished by the Contractor.

5.17 Testing

Before commissioning of the equipment, the entire electrical installation shall be tested in accordance with relevant BIS Codes and test report furnished by a qualified and authorised person. The entire electrical installation shall be got approved by Electrical Inspector and a certificate from Electrical Inspector shall be submitted. All tests shall be carried out in the presence of Supervisor.

5.18 Painting

All sheet steel work shall undergo a process of degreasing, thorough cleaning, and painting with a high corrosion resistant primer. All panels shall then be backed in an oven. The finishing treatment shall be by application of synthetic enamel paint of approved shade.

5.19 Labels and Tags

Engraved PVC labels shall be provided on all incoming and outgoing feeders switches. Circuit diagram showing the arrangements of the circuit inside the control panel shall be pasted on inside of the panel and covered with transparent plastic sheet. All cables terminations at panels and at equipments shall be provided with tags as approved by Project Managers.

5.20 All panels to have provision for padlocking and all MCCB's / MCB's to have provision for locking in off position.

5.21 Measurement of Electrical Control Panels

Panels shall be counted as number of units. Quoted rates shall include as lump sum (NOT measurable lengths) for all internal wiring, power wiring and earthing connections from the control panel to the starter and to the motor, control wiring for inter-locking, power and control wiring for automatic and safety controls, and control wiring for remote start/stop as well as indication as per the specifications. The quoted rate for panel shall also include all accessories, switchgear, fuses, contactors, indicating meters and lights as per the specifications.

(Signature of Architect consultant).

(Signature of Architect consultant).

ANNEXURE-D

SCHEDULE
SCOPE OF WORK

Scope of works National Science Centre

A. INTERIOR AND FITOUT WORKS INSIDE THE AUDITORIUM:

1. Wall Acoustic Panelling:

- A. Removal of existing wall panelling for all walls inside the auditorium.
- B. Rectification and levelling of wall where so ever required.
- C. Supply and installation of wall substructure for stretch fabric wall acoustic panels.
- D. Supply and installation of sound insulation.
- E. Supply and installation of client chosen fabric in line with final approved design.
- F. Supply and installation of fire-rated wooden wall acoustic panels.

2. Stage Area:

- A. Supply and installation of engineered wood for the stage area and stage steps as per final design.
- B. Paint works – fixing of damaged walls and ceiling due to water leak and all walls and ceiling at the stage area
- C. Installation of acoustic wood for the stage front including stage edge lipping.
- D. Erection of proscenium cladded with wood on the outside and gypsum boards.

3. Auditorium Entrance Doors:

- A. Repair / refurbishment of all entrance doors and door frames for the auditorium
- B. Repair / replacement of any door hardware such as door handles, door stoppers, push bars, door closers, lock sets etc.

5. Auditorium Audience area Flooring Works:

- A. Supply and installation of new carpet
- B. Supply and installation of illuminated step lights for the centre isle and night lights installation for the side steps.
- C. Re-installation of chairs.

B. ELECTRICAL LIGHTING AND TECHNOLOGY WORKS INSIDE THE

Scope of works

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AUDITORIUM:

1. Electrical Works:

- A. Removal of all old electrical cables, conduits, equipment inside the auditorium.
- B. Electrical conduiting, laying of trunks, wiring works to provision for all new equipment, lighting and technology requirements inside the auditorium and the control room.
- C. Modification to the existing Electrical DBs where ever necessary.
- D. Supply and installation of twin power points at multiple locations for service and maintenance purposes inside the auditorium and the control room.

2. Lighting System:

- A. Supply and installation of a programmable lighting control system for the audience seating area.
- B. Supply and installation of stage lighting systems.
- C. Supply and installation of FOH Lighting system for the front stage.

3. Technology Works: (Audio System, LED Display System, Video System & Camera System)

- A. Removal of all existing AV Systems inside the auditorium and control room.
- B. Supply and installation of Audio system (Array Speakers, Sub-woofers, front fill, surround speakers, stage monitors and control room monitor speakers) including new audio cabling.
- C. Supply and installation of DSP, Audio Amplifiers, AV control processors inside the control room.
- D. Supply and installation of wireless microphone system to accommodate min. 12 units with a combination of handheld mics, mic stand.
- E. Supply and installation of wireless antennas inside the auditorium for wireless mics.

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F. Supply and installation of audio rack inside the control room complete with head-end equipment for the audio system.

1. Project Overview

A brief description of the project including location, purpose.

Example:

This project involves the design, construction, and commissioning of a state-of-the-art auditorium with a seating capacity of 225-275, to be located within National Science centre. The facility will host lectures, performances, and events.

2. Design & Planning

1. Architectural design (seating layout, stage design, acoustics)
2. Structural design
3. Interior design (flooring, wall finishes, ceiling treatment)
4. Acoustic and soundproofing treatment
5. HVAC, plumbing, and electrical planning
6. Fire safety and emergency exits
7. Compliance with local building codes

3. Civil & Structural Works

1. Site preparation and grading
2. Foundation and superstructure

Scope of works

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3. Brickwork, plastering, roofing
4. Flooring and ceiling installation
5. Stage construction

4. Electrical & Lighting Systems

1. General lighting and decorative lighting
2. Emergency and exit lighting
3. Stage and spotlight lighting systems
4. Power distribution boards and cabling
5. UPS/backup systems

5. Acoustic and Audio-Visual (AV) Systems

1. Soundproofing of walls, ceiling, and flooring
2. Acoustic panel installation
3. PA system setup (microphones, amplifiers, speakers)
4. Digital audio console and sound management
5. Projection systems (LED screen/projector)
6. Control room setup

6. HVAC and Ventilation

1. Air conditioning systems (Duct-able/Split)
2. Fresh air and exhaust systems

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3. Temperature and humidity control

7. Seating and Interiors

1. Ergonomic and fire-retardant auditorium seating
2. Aisles and wheelchair access zones
3. Stage curtains and backdrop
4. Interior painting and decorative finishes

8. Fire Safety & Security Systems

1. Fire alarm and detection systems
2. Fire extinguishers and suppression systems
3. Emergency exits and lighting
4. CCTV and surveillance systems
5. Access control if required

9. IT and Communication

1. Wired and wireless internet connectivity
2. Networking racks and cabling
3. Control interfaces (e.g., for AV, lighting)

10. Testing, Commissioning & Handover

1. System-level testing (AV, electrical, HVAC)

Scope of works

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2. Acoustic testing
 3. Safety inspection and certification
 4. Training to facility staff
 5. Documentation and handover of manuals/as-builts
-

Scope of works National Science Centre

SCOPE OF WORKS DETAILS

Category-I

Note: -

1. The below mentioned scope of works in this section shall include entire scope of works to be executed as per fee structure including but not limited to Works) (i.e., civil, structural, Hardscape, Architecture, Interior, finishing etc. and all other works.
2. The scope under this section shall also include but not be limited to all civil and structural works including Architecture works, Interior and Finishing works.

1. Scope of works - General

a. The scope of work comprises construction and completion of civil, structural and all other allied works in accordance with technical specifications and/or all other connected relevant documents/ specifications and its maintenance thereof and except in so far as the contract otherwise provides, the provision of all labor, materials, construction plant of temporary or permanent nature, works and everything whether of a temporary or permanent nature, required in and for such construction, completion and rework so far as the necessity for providing the same is specified in or reasonably to be inferred from the contract. Rework thereof means complete rectification/remedy of the defects to arrive at zero defects during the defect's liability period for the duration as mentioned in the Contractor contract. The Contractor shall give all notices; pay all taxes, fees, and duties etc. that are required for all work including temporary works.

b. Broadly the scope of civil work covers the following buildings, structures, facilities and works:
Civil & Structural works for buildings / external civil works as listed below:

- Demolition of Existing structures
- Site grading
- Earth Work & Anti-Termite Treatment
- Roads and Drains
- Ceiling works
- Interior works
- Finishing works
- Miscellaneous Work
- Internal utilities

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C. The scope of work shall be inclusive but not limited to sub structure and super structures and allied works as required for successful completion of construction works.

d. All works shall be carried out in accordance with the technical requirements of the specification and as directed by Authority.

1. Reinforced concrete work in raft, isolated footings, walls, columns, slabs, beams, underground tanks and trenches etc.

2. Reinforcement work

3. Fabrication & erection of structural steel work, embedded parts, pipe sleeves, etc. including painting.

4. Fixing expansion joint materials and caulking of joints.

5. Brick / Autoclaved Aerated Concrete masonry works.

6. Finishing works - Partition walls, GI sheet/aluminum perforated screen, plastering, flooring, painting, etc.

7. Providing and laying flooring as per specifications.

8. For approach to the site from road, care should be taken to coordinate existing levels of respective structures in order to ensure smooth access to the project site. Works essential for this shall be done by bidder at no additional cost.

9. External Development with Landscaping – Water Feature, Hardscape and Softscape and Duct able lighting complete in all respects.

10. Preparing Mock-ups for all finishing items, furniture pedestals, railings, cladding, etc.

11. Preparing and submitting shop drawings of all the mentioned items, as and when required.

12. Disposal of excess excavated earth as directed by Authority.

13. Any additional work needed for the project's improved/smooth operation/commissioning that was not previously indicated shall be included in the scope of work.

2.1 Scope

a. The civil skeletal structure made of RCC foundation, columns, beams, slabs, lift structure and other miscellaneous civil works to be made available on or before execution of Architectural items.

b. Scope of construction will comprise of all superstructure works like brickwork, plaster, finishing,

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flooring, painting, doors, window, false ceiling, false flooring or cavity flooring, structural glazing, skylight, automated gates, rolling shutters, decorative exterior finishes, cladding, sculpture integrated to exterior if any, internal wall cladding, aluminum and gypsum decorative features, interior and exterior of the building, waterproofing wherever applicable, hardscape work outside the buildings or in courtyard, paving work and construction related to external parking, drainage, making provisions for MEP works, finishing in all aspect after installation of MEP system and all other allied works related to construction of state of art Gallery along with making provisions for glass cleaning and other maintenance of finishing of the building.

c. The scope will include complete solution for facade treatment comprised of design, supply, storage, fabrication and handing over in good condition of items like Textured painting, structural glazing, ACP/Aluminum screen cladding, sky light treatment, stainless steel decorative railing work with or without Glass panels, MS decorative grill and gate as will be indicated in design and Bill of quantities.

d. Construction of partition work, using non-masonry materials like Gypsum board, Calcium silicate board, Cement Board, Aluminum or CRCA or GI framework with panel inserts using Particle board, block board, plywood, gypsum panels, WPC, glass, Aluminum composite Panels along with providing all clips, gaskets, sealants, beads, providing insulations, joint fillers all complete as per design and Specification. Provisions for doors, windows, service opening, louvers, exhaust fans should be made as per details as will be provided from time to time during or prior to construction.

e. Scope of partition includes providing shop drawings, fabrication details based on basic layout and construction of partitions as per approved specification.

f. Scope will include supply and installation of all sorts of sanitary systems, Earthenware, ceramic, stainless steel and chromium plated brass sanitary fixture and related plumbing and disposal system.

g. The scope includes construction of all utilities, provision of crossing over services at necessary locations. The scope will also include enclosure to DG, transformer etc. as per design.

h. Scope includes design, supply, and construction of water body if anything stated in detail, preparation of construction drawings with allied nozzles, plumbing, water overflow, disposal and recycling system provisions, Pump, underwater lighting fixture and other electro-mechanical equipment, and execution of the total system as per approved drawing.

i. The scope is limited up to the boundary of the National Science Centre in general. But for

Scope of works

National Science Centre

services and drainage, sewerage, rainwater harvesting systems, HVAC system and inlet water line etc. the scope may be extended up to utility building or nearest tapping / outfall point whatsoever is applicable.

j. Scope includes Submission of Shop drawings or fabrication drawings or assembly drawing whatsoever is applicable for fabricated items.

k. Scope includes gathering samples of Architectural materials, display, preparation of material selection and approval board, multiple alternative physical mock-ups and any other formalities required for material approval by Authority and consultant.

l. Shop drawings for all vendor-based items, facade, glazing, aluminum screen cladding, all electrical works, signages, water recirculation system for water body, all glass works, door windows, irrigation, STP, mist plaza, radiant cooling, pumps, and any other Contractor/vendor specific items, will be provided by the Contractor with all necessary data and requirement.

m. The materials shall strictly conform to relevant standards mentioned in detailed specifications. The testing and inspection plan for the materials shall be prepared by the CONTRACTOR and get approved by the prior to purchase of the same. The work shall be executed in accordance with best modern practices, latest I.S. codes and other relevant codes.

n. CONTRACTOR shall make his own arrangements for drawing and distribution of water and electricity. CONTRACTOR shall also make his own arrangements for other facilities like compressors; DG sets etc. for unhindered progress of work.

o. List of tender drawings issued at the time of calling of tenders for this work is given elsewhere in this Contract document. These drawings are meant for Contractor's guidance only. The Authority will not entertain any claim for compensation because the details as shown on "Good for Construction" drawings are different from those shown on tender drawings.

p. One permanent benchmark will be furnished and all other layout, fixing levels etc. shall be done by the Contractor at his own cost. The Contractor shall protect and maintain, during execution of the work, the main center lines and benchmarks, so that they are left undisturbed even after completion of his work.

q. For any structural steel fabrication, all the shop drawings shall be prepared by Contractor.

r. For the steel structure, the CONTRACTOR shall prepare the entire structure in REVIT/TEKLA model and showcase the erection sequence and methodology. The erection methodology shall

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National Science Centre

be worked out entirely by the CONTRACTOR and the CONTRACTOR shall also have to co-relate the same with the erection methodology of main steel roof.

2.2 Anti-Termite Treatment

The Contractor must take special care in performing anti-termite treatment since the construction site / project location is prone to termite infestation.

2.2.1 Chemicals

The chemicals used for the soil treatment shall be any one or combination of the following with the concentration shown against each aqueous emulsion: Chemicals concentration: Imidacloprid 30.50 SC (by weight)

The quantity of all chemicals will be as per CPWD Specifications or as per manufacturers specification.

2.2.2 Treatment of column pits, wall trenches and basement excavations

The bottom surface and sides (up to a height of 30 cm from the bottom) of the excavations made for column pits and trenches shall be treated with the chemical emulsion mentioned above at 5 liters sq. meter of surface area.

2.2.3 Treatment to Backfill Earth

After the column foundations and wall foundations come up, the backfill in immediate contact with the foundation structure shall be treated with the chemical emulsion at the rate of 15 liters /sqm. of the vertical surface of the sub-structure for each side. The earth is usually returned in layers and the treatment shall be carried out in similar stages. The chemical emulsion shall be directed towards the concrete or masonry surfaces of the columns and walls so that the earth in contact with these surfaces is well treated with the chemical.

2.2.4 Treatment for R.C.C Framed Structures

The treatment described above applies essentially to masonry foundations where there are voids in the joints through which termites can seek entry into the superstructure. Hence the foundations require to be completely enveloped by a chemical barrier. In the case of RCC framed structures with columns and plinth beams, the concrete mix is rich and dense (being 1:2:4 or richer), it is unnecessary to start the treatment from the bottom excavations for columns, plinth beams and basement walls. The treatment shall start at depth of 50cm below ground level. From this depth, the backfill around the columns, beams and RCC basement walls shall be treated at the rate of

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15-liters/ sqm of the vertical surface. The other details of the treatment shall be as laid down above.

2.2.5 Treatment of Top Surface of Plinth Filling

After the earth filling is completed in the plinth area and before the dry rubble packing or sub grade is laid, the entire surface of the filled earth shall be treated with the chemical emulsion at the rate of the 5 liters per sqm Light rodding may be carried out in the soil surface to facilitate absorption of the emulsion.

2.2.6 Treatment at Junction of Walls and Floor

Special care shall be taken to establish continuity of the vertical chemical barrier on inner wall surface from the ground level up to the level of the filled earth surface. To achieve this, a small channel 3 x 3 cm shall be made at all the junctions of wall and columns with floor (before laying the sub grade) and rod holes made in the channel up to the ground level 15 cm apart and the rod moved backward and forward to break up the earth and chemical emulsion poured along the channel at the rate of 15 liter/ Sq.m of the area of the vertical surface of the wall surface of the sub-structure so as to soak the soil right to the bottom. The soil should be tamped back into place after this operation.

2.2.7 Guarantee

The Contractor shall guarantee the anti-termite work for a period of 10 years from date of completion. The guarantee will cover the surfaces treated and will bind the Contractor to perform remedial measures, at his expense including but not limited to repeat of anti-termite work in the affected area/zone.

Contractors must ensure that the work is done through a professional pest control operator who is a member of Indian Pest Control Association or other recognized professional body. A list of termite control jobs successfully undertaken for Government Departments, Statutory bodies or large private organizations are to be provided to prove that they are capable of handling anti- termite work.

Scope of works

National Science Centre

Scope of work – Interior

3.1 Interior execution

3.1.1 Scope of Work

- Coordination of works with sub-vendors, and Authority, as per requirement.
- All the works mentioned to be approved by Authority and for execution.
- CONTRACTOR is required to coordinate with any other agency (Government or private) that Authority desires for work measurement & inspection. CONTRACTOR should be able to showcase & get work completion certificates from such agencies denoted by Authority.
- CONTRACTOR should provide a clear timeline and deliverable on commencement of the project. This timeline should provide a clear overview of the entire project and include specific dates for important milestones such as 3ds/ detail design/shop /drawing completion, material delivery, and installation. The purpose of this timeline is to help ensure that the project stays on track and is completed within the agreed-upon timeframe. By setting clear expectations upfront, both the CONTRACTOR and the project stakeholders can work together to ensure that the project is successful.
- The CONTRACTOR must submit a periodic report, with the works done and projected work schedule for each specified period. Pert chart to be prepared with the overall timeline of the project with clear meeting schedule and milestones.
- No compromise to be made in the project in terms of quality.
- Provision of as-built drawings of the building once the execution is finished for documentation and maintenance purposes is in the scope of work of the CONTRACTOR.
- The CONTRACTOR shall submit all audio visual/ static/ digital/ graphics etc. content in a hard disk and other required formats to the Authority after the completion of the project execution.
- Sampling/prototyping of all the works to be done as per requirement in- coordination with the & will be approved by Authority.
- It is mandatory to identify a design manager and team leader who will be responsible for all design related coordination throughout the timeline of the project and interface with the Authority. They should have excellent knowledge of the interiors, technology integration, soft content, visual design, research and all other aspects of design included in the project for smooth and efficient functioning of the project.

Scope of works

National Science Centre

- List of approved makes and manufacturers provided by the shall be used everywhere in all aspects, in case of any change necessary explanation shall be provided and the final decision to be taken by the Authority.

- The individual SOW with respect to the major segments as mentioned above are as follows:

a. Digital and mechanical (mix-media) equipment and integration

- i. Detailing and further exploration and recommendation if any for the best suitable equipment and technology for all the installations as per the design.

- ii. Supply, testing, installation and end-to-end integration of all equipment, lighting and respective soft content as per design.

- iii. Mandatory to submit projector drawings in 2D/3D highlighting the coverage and resolution of the projection.

- iv. Drawing (2D and 3D) details highlighting the location of equipment and installations (projector, speaker, any other relevant equipment) in sync with the scenography of the exhibit.

- v. Required wiring and cabling for the installations.

- vi. Back-end support, server, UPS system connectivity to operate the equipment smoothly.

- vii. Since the proposed location is expecting regional & international visitors, it is the Authority's fundamental requirement to deliver content in any two languages, Hindi and English, as required by NSCD.

- viii. Trial run of digital/ mechanical/ electrical/ exhibits shall be done on site before final deliverable and as per the satisfaction of the, and necessary amendments shall be made for as per the requirement.

b. Interior works and installations

- i. Providing samples for materials used in the interior works, part samples of installations in real material, to be provided as per design requirement at the 's office.

- ii. Execution and installation of interior finishes, installations, information panels & other items as per Gallery Interior execution BOQ.

Scope of works

National Science Centre

- iii. Basic typical details of material joinery, cove and lighting details to be made and implemented in the interiors.
- iv. Structure stability of all installations is the responsibility of the CONTRACTOR and appropriate measures and approvals to be taken from respective authorities/experts.
- v. All models/ working models/installations to be detailed out with relevant experts and material samples, proof of concept, housing details, and appropriate measures for safety and longevity of the same to be ensured by the CONTRACTOR.
- vi. Coordination drawings for all services and exhibits are in the scope of CONTRACTOR.
- vii. All shop drawings for all fixed panels in all formats to be shared and approved by the before execution.

3.2 Technical services

- Should provide AMC for all projectors and other equipment installed in the Gallery as per the BOQ for a period of 5 years.
- Inspect assigned systems for documentation and operating parameters.
- Check and update the panel maintenance schedule
- Ensure calibration of instruments per schedule.
- Provide suggestions if any parts of equipment are end of life.
- The instruments shall be used within the manufacturing range for that equipment.
- All spanners, wrenches and required hand tools must be in good working order.
- All powered tools must be equipped with individual ELCB to prevent main tripping.

Category-II

Note: -

1. The below mentioned scope of works in this section shall include but not be limited to the entire

Scope of works National Science Centre

scope of works to be executed as per fee structure mentioned. (i.e. MEPF systems, BMS, Acoustics works, ICT systems, AV systems and lighting systems at both interior and exterior locations and all other works)

2. The scope under this section shall include but not be limited to all MEPF systems and general lighting works of planetarium and observatory and acoustic treatment of planetarium.

3. HVAC works

4.1 Scope of works – HVAC

The scope of the Contractor shall comprise design, engineering, manufacturing, inspection & testing at works, packing, forwarding, supply to site, unloading at site, storage at site, construction, installation, erection, testing, commissioning, performance testing at site, and other related items of work for the complete following Air Conditioning & Ventilation (HVAC) system:

1. Air Handling Units, of Types / Construction / Capacities as specified in the BOQ, specifications and AHU schedule complete with Casing, Pre Filters, Fine Filters, Chilled Water-Cooling Coil with SS casings, Centrifugal Fans, Electrical Motor, Drain Pan, Access Doors, control panels, VFDs etc. All supply fans are provided with VFD with by-pass. Mixing boxes shall be provided for each AHU and the CSU as mentioned in BOQ and AHU schedule.
2. High Wall Split Air Conditioner Units with R-410a refrigerant having Zero Ozone Depletion Potential (ODP) and Low Global Warming Potential (GWP), of Capacities as specified in the BOQ, complete with Indoor Unit with filters; evaporator cooling coil; fan with motor & drive arrangement; power & control components with wiring, Air cooled condensing unit with compressor(s); multi row deep air cooled condenser coil; condenser fan with motor & drive; controls; power & control components with wiring, Stands for Outdoor Condensing Units, Initial charge of refrigerant and oil, Electronic remote control unit, Refrigerant Piping with fittings & insulation, Filter Dryer, Refrigerant Solenoid / Manual Valves, Expansion Valve etc.
3. Propeller Fans of Capacities as specified in the BOQ, complete with mounting arrangement, speed regulator, gravity louvers & bird screen etc.
4. Battery Room Exhaust Fan - Explosion Proof of Capacities as specified in the BOQ, complete with Explosion Proof Fan suitable for Battery Room Exhaust, certified according to ATEX 94/9/EC Directive, electrical motor, capacitor, etc.
5. Supply and installation of GI site fabricated oval/elliptical/circular exposed ducts with insulation inside, complete with RTV Sealant joints with necessary supports using threaded rods (as directed) and

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anchor bolts, supply air collars, vanes, splitters dampers duly painting of the ducts and as per specification for Air-Conditioned Areas. Fusible Link Type Fire Dampers, UL Listed Fusible Links, Manual Volume Control Duct Dampers, Grilles, Grille Collar Dampers, Air Transfer Grilles, Diffusers, Diffuser Collar Dampers, Louvers, Non-Return Dampers etc. – All complete with fittings, flanges, bracings & supports.

6. Supply and installation of the UL approved motorized fire/smoke damper with required rating.
7. Supply and installation of the motorized, modulating volume control dampers with required actuator as specified in BOQ and specifications.
8. Drain Water piping complete with Supports, Valves, Fittings Insulation and all Related Accessories.
9. Thermal Insulation of Supply & Return Air Ducting complete with all accessories and finishes (including Protective Coating on the insulated ducts exposed to atmosphere) as per specifications and BOQ.
10. Acoustic Insulation of Supply & Return Air Ducting complete with all accessories and finishes as per specifications and BOQ.
11. Acoustic Insulation of Walls & Ceiling of AC Plant Room complete with all accessories and finishes as per specifications and BOQ.
12. Jet Nozzles on the ducts complete with all accessories and finishes as per specifications and BOQ.
13. Grouting & Finishing of Foundations.
14. Paint & Painting of Equipment, Supports, Piping, Flow Direction Indicators etc.
15. One Set of Special Erection & Maintenance Tools & Tackles.
16. Start Up & Essential Spares.
17. Supply of Counter Flanges with Gaskets, Nuts & Bolts at all Flanged Terminal Points.
18. All accessories required for system completion and required for normal operation of equipment.
19. Shop Inspection & Testing.
20. Packing, marking and forwarding.
21. Completion erection of all equipment covered under this contract.

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22. Testing and trial run of equipment.
23. Pre-commissioning checks and commissioning of all equipment.
24. Carrying out field performance testing of equipment at site as per relevant standards, air and water balancing and demonstrating guaranteed performance parameters and handing over the systems.
25. Associated minor civil works including but not limited to making & repairing of openings in brick works, etc. to be executed by the Contractor
26. Electricals:
 - a. Mechanically coupled motors
 - b. Cable termination at Motor terminals including cable glands and lugs. CONTRACTOR shall provide required power and control cables up to the equipment.
 - c. Grounding of Motor's body and other supplied items by using tinned stranded copper conductor from the nearest earthing conductor.
27. Local instruments, controls and interlocks inclusive of electrically operated chilled water outlet valves for each of the chillers.
28. Factory Acceptance Tests (FAT) and Site Acceptance Tests (SAT) including loop checking & commissioning, trial runs of all the above systems to meet the design specifications & functional requirements.
29. Operation and comprehensive maintenance including all consumables is included in the scope of work after handing over for a period mentioned elsewhere in the Contract Document

Scope of work – general

1. Engineering Responsibility of the System - The responsibility of system design, manufacturing, erection, working and safety will solely be the responsibility of the Contractor for the parameters as mentioned in the tender documents. The Contractor shall study design depicted in these documents thoroughly and point out reservations, if any, at tender stage only.
2. Codes and Standards - A reference made to various codes and standards in these Contract document shall imply reference to the latest version of that standard, including such

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revisions/amendments as may be issued by the relevant Authority during the currency of the contract and the corresponding clause(s) therein shall hold valid in place of those referred to.

3. Performance Tests- The Contractor shall guarantee the satisfactory functioning of the system to maintain the specified design conditions. The Contractor shall also give summer, monsoon and winter performance tests of the system after the same is completed and commissioned. These tests shall be carried out during the first summer, monsoon and winter following the completion and commissioning. Before taking over the installation, the system will be run by the Contractor continuously for 72 hours to demonstrate the satisfactory functioning and performance of the system installed.

4. Samples - Before undertaking fabrication and/or installation, the Contractor shall manufacture, at his own cost, a sample of every type of item. The Authority will approve these samples. The Contractor shall proceed further only after the above referred approval.

5. Noise and Vibration Levels-Noise level in conditioned spaces due to all refrigeration and air conditioning equipment (without operation of any other equipment) shall not exceed 45 dBA (unless specifically mentioned elsewhere) when measured at any point in occupied spaces at 1.5 meter above floor level and at 1.5 meter from any supply air register or 0.6 m from any return air grills. Necessary provisions of duct Sound Attenuators and/or acoustic insulation are to be included by the HVAC Contractor whether forming part of the specifications and/or BOQ. The HVAC equipment shall be provided with proper vibration isolators to ensure vibration free operation of the plant.

6. The tender drawings attached are preliminary. However, the Contractor will be required to submit the detailed shop drawings indicating P & I drawings, Ducting layouts, foundation details, Dimensional drawings of all AHU, Chillers, cooling towers, pumps, vessels and equipment, Chiller plant layout, piping and valves, electrical control panel with cable routing, level sensors and all other accessories as required. These detailed shop drawings shall be submitted to Authority for their comments & approval.

Plumbing works

5.1 Scope of work – General

- i. The scope shall cover the collection of data, evaluate them, design, manufacture, erection, operation, maintenance and adopting safety measures, repairs, replacement etc.
- ii. The CONTRACTOR shall refer to the latest norms, codes, manuals, Indian and Internationals for adopting parameters for design. The system as suggested in tender is only indicative and CONTRACTOR shall be responsible to review afresh design, specification, drawings, selection of materials, execution and testing

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strategy. The items in the BOQ are suggestive and tentative and shall be reviewed holistically as per the building planning, routing, circulation etc. The necessary documents on review shall be generated for the study to be reviewed by the owner in regard through various inputs, modification, correction suggested by the CONTRACTOR which shall be reviewed for final approval. All these activities shall be done at tender stage.

- iii. The materials shall strictly conform to relevant standards mentioned in detailed specifications. The testing and inspection plan for the materials shall be prepared by the Contractor and approved by the prior to purchase of the same. The work shall be executed in accordance with best modern practices, latest I.S. codes and other relevant codes.
- iv. Contractor shall make his own arrangements for drawing and distribution of water and electricity. Contractor shall also make his own arrangements for other facilities like compressors; DG sets etc. for unhindered progress of work.
- v. List of tender drawings issued at the time of calling of tenders for this work is given elsewhere in this Contract document. These drawings are meant for Contractor's guidance only. The Authority shall not entertain any claim for compensation for the reasons that the details as shown on "Good for Construction" drawings are different from those shown on tender drawings.
- vi. One permanent benchmark shall be furnished and all other layout, fixing levels etc. shall be done by the Contractor at his own cost. The Contractor shall protect and maintain, during the course of execution of the work, the main center lines and benchmarks, so that they are left undisturbed even after completion of his work.
- vii. Authority has carried out Soil investigations and the extract from the report. However, the Contractor shall note that there is neither express nor implied guarantee, as to either the accuracy of the records or any interpretation of them. The information about the site of work and site conditions in the Tender Documents is given in good faith for guidance only but the Contractor shall satisfy himself regarding all aspects of site conditions. The Contractor must satisfy himself regarding the character and volume of all work under this tender and expected surface, sub- surface and/or sub-soil water to be encountered. The location of the works and the general site particulars are as generally shown on the Site plans shown in Schedule 3.

5.2 Scope of Works- Plumbing

- viii. All the work shall be carried out in a workmanship like manner and as per the best practices of the

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trade.

The scope of work shall include supply of all material, labor and T&P, installation, testing in position and commissioning of followings –

1. Sanitary fixtures and accessories.
2. C.P. bathroom fittings and accessories
3. Soil, waste and vent pipes with fittings
4. Rainwater disposal pipes with fittings
5. Water supply pipes with fittings
6. Water misting system at terrace
7. External sewerage system
8. External Drainage system
9. External water supply system
10. All kinds of water supply and waste disposal pumps.
11. Connection to and from municipal mains in case of water, sewer and drain connection including coordination with all other agencies.
12. Storm water system with recharging well.

ix. Flushing Out and Sterilization of Pipe Work and Tanks -It is essential that all internal water services, external mains and tanks are thoroughly flushed out prior to being put into services and that drinking and domestic water services mains and tanks are sterilized in accordance with IS: 2065 :1965 – code of practice for water supply in buildings. The Contractor shall be responsible for making any temporary pipework connection required.

x. Testing And Commissioning - The Contractor shall be responsible for testing and commissioning the entire services installation described in the technical specifications of Schedule-3 and shall demonstrate the operation of the systems to the entire satisfaction of the Design consultant and to the Authority

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approval.

xi. All water supply, sewerage and storm water drainage work comprising of internal and external installations, water lines, sanitary fixtures, bathroom fittings, soil/waste/vent/rainwater pipes, excavation, laying and jointing of pipes, refilling of trenches, construction of appurtenances like manholes, road gully chambers etc. shall be carried out in a workmanship like manner and as per the specifications mentioned in Schedule-3. The quality and makes of the materials shall be as specified in each specification, bill of quantities, approved list of makes and drawings. In case specifications of a material or work is not mentioned or not clear in the enclosed specifications, then the reference shall be made to the latest CPWD specifications and the relevant IS Codes amended up to date.

xii. Structural Alterations to Buildings: -

1. No structural member in the building shall be damaged/altered, without prior approval from the competent Authority.
2. Structural provisions like openings, cutouts if any, provided by the Authority for the work, shall be used. Where these require modifications, or where fresh provisions are required to be made, such contingent works shall be carried out by the Contractor at his cost.
3. All such openings in floors provided by the Authority shall be closed by the Contractor after installing the cables/conduits/rising mains etc. as the case may be, by any suitable means as approved by the without any extra payment.
4. All chase required in connection with the plumbing works shall be provided and filled by the Contractor at his own cost to the original architectural finish of the buildings.

Fire Fighting works

6.1 Scope of work – General

- i. The scope shall cover the collection of data, evaluate them, design, manufacture, erection, operation, maintenance and adopt safety measures, repairs, replacement etc.
- ii. The CONTRACTOR shall refer to the latest norms, codes, manuals, Indian and Internationals for adopting parameters for design. The system as suggested in tender is only indicative and CONTRACTOR shall be responsible to review afresh design, specification, drawings, selection of materials, execution and testing strategy etc. The items in the BOQ are suggestive and tentative and shall be reviewed holistically as per

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the building planning, routing, circulation etc. The necessary documents on review shall be generated for the study to be reviewed by the owner in regard through various inputs, modification, correction suggested by the CONTRACTOR which shall be reviewed for final approval. All these activities shall be done at tender stage.

- iii. The materials shall strictly conform to relevant standards mentioned in detailed specifications. The testing and inspection plan for the materials shall be prepared by the Contractor and approved by the DAT prior to purchase of the same. The work shall be executed in accordance with best modern practices, latest I.S. codes and other relevant codes.
- iv. Contractor shall make his own arrangements for drawing and distribution of water and electricity. Contractor shall also make his own arrangements for other facilities like compressors; DG sets etc. for unhindered progress of work.
- v. List of tender drawings issued at the time of calling of tenders for this work is given elsewhere in this Contract document. These drawings are meant for Contractor's guidance only. The Authority shall not entertain any claim for compensation for the reasons that the details as shown on "Good for Construction" drawings are different from those shown on tender drawings.
- vi. One permanent benchmark shall be furnished and all other layout, fixing levels etc. shall be done by the Contractor at his own cost. The Contractor shall protect and maintain, during the course of execution of the work, the main center lines and benchmarks, so that they are left undisturbed even after completion of his work.
- vii. "Good for Construction" drawings shall be furnished to the Contractor progressively during the execution of the work and as further data becomes available, to supplement the tender drawings. These drawings shall show all dimensions and clearances of the structures, loadings where necessary, material to be furnished and size of each member, definite location of openings, reinforcing steel details, embedded parts and piping. "Good for Construction" drawings shall be revised and fresh revised copies issued to the Contractor from time to time by the design consultant to adopt them in work to the final designs and to suit the physical conditions encountered during the progress of the works.
- viii. The tender drawings attached are preliminary. However, the Contractor shall be required to submit the detailed shop drawings indicating P & I drawings, foundation details, Dimensional drawings of all pumps, vessels and equipment, pump room layout, piping and valves, electrical control panel with cable routing, level sensors and all other accessories as required. These detailed shop drawings shall be submitted to s / Authority for their comments & approval.
- ix. Contractor has to submit all the technical details for all equipment along with sizing calculations and

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equipment selection to the Authority and should get approval. All the works shall be carried out as per final "Good for construction drawings" only.

- x. Any other item not specifically / mentioned in this tender but is essential for proper and successful completion, commissioning and running of the Plant for its commercial utilization is also to be included in the scope of contract.

6.2 Scope of Work – Fire Fighting

xi. The scope of the Contractor shall comprise design, engineering, manufacturing, inspection & testing at works, packing, forwarding, supply to site, unloading at site, storage at site, construction, installation, erection, testing, commissioning, performance testing at site, and other related items of work for the complete firefighting works comprising of the following major items:

1. Internal hydrant system.
2. External hydrant system.
3. Related piping with all accessories.
4. All types of valves, connections, headers.
5. Hydrant valves, hose reel, hose pipes, Fire hose cabinets etc.
6. Electrical and diesel operated Fire Fighting pumps with all accessories.
7. Electrical works, Panels, cables and earthing.
8. Gas based suppression system for command & server rooms.
9. Fire extinguishers.
10. All other allied and necessary equipment and accessories to complete the system up to the satisfaction of Authority and for proper functioning of the entire system.

xii. The complete installation of Fire Fighting System shall strictly confirm to the minimum specifications and guidelines given in NBC – 2016 (Part IV), IS: 15105 for sprinkler system, IS: 13030 for external hydrant system, other relevant IS code of practice and CPWD specifications (Part V) amended up to date.

xiii. Unless otherwise mentioned in the tender documents, the following works shall be done by the Contractor

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and therefore, their cost shall be deemed to be included in their tendered cost- whether specifically indicated in the schedule of work or not: -

1. Foundations for equipment including foundation bolts and vibration isolation spring/pads,
2. Suspenders, brackets and floor/ wall supports for suspending/supporting pipes.
3. Suspenders and/or cable trays for laying the cables.
4. Excavation and refilling of trenches in soil wherever the pipes are to be laid directly in ground, including necessary base treatment and supports.
5. Sealing of all floor slab/wall openings for pipes and cables, from a fire safety point of view, after laying of the same.
6. Painting of all exposed metal surfaces of equipment and components with appropriate color.
7. Making openings in the walls/ floors/ slabs or modification in the existing openings wherever provided for carrying pipeline, cables etc.
8. All electrical works including cable/wires, earthing etc. beyond power supply made available by the Contractor.
9. Making good all damages caused to the structure during installation and restoring the same to their original finish.
10. Approval from local fire authorities as may be required as per local byelaws. (The Contractor's responsibility shall be limited to the work executed by him.)
11. Preparation of Pressure Flow analysis for hydrant and sprinkler systems.
12. Operation and comprehensive maintenance including all consumables is included in the scope of work after handing over for a period mentioned elsewhere in the Contract Document.

6.3 Scope of Works – General

6.3.1 Discrepancies in the drawings

If there is any discrepancy due to in-complete description, ambiguity or omission in the drawings and

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other documents relating to this Contract found by the Contractor either before starting the work or during execution or after completion, the same shall be immediately brought to the attention of the Authority and their decision would be final and binding on the Contractor.

6.3.2 MATERIALS

All materials to be supplied by the Contractor shall be new, best of their kind and shall confirm to the latest Indian standards. All packed items shall arrive at site in original packing only. Any items found defective or damaged shall be replaced by the Contractor at his own expenses.

It shall also be the responsibility of the Contractor to submit without any extra charge the samples of the materials/equipment as and when asked by the Authority. If the Contractor wishes to use an alternative make due to non-availability of the approved one, he should take the prior approval of the Authority. Under such situations the Contractor shall show such promptness as not to hamper the progress of the work.

The Contractor shall submit shop drawings of all the custom-built equipment, including pumping system, pump house layout, piping, valves, positions of all types of sleeves in structural members and drainage network etc., he proposes to install to the 's for approval.

The Contractor shall also submit catalog, manufacturer's drawings, equipment characteristics data, performance charts as required by the Authority.

6.3.3 INSTRUMENTS FOR MEASUREMENT AND TESTING

The Contractor shall provide, free of cost, all equipment, instruments, labor and all other allied assistance required by the Authority or their representatives for measurement and testing of the works.

6.3.4 BATTERY LIMIT

All the service lines of Mechanical, Electrical, Plumbing and Firefighting systems shall be laid, installed and terminated in complete with required civil infrastructure and accessories and in between the utility building/designated points and the Gallery to achieve complete provision and functionality of the services.

MISCELLANEOUS

6.3.4.1 All sundry equipment's, fittings, assemblies, accessories, hardware items, foundation bolts, supports, termination lugs for electrical connections, cable glands, junction boxes and all other items

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which are useful and necessary for proper assembly and efficient working of the various equipment and components of the work shall be deemed to have been included in this Contract, irrespective of the fact whether such items are specifically mentioned in the Contract or not.

6.3.4.2 In addition, components/materials, which may not be specifically stipulated in the Contract document, but which are necessary for satisfactory installation and/or operation of any portion of the work, shall also be provided within the contract rates without any extra cost. Contractor shall carry out and complete the work in all respects to the satisfaction of Authority as per the Contract Agreement and as directed by Design consultant and as required.

6.3.4.3 Unless and otherwise mentioned in the Contract documents the following works shall have to be done by the Contractor, and therefore the cost shall be deemed to be included in the Contractor's scope:

6.3.4.3.1 Furnishing of all labor, skilled and unskilled, supervisory and administrative personnel, erection tools and tackles, testing equipment, implements, supplies, consumables like welding rods and gas, oil and grease, cleaning fluids, insulating tape, anti-corrosive paints, jute cotton waste etc., and hardware for timely and efficient execution of the erection work.

6.3.4.3.2 Transport vehicles necessary for efficient transportation of equipment from Authority's stores to site of erection and excess materials back to Authority's stores .

6.3.4.3.3 Complete assembly, erection and connection, testing and commissioning, putting into successful and satisfactory commercial operations of above equipment.

6.3.4.3.4 The items of work to be performed on all equipment and materials shall include but not limited to the following:

6.3.4.3.4.1 Receiving, unloading and transportation at site. (To Authority's or Contractor's stores and from there up to actual place of erection).

6.3.4.3.4.2 Opening, inspecting and reporting all damages and short supply items.

6.3.4.3.4.3 Arranging to repair and/or re-order all damaged and short supply items.

6.3.4.3.4.4 Storing at site with suitable all-weather protection.

6.3.4.3.4.5 Assemblies, erection and complete Installation.

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6.3.4.3.4.6 Necessary coordination between work done by other Contractors.

6.3.4.3.4.7 Final check-up, testing and commissioning in presence of Authority's representative.

6.3.4.3.4.8 Obtaining Authority's written acceptance of satisfactory performance.

6.3.4.3.5 Compliance with these specifications and/or approval of any of the Contractor's documents shall in no case relieve the Contractor of his contractual obligations.

6.3.4.3.6 All work to be performed and supplied shall be as a part of contract requiring specific approval/review of Authority or his.

6.3.4.3.7 The Contractor shall carry out all necessary coordination with regard to subcontracted equipment. The Authority shall communicate only with the Contractor for all matters pertaining to the contract.

6.3.4.3.8 The Contractor needs to submit all the relevant drawings, quality assurance plan for all the supply items under Contractor scope, based on the approval from Authority, the Contractor need to submit the inspection call a week ahead, the same shall be inspected by Authority at vendor / sub vendor works, based on the clearance the same needs to be dispatched to site.

6.3.4.3.9 Makes of equipment / components shall be as per list of approved makes indicated in the Schedule 3. Deviation to this is not acceptable. For equipment / components where make is not specified, Contractor shall obtain specific approval from Authority to ordering.

6.3.4.3.10 The Contractor shall supply maintenance tools including special tools, if required, for attending to the equipment supplied at no extra cost.

6.3.4.3.11 Installation / Erection of the equipment / Auxiliary systems supplied by Contractor in Contractor's scope.

6.3.4.3.12 All site test reports in specified format maintained by Contractor duly approved by Authority shall be handed over to Authority after completion of job.

6.3.4.3.13 Approved drawings/shop drawings, layout, and pipe route layout to be maintained at site for the purpose of cross-reference during installation.

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6.3.4.3.14 Operation and Maintenance manual to be supplied for all types of machinery, W.T.P., S.T.P. and other related items.

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Electrical Works

7.1 Scope of works – Electrical

The scope of the Contractor shall comprise design, engineering, procurement, manufacture, installation, testing at manufacturer's works, packing, transportation, shipping, unloading at site, transportation to site, storage, insurance, transportation from stores to erection site, erection, site DRY testing, commissioning, demonstration of performance guarantee test of the Internal & External electrification power distribution system and handing over to Authority including submission of hard copy and soft copy of GFC cum Shop drawings based upon available data in tender drawing, and after successful installation Contractor should submit all as-built drawings, O&M manuals etc. required for successful operation of entire project. Scope also includes all works related to HT cable from HT panel, HT cable's termination, transformer, LT cable & cable tray from Utility room (which is away from building) to this building, LT cable's terminations, all electrical works for plumbing, fire and HVAC for utility room as per requirement, etc. (all require to complete the job).

Installation, Testing and commissioning of outdoor type DP structure, Transformer, DG set with DG exhaust stake and main S/S with approval from chief electrical inspector and any other govt body for approval of the project set up. DG set is considered based on the emergency load of the building. At later stage due to the existing utility infrastructure or any other reason if the DG set or its synchronization panel (or both with necessary items) is not required, price of DG set and its panels – as mentioned in schedule III, should be deducted from total cost of the project and from the Contractor's scope and passed back to the client.

Main LT panels, Sub LT panels, HVAC Panels/DBs, Lighting and Power DB, APFCR panels complete with ACBs, MCCBs, cable, relays, instruments, meters, indication lamps, etc.

Complete Distribution boards with MCCB & MCB

UPS, UPS input and output panel with battery backup arrangement, connection etc.

LT power, control cables and Pair cables with required numbers of glands, lugs, termination kits, jointing kits, etc. as required for interconnection between various electrical equipment along with cable markers.

Complete cable carrier system –cable trays, supports, brackets, clamps etc as well as GI/PVC

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conduits, Hume pipes and all other installation materials as required for laying of above power and control cables. HDPE/Hume pipes encased in concrete to be provided for crossing of cables below roads (wherever applicable).

Power to all equipment which require power including Lifts, Escalators, etc. The Control Panel of Lift and Escalators will be in part of the respective vendor.

Indoor & outdoor Lighting system for complete buildings, approach road and any other areas covered in this Contract. LDBs, lighting transformers (if any), Junction Boxes for raceways and for Outdoor lighting, Lighting Panels, light fixtures of various types, isolating and change over switches, switch boxes, switch socket outlets, cables, wires, GI/PVC conduits with all accessories, civil works required for installation of lighting poles, High mast, lightning, earthing, etc. It is the responsibility of the Contractor to submit the control layout along with circuit schedule, conduit layouts etc. for the approval of Authority, including details of wiring for lighting, sockets etc. as per Standard.

Lighting and power points for all Exhibits, Panels, Gallery, AV, IT, etc. all equipment. Necessary wiring or plugs to be provided as per requirement.

Point wiring with Conduits for all types of wiring including circuits, sub mains, light, fans, power and AC etc.

Switches and socket outlets for light, fans, plug, power, Tel, TV, computer network etc with suitable MS/GI boxes with all required accessories.

This scope shall also include conduits and wiring for Network Data and voice, network EPABX, TV system (if any), Public Address system for fire evacuation, CCTV and Computer networking, fire alarm, broad band etc. Contractor should ensure that all ELV systems shall be design built as per manufacturer's recommendation and ensure that it shall be capable to cater all design requirements and scalability of future requirements.

Lighting Fixtures, fans and exhaust fans for building and external areas. The scope also includes Design, supply, installation, testing and commissioning of necessary accessories to install the Lighting fixture such as connectors supporting rods / frames, anchor fasteners, necessary hardware etc. complete with all accessories required for installation.

System earthing as well as earthing fall non-current carrying metallic parts as per IS 3043 and lightning protection system as per codes and standards complete with deep bore earth pits, treated earth pits, earthing conductor, earth leads/strips etc. as required for Power Distribution System.

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Electrical system related miscellaneous items like three phase welding receptacles, rubber mats, danger boards, first aid charts, first-aid boxes, insulated hand gloves, shock treatment chart, etc.

Fireproof sealing system comprising fire stops and fire breaks for the cable and cable trays, any wall/floor openings.

Underground and above ground LT cables and other allied works Feeder pillars with circuit breakers

Automatic protection of all electrical equipment through selective relaying systems. Electrical supply to equipment and machinery

Adequate provision for future expansion and modification. Maximum interchangeability of equipment.

Fail safe feature. Suitability for applicable environmental factors.

Civil work for earth pits, wall opening, minor core cutting in floors, minor chipping works for lighting inside building, cable burial including excavation, back filling and compression etc as detailed in technical specification. Foundation frames, bolts, bolts of special design, embedment, anchor fasteners and inserts.

Complete relay setting and coordination documentation with calculation for the Power Distribution System shall be submitted by the successful Contractor.

All safety equipment required in the electrical substation and other installations shall be as per the statutory requirement shall be provided by the Contractor. Safety to personnel and equipment during operation and maintenance.

All the required approvals shall be in the scope of the Contractor and all the required coordination charges, professional charges, etc. shall be in the scope of the Contractor. However, statutory application fees shall be borne by the Authority. Contractor to coordinate with all agencies (AV, IT, PHE/FFTG, HVAC, Exhibit gallery, etc.) for power requirement and complete functioning.

All equipment supplied and all works executed under this contract including system design and detailed engineering, shall comply with the statutory requirements and local regulations. The scope of work includes obtaining necessary statutory approvals/clearances from all the concerned authorities for various systems covered in this specification including preparation of Drawings & attending necessary meetings with statutory authorities.

It is not the intent to completely specify herein all details of design and construction of the

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equipment/systems. However, all equipment/systems shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing continuous operation up to the successful Contractor's guarantees in a manner acceptable to the Authority who will interpret the meaning of drawings and specifications and shall have the power to reject any work or material which in his judgment are not in full accordance with the requirements. All the major equipment shall be installed, tested and commissioned under supervision of the representative of the original manufacturer of respective equipment.

All components included in Schedule 3 are not explicitly identified and/or listed herein, these shall be supplied under this contract to ensure completeness of the system and facilitate proper operation and easy maintenance of the electrical equipment.

All services necessary for the erection, testing and commissioning and all instruments/services required for carrying out performance testing of all items of the plant electrics covered under this specification shall be arranged by the Contractor.

Contractor to submit filled up data sheets along with the RFP.

All quantities, rating indicated in the datasheet, SLD is indicative only. The responsibility lies with the Contractor to arrive at the exact requirement, quantity and ratings of the entire equipment. Items which are not indicated in specification or datasheet, but however required for completeness of the system are deemed necessary to be considered by the Contractor.

Contractor has to prepare and submit all detailed design drawings/detailed calculations and vendor drawings for approval to the Authority. In case of any contradiction between various referred standards specification/datasheets statutory regulations more stringent shall govern.

The Contractor has to submit the detailed design calculations, GFC cum shop drawings and all required documents for construction to Authority for approval before proceeding with the construction.

Preparation of as-built drawings for all electrical systems is in the scope of Contractor

In case of any deviation in the ratings indicated (in layouts, drawings, specification, datasheet) and sizing arrived by the Contractor at the time of detailed Engineering, it remains the responsibility of the Contractor to proceed as per actual sizing arrived and approved by the Authority without any time & cost implication.

Type test certificates for electrical equipment not less than 5 years shall be submitted for Authority's approval.

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Instrumentation works (ELV Works)

7.1 Scope of Works – Instrumentation

The scope covers the design, engineering, documentation, inspection and testing at Contractor's / his SUB-Contractor's works, packing, supply, transportation from place of manufacture to site, unloading, storage and handling at site, site fabrication & erection, testing, pre-commissioning checks & commissioning, field performance testing and performance guarantee of LV System.

The scope of work shall include Design, supply, installation, testing and commissioning of following systems in the building.

- a. IP CCTV System
- b. Addressable Fire Detection & Alarm with evacuation PA system
- c. IT/LAN System with Audio Visual system
- d. Access Control System
- e. IP DATA and voice Network system
- f. Vesda system for fire detection
- g. Novec based gas detection system for all server room for fire suppression

The scope shall also cover incoming lease lines from the CONTRACTOR starting from necessary documents and drawings required for necessary arrangement up to installation, testing and its support.

All cabling required for interconnecting the various components of the System shall be in the scope of Contractor.

The LV System shall be designed as per description given in this specification subject to satisfying the system needs after commissioning of the system.

It is not the intent to specify completely herein all the details of design and manufacture of the system/components. However, the system/ component shall conform in all respects to high standards of engineering, design and workmanship and be capable of performing in a manner

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acceptable to the Authority, who will interpret the meaning of drawings and specifications and shall be entitled to reject any material or work, which in his judgment is not in full accordance with the requirements. Whether called for specifically or not, all accessories required for operation of the system are deemed to be considered as part of the Contractor's scope of supply.

Supply and services shall be rendered in conformity with proven design principles, taking into account the current technology. The requirements of the contract must be fulfilled in totality.

The supply & services shall be rendered inclusive of all components, software and interconnecting arrangements with other supplies needed for proper and reliable continuous operation and for satisfactory maintenance and repair. In addition to components described, any other component including any system and software required to make the system complete shall form part of this contract and shall be deemed to be included in the Contractor's scope.

If data on the execution of supplies and services are contained in drawings, but none in specification and vice versa, such data shall be deemed to be contained in both. Contradictions in the specification, if any, shall be brought to the attention of the Authority and by the Contractor and the correct requirement shall be obtained.

Contractor shall undertake repair/replace any defective or inappropriate component/ system supplied within the warranty period and shall make good such deficiency within one day from the date the same is brought to his notice by the Authority.

Apart from the above visit during the warranty period, trouble-call visits shall be made as & when required by the Authority.

The various items of work shall be as per the schedule of items given in the Schedule of quantities of the specification.

Testing And Commissioning: The Contractor, at no extra cost, shall provide all instruments and accessories required for testing and commissioning of the items specified for the required duration of test.

Any modification/revisions in the equipment, installation of equipment as required by the statutory Authority shall be carried out by the Contractor. All tools and tackles along with necessary measuring and testing equipment required right from supply to final commissioning shall be in the scope of the Contractor. Contractor shall submit a commissioning Checklist along with commissioning tests for Authority approval. It is the responsibility of the Contractor to arrange for required test equipment for carrying out these tests. All pre-commissioning and commissioning tests

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shall be carried out in the presence of Authority's representative and approval for it shall be obtained before commissioning the installations.

8.1 Code of Standards

All equipment, system and services covered under this specification shall comply with all currently applicable statutes, regulations and safety codes. Nothing in this specification shall be construed to relieve the Contractor of this responsibility.

The standards not indicated in the specification are also acceptable, if they are established to be equal or superior to the standards indicated in the specification which shall be pre-approved by the Authority.

The metric units/SI units shall be used in all data/drawings submitted against this package.

The Contractor shall furnish the English translations of all standards to which the equipment and systems offered are conforming to, as and when required by the Authority.

The work shall be performed in conformity with these specifications standards and Codes of Practice specified or referred in the tender. In case of any conflict the stipulations under these specifications shall govern.

In addition, work shall also confirm to the requirements of latest editions/ amendments of the following:

- a. CEA Rules framed there under
- b. Fire Insurance Regulations
- c. Regulations laid down by the Factory Inspectorate
- d. Regulations laid down by the Chief Electrical Inspectorate of Government, PCB
- e. Applicable Codes of Practice of the Bureau of Indian Standards
- f. Any other regulations laid down by the Central, State or Local Authorities from time to time and during the execution of this contract and during the execution of this contract.

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8.2 Scope of works – General

Unless otherwise mentioned in the tender documents, the following works shall be done by the Contractor and therefore, whether specifically indicated in the schedule of work or not:-

Suspenders and/or cable trays for laying the cables,

Sealing of all floor slab/wall openings made by the Contractor for cables, from fire safety point of view, after laying of the same.

Painting of all exposed metal surfaces of equipment and components with appropriate colour.

Making openings in the walls / floors / slabs or modification in the existing openings wherever provided for carrying conduits, cables etc.

Making good all damages caused to the structure during installation and restoring the same to their original finish.

Approval from local fire authorities as may be required as per local byelaws. (The Contractor's responsibility shall be limited to the work executed by him.)

9 Scope of work – Acoustical works

a. The scope of service for the Acoustical Contractor is to engineer and execute acoustical work for National Science centers per the design given in the Tender drawings, Bill of Quantities, specifications and Design brief report.

b. It includes the furnishing of all materials, Labor, tools and equipment and management necessary for Construction and completion of Work.

c. The CONTRACTOR to check the Ducting and other services layout before leveling the false Ceiling heights.

d. All Materials used to be of fire retardant and recommended STC, NRC, and Color to be followed as approved by Authority.

e. The Contractor shall follow the Manufacturer installation instructions to avoid any further confusion.

f. The CONTRACTOR to submit the descriptive technical literature of the materials, test certificates for the recommended materials to the Authority for approval.

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- g. The CONTRACTOR to submit the samples and installation images, Mockup along with technical bids to the Authority for approval.
- h. CONTRACTOR should verify the quantities with respect to actual site measurements before confirming order to manufacturer and no claims are entertained in the later stage.
- i. Manufacturer /CONTRACTOR should submit all valid test certificates of the materials before starting the work.
- j. Any clarifications regarding installation to be clarified with Authority / Manufacturer before starting the work.
- k. Change of materials is not recommended without valid reason. Change is accepted only on approval of Authority.
- l. Color to be approved by Authority.
- m. All work during its progress and upon Completion shall confirm the Specifications and layout drawings. Should any detail essential for completion of work when omitted from the drawings and specifications it shall be responsible for Contractor to inform the Client or so that upon completion of work will be acceptable
- n. If required to support and execute the Acoustics Interior systems the CONTRACTOR shall have to deploy supervisors, civil masons, laborers, carpenters, Tile masons, painters, electricians, etc. on his own cost to carry out the work effectively.
- o. CONTRACTOR thereby certifies that it is qualified in all areas pertaining to, either directly or indirectly, the Work. In the event the CONTRACTOR becomes unable to complete the Work in accordance with the Contract Documents, or the satisfaction of the Authority or its representatives, due to a lack of understanding of design or services required by the Contract Documents, it shall be the responsibility of the CONTRACTOR to retain the services of the applicable manufacturers' representatives to expeditiously complete the Work in accordance with the construction schedule with no additional cost to the Authority.
- p. The CONTRACTOR shall execute the Work as per Authority Instructions and as per the Specifications and no work should be executed which is not mentioned in the contract documents.
- q. The CONTRACTOR is responsible to submit the Shop drawings with Junction details for the

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proper Execution of Work. The work will be executed after the approval from Authority. Immediately after the award of Contract the Contractor shall develop the detailed progress Project schedule and send it to clients or Consultants for approval which will indicate the start and finish date of the project.

r. CONTRACTOR to visit the Site and make himself thoroughly understand the Site condition, nature and requirement of work, Facilities for the transportation of materials, Storage of materials and removal of rubbish and wastes. Hence the bidder to include the cost and charges for the additional difficulties. The CONTRACTOR should not claim any extra compensation if they face any difficult conditions from Authority after the Commencement of the Work.

s. The CONTRACTOR should maintain his cost for Work tools and tackles Machines, Transportation, Scaffolding, timbering, shuttering, lighting, Storage.

t. The CONTRACTOR is responsible for any damages to the Property, Injury to the workers due to his / their carelessness or negligence. The CONTRACTOR should rectify the damages without any claim or compensation from the Authority.

u. The entire work must be completed within the stipulated time mentioned in the formal work order.

v. The work will not be considered as completed unless otherwise the Authority has certified in writing.

10 Scope of work – Lighting and LMS

10.1 Lighting:

a. Brief Document of design basis report on understanding on the project and Implementation on the lighting concept to be prepared and approved.

b. Design Intent / Presentation with the rendered night views and lighting element details for all critical areas to be prepared and approved.

c. Shop drawings of complete area lighting drawings with legend and drawing list are to be prepared, submitted and approved and this would be done on a staggered basis.

d. Shop drawings of Fixture Mounting details / Method which includes Elevation/sections drawings

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- e. Shop drawings of complete area Lighting Controls drawings and its Load schedule
- f. Area Wise Dialux simulation & Lux level report for all major public areas or as directed by the client's consultant.
- g. Detailed Technical Specifications of each light fixture, - fixture mockup and sampling as decided in conjunction with the client's consultants.
- h. Factory visits shall be undertaken at the cost of the CONTRACTOR for review of any specific customized fixtures as per requirement and as directed by the Authority.

11 Server

CONTRACTOR needs to obtain approval of Authority regarding detail requirements of the Server. And incorporate functional and policy based operational requirements as directed by Authority.

Category-III

Note: -

1. The below-mentioned scope of works in this section from serial shall include entire scope of works to be executed as per fee structure.

11.1 Scope of work- general

- a) The materials shall strictly conform to relevant standards mentioned in detailed specifications. The testing and inspection plan for the materials shall be prepared by the Contractor and approved by the Authority prior to purchase of the same. The work shall be executed in accordance with best modern practices, latest I.S. codes and other relevant codes.
- b) Contractor shall make his own arrangements for drawing and distribution of water and electricity. Contractor shall also make his own arrangements for other facilities like compressors; DG sets etc. for unhindered progress of work.
- c) One permanent benchmark will be furnished and all other layout, fixing levels etc. shall be done by the Contractor at his own cost. The Contractor shall protect and maintain, during the course of execution of the work, the main center lines and benchmarks, so that they are left

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undisturbed even after completion of his work.

d) "Good for Construction" drawings will be furnished to the Contractor progressively during the execution of the work and as further data becomes available, to supplement the tender drawings. These drawings will show all dimensions and clearances of the structures, loadings where necessary, material to be furnished and size of each member, definite location of openings, reinforcing steel details, embedded parts and piping. "Good for Construction" drawings will be revised, and fresh revised copies issued to the Contractor from time to time by the Design consultant to adopt them in work to the final designs and to suit the physical conditions encountered during the progress of the works.

e) "Good for Construction" drawings issued by the Design consultant shall form part of these specifications. Unless otherwise specified, the plans and specifications are intended to include everything obviously requisite and necessary for proper and entire completion of the work and shall be read in conjunction with the relevant specifications and codes of practice. These specifications shall have precedence in case anything contrary to this is stated anywhere in the contract document except description of items given in the schedule of items. If there is a conflict between the specification and schedule of items, then the details provided in the schedule of items will govern. The decision of Authority shall be final, on any issue arising out of such discrepancies.

f) Authority has carried out Soil investigations and the extract from the report. However, the Contractor shall note that there is neither express nor implied guarantee, as to either the accuracy of the records or any interpretation of them. The information about the site of work and site conditions in the Tender Documents is given in good faith for guidance only but the Contractor shall satisfy himself regarding all aspects of site conditions. The Contractor must satisfy himself regarding the character and volume of all work under this tender and expected surface, sub-surface and/or sub-soil water to be encountered. The location of the works and the general site are as generally shown on the Site plans attached in tender drawings

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Scope of Works General.

1. Discrepancies in drawings

If there is any discrepancy due to in-complete description, ambiguity or omission in the drawings and other documents relating to this Contract found by the Contractor either before starting the work or during execution or after completion, the same shall be immediately brought to the attention of the Authority and their decision would be final and binding on the Contractor.

2. Materials

All materials to be supplied by the Contractor shall be new, best of their kind and shall conform to the latest Indian standards. All packed items shall arrive at site in original packing only. Any items found defective or damaged shall be replaced by the Contractor at his own expenses.

It shall also be the responsibility of the Contractor to submit without any extra charge the samples of the materials/equipment as and when asked by the Authority. If the Contractor wishes to use an alternative make due to non-availability of the approved one, he should take the prior approval of the Authority, . Under such situations the Contractor shall show such promptness as not to hamper the progress of the work.

The Contractor shall submit shop drawings of all the custom-built equipment, including pumping system, pump house layout, piping, valves, positions of all types of sleeves in structural members and drainage network etc, he proposes to install to the 's for approval.

The Contractor shall also submit catalogue, manufacturer's drawings, equipment characteristics data, performance charts as required by the Authority.

3. Instruments for Measurement and Testing

The Contractor shall provide, free of cost, all equipment, instruments, labor and all other allied assistance required by the authority or their representatives for measurement and testing of the works.

4. Miscellaneous

1. All sundry equipment, fittings, assemblies, accessories, hardware items, foundation bolts, supports, termination lugs for electrical connections, cable glands, junction boxes and all other

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items which are useful and necessary for proper assembly and efficient working of the various equipment and components of the work shall be deemed to have been included in this Contract, irrespective of the fact whether such items are specifically mentioned in the Contract or not.

2. In addition, components/materials, which may not be specifically stipulated in the Contract document, but which are necessary for satisfactory installation and/or operation of any portion of the work, shall also be provided within the contract rates without any extra cost. Contractor shall carry out and complete the work in all respects to the satisfaction of Authority as per the Contract Agreement and as directed by Design consultant and as required.

3. Unless and otherwise mentioned in the Contract documents the following works shall have to be done by the Contractor, and therefore the cost shall be deemed to be included in the Contractor's scope:

a. Furnishing of all labor, skilled and unskilled, supervisory and administrative personnel, erection tools and tackles, testing equipment, implements, supplies, consumables like welding rods and gas, oil and grease, cleaning fluids, insulating tape, anti-corrosive paints, jute cotton waste etc., and hardware for timely and efficient execution of the erection work.

b. Transport vehicles necessary for efficient transportation of equipment from Authority's stores to site of erection and excess materials back to Authority's stores .

c. The items of work to be performed on all equipment and materials shall include but not limited to the following:

i. Receiving, unloading and transportation at site. (To Authority's or Contractor's stores and from there up to the actual place of erection).

ii. Opening, inspecting and reporting all damages and short supply items.

iii. Arranging to repair and/or re-order all damaged and short supply items.

iv. Storing at site with suitable all-weather protection.

v. Assemblies, erection and complete Installation.

vi. Necessary coordination between work done by other Contractors.

vii. Final check-up, testing and commissioning in presence of Authority's representative.

viii. Obtaining Authority's written acceptance of satisfactory performance.

4. Compliance with these specifications and/or approval of any of the Contractor's

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documents shall in no case relieve the Contractor of his contractual obligations.

5. All work to be performed and supplied shall be as a part of contract requiring specific approval/review of Authority.
6. The Contractor shall carry out all necessary coordination with regard to sub- contracted equipment. The Authority will communicate only with the Contractor for all matters pertaining to the contract.
7. The Contractor needs to submit all the relevant drawings, quality assurance plan for all the supply items under Contractor scope, based on the approval from Authority, the Contractor need to submit the inspection call a week ahead, the same shall be inspected by Authority at vendor / sub vendor works, based on the clearance the same needs to be dispatched to site.
8. Makes of equipment / components shall be as per list of approved makes. Deviation to this is not acceptable. For equipment / components where make is not specified, Contractor shall obtain specific approval from Authority prior to ordering.
9. The Contractor shall supply maintenance tools including special tools, if required, for attending to the equipment supplied at no extra cost.
10. Installation / Erection of the equipment / Auxiliary systems supplied by Contractor in Contractor's scope.
11. All site test reports in specified format maintained by Contractor duly approved by Authority shall be handed over to Authority after completion of job.
12. Approved drawings/shop drawings, layout, and cable route layout, to be maintained at site for the purpose of cross-reference during installation.

SCOPE OF WORKS- Inspection

5. Quality assurance Plan

To ensure that the equipment and services under the scope of this Contract whether manufactured or performed within the Contractor's works or at his sub-Contractor's premises or at the Authority's site or at any other place of work are in accordance with the specifications, the Contractor shall adopt suitable quality assurance plan to control such activities at all points

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necessary. Such a program shall be outlined by the Contractor and shall be finally accepted by the Authority after discussions before the award of Contract. A quality assurance plan of the Contractor shall generally cover the following:

- a. His organization structure for the management and implementation of the proposed quality assurance plan.
- b. Documentation control system.
- c. Qualification data for Contractor's key personnel.
- d. The procedure for purchases of materials, parts components and selection of sub-Contractor's services including vendor analysis, source inspection, incoming raw material inspection, verification of material purchases etc.
- e. System for shop manufacturing and site erection controls including process controls and fabrication and assembly control.
- f. Control of non-conforming items and system for corrective actions.
- g. Inspection and test procedure both for manufacture and field activities.
- h. Control of calibration and testing of measuring instruments and field activities.
- i. System for indication and appraisal of inspection status.
- j. System for quality audits.
- k. System for authorizing release of manufactured products to the Authority.
- l. System for maintenance of records.
- m. System for handling storage and delivery
- n. A quality plan detailing out the specific quality control measures and procedures adopted for controlling the quality characteristics relevant to each item of equipment furnished and/or services rendered.
- o. The Authority or his duly authorized representative reserves the right to carry out quality audit and quality surveillance of the system and procedure of the Contractor/his Vendor's quality management and control activities.

6. Quality assurance documents

The Contractor shall be required to submit the following Quality Assurance Documents within three weeks after dispatch of the equipment.

- a. All Non-Destructive Examination procedures, stress relief and weld repair procedure actually

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- b. used during fabrication and reports including radiography interpretation reports.
- c. Welder and welding operator qualification certificates.
- d. Welder's identification list, listing welders and welding operator's qualification procedure and welding identification symbols.
- e. Raw material test reports on components as specified by the specification and/or agreed to in the quality plan.
- f. Stress relief time temperature charts/oil impregnation time temperature charts.
- g. Factory test results for testing required as per applicable codes/mutually agreed quality
- h. The quality plan with verification of various customer inspection points (CIP) as mutually and methods used to verify the inspection and testing points in the quality plan were performed satisfactorily.

7. Inspection and Testing

- a. The Contractor needs to submit all the relevant drawings, quality assurance plans for all the supply items under Contractor scope. Based on the approval from Authority, the Contractor needs to submit the inspection call, the same shall be inspected by Authority at vendor / sub vendor works, based on the clearance the same needs to be dispatched to site.
- b. Inspection of materials and equipment at manufacturer's works shall be done by the Authority. For item/ equipment requiring inspection at manufacturer's works, the Contractor will intimate the date of testing of equipment at the manufacturer's works before dispatch. The Contractor shall give sufficient advance notice regarding the dates proposed for such tests to the Authority's representative(s) to facilitate his presence during testing. The Authority at his discretion may witness such testing. Material / Equipment will be inspected at the manufacturer/ authorized dealer's premises, before dispatch to the site by the Contractor.
- c. The Authority also reserves the right to inspect the fabrication job at the factory and the CONTRACTOR has to make arrangements for the same.
- d. The materials duly inspected by Design consultant or his authorized representative shall be dispatched to site by the Contractor.
- e. No additional payment shall be made to the Contractor for inspection/testing at the manufacturer's works by the representative of the Design consultant. Also, the Contractor will bear the cost of Authority's representative deputed for carrying out inspection/testing.
- f. The Authority and the Design consultant or duly authorized representative shall have at all

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reasonable times free access to the Contractor's premises or works and shall have the power at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection, if part of the works is being manufactured or assembled at other premises or works, the Contractor shall obtain permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works. Inspection may be made at any stage of manufacture, dispatch or at site at the option of the Authority and the equipment if found unsatisfactory due to bad workmanship or quality, material is liable to be rejected.

- g. All equipment being supplied shall conform to type tests and shall be subject to routine tests
- h. Accordance with requirements stipulated under respective sections. Contractor shall submit the type tests reports for approval. The Contractor shall intimate the Authority the detailed program about the tests at least three (3) weeks in advance in case of domestic supplies. If for any item type test is pending payment would be made on successful completion of type/routine test(s) actually carried out as per Authority instructions.
- i. The Contractor shall give the Authority thirty (30) days written notice of any material being ready for testing. Such tests shall be to the Contractor's account. The Authority unless witnessing of the tests is virtually waived will attend such tests within thirty (30) days of the date of which the equipment is notified as being ready for test/inspection, failing which the Contractor may proceed with the test which shall be deemed to have been made in the presence of Authority and he shall forthwith forward to the Design consultant duly certified copies of tests in triplicate.
- j. The Authority shall within fifteen (15) days from the date of inspection as defined shall inform in writing to the Contractor of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Contractor shall give due consideration to such objections and make the necessary modifications accordingly.
- k. When the factory tests have been completed at the Contractor's or Sub- Contractor's works, the Authority shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by the Authority, the certificate shall be issued within fifteen (15) days of receipt of the Contractor's Test certificate by the Authority. Failure of the issue such a certificate shall not prevent the Contractor from proceeding with the works. The completion of these tests or the issue of the certificate shall not bind the Authority to accept the equipment should, on further tests after erection, be found not to comply with the Specification. The equipment shall be dispatched to site only after approval of test reports and issuance of MICC (Material Inspection Clearance Certificate) by the Authority.

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I. For tests whether at the premises or at the works of the Contractor or of any Sub Contractor, the:

1. Contractor except where otherwise specified shall provide free of charge such items as labor, materials, electricity, fuel, water, stores, apparatus and instruments as may be required by Authority to carry out effectively such tests of the equipment in accordance with the Specification.

2. The inspection by Authority and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed quality assurance plan forming a part of the Contract.

3. The Authority will have the right of having at his own expense any other tests(s) of reasonable nature carried out at Contractor's premises or at site or in any other place in addition to aforesaid type and routine tests to satisfy that the material complies with the specifications.

4. The Authority reserves the right for getting any field tests not specified in respective sections of the technical specification conducted on the completely assembled equipment at site. The testing equipment for these tests shall be provided by the Contractor.

5. Any other tests or reasonable nature as required by the Authority not listed above shall be carried out by the CONTRACTOR at his own expense.

8. Final Inspection and testing

a. Final Inspection and testing will be done by the Authority or his representative. The necessary test certificates shall be submitted before dispatch of material.

b. The installation will be offered for inspection by local bodies (Chief Fire Officer). The Contractor or his representative shall attend such inspection of the Chief Fire Officer, extend all test facilities as are considered necessary, rectify and comply with all observations of the Chief Fire Officer which are part of the agreement and arrange for obtaining necessary clearance certificate in favor of the Authority. In case the Contractor fails to attend the inspection and make desired facilities available during inspection, the Authority reserves the right to provide the same at the risk and cost of the Contractor and impose penalty for the same. The installation will be accepted by the Authority only after receiving clearance from the Chief Fire Officer for the work executed by the Contractor under the agreement.

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Note :-

The below mentioned scope of maintenance in this section shall be applicable to all the [aforementioned](#) categories of works.

The Contract shall maintain the gallery as per the Good Industry practice.

The maintenance lists and [equipment](#) are indicative; it shall be further updated during the submission of Maintenance Manual which shall become an integral part of the contract.

1.1 General and ambience upkeep

- a. The general ambience and upkeep shall be of such standards to attract visitors to the facility and provide them with clean, attractive, comfortable, informative, fun and welcoming surroundings and interiors that offer a platform for learning and value for money.
- b. The Contractor shall be responsible for cleanliness, maintenance, upkeep of premises and facilities and provide clean, comfortable and safe premises. The Contractor shall arrange for an appropriate number of dustbins in Gallery areas to minimize littering from users of the Project Facility.
- c. There shall be regular sweeping/ housekeeping of the Gallery areas multiple times in a day to ensure cleanliness.
- d. While cleaning the Gallery, the Contractor shall make sure that the dump shall Be thrown in the area approved by the Authority. It may be outside the campus approved by the local municipal corporation.
- e. The Contractor shall follow adequate waste management and disposal methods for waste generated from Project Facility operations.
- f. The Contractor shall ensure collection, screening and segregation of dry and wet garbage areas.
- g. The Contractor shall also ensure the segregation of biodegradable, non-biodegradable and hazardous waste. Appropriate disposal as approved by applicable authority shall be the responsibility of the Contractor. The Contractor shall in no way harm the environment of the place.
- h. The Contractor shall undertake clearing of any choking in the drainages, manholes, etc.

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removal of beehives and cobwebs/ honey webs from the property and its premises, cleaning and sweeping of rooftops with brooms/ mechanized sweeping, cleaning of signage. All dustbins shall be properly cleaned from in and outside and shall be emptied at the end of the shifts on a regular basis.

i. The Contractor shall not damage, destruct or demolish any structure, area or asset, which is owned by Authority, inside or outside Project Facility areas without prior instructions and / or approval of Authority.

1.2 Toilets/washrooms and shower areas

a. There shall be a regular maintenance program in place for toilet/washroom and shower area cleaning to maintain the facilities in a clean, working condition.

b. The housekeeping staff of the Contractor shall be responsible for daily cleaning and disinfection of toilets/washrooms and shower areas in the project facility as per following checklists.

c. Esthetically appealing environment

d. Appropriate cleaning mechanism must be employed

1.2.1. Signage and information board maintenance

a. The Contractor shall provide sufficient and elaborate signage, both symbolic / directional as well as descriptive throughout the site. The signage shall be well lit, readable and located at strategic locations.

b. The Contractor shall provide Internal directional signs which may be required in large part of the Project.

c. Information signage and display boards shall be visible, legible and functional. These shall be cleaned once a week. Damaged signage and boards shall be replaced, repaired within seven days of detection.

d. The Contractor shall provide controlled Entrance (access) and Exit (Egress) to be suitably manned by security personnel.

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1.2.2. Other Maintenance Requirements

1. Extension of time limit

Notwithstanding anything to the contrary specified in this Schedule, if the nature and extent of any defect or deficiency justifies more time for its repair or rectification than the time specified herein, the Contractor shall be entitled to additional time in conformity with Good Industry Practice. Such additional time shall be determined by the Authority and conveyed to the Contractor and the Authority with reasons thereof.

2. Emergency repairs / restoration

Notwithstanding anything to the contrary contained in this Schedule, if any defect, deficiency or deterioration in the Project poses a hazard to safety or risk of damage to property, the Contractor shall promptly take all reasonable measures for eliminating or minimizing such danger.

3. Daily Inspection by the Contractor

The Contractor shall, through its engineer, undertake a daily visual inspection of the Project and maintain a record thereof in a register to be kept in such form and manner as the Authority may specify. Such records shall be kept in safe custody of the Contractor and shall be open to inspection by the Authority.

4. Scope of maintenance-general

a. The general scope of work includes operations, monitoring team and maintenance related works. The manpower deployments considered are to carry out equipment operations & maintenance works and attend to breakdowns as and when required. Also, the maintenance schedules shall be prepared by the Contractor and the site-based team shall carry out the equipment related works as per schedules & instructions.

b. The basic tools required for maintenance, access ladders including special tools & tackles, measuring instruments, access ladders beyond 6 feet, scissor lift / boom lift for high access, etc and PPEs are included in the scope of Contractor and this is included as part of operation cost.

c. All necessary logbooks, computers, office space, tables, chairs, registers & stationeries for report generation shall be arranged and provided by Contractor

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- d. High access ladders (above 10 feet), scaffolding, boom lift / scissor lift etc shall be provided by Contractor as and when required.
- e. Storage space / Cupboards shall be provided by the Contractor for keeping the tools and tackles and other instruments.
- f. All equipment spares shall be provided by Contractor and has to monitor the spares & if stock of spares is less, the same should be arranged and provided by the Contractor.
- g. Contractor has to ensure the Tools & PPE's quantity as much as sufficient for the trouble-free service.
- h. In case of any defect in materials, workmanship or structural defects (strength and serviceability) of any element or the building, the Contractor shall make good, rectify or replace the element/structure.
- i. Maintenance technicians should be qualified (B.E / Diploma / ITI) and experienced in the related field. Persons deployed should be approved / confirmed by Authority, if persons deployed are found unsatisfied by Authority after necessary communication to Contractor, they have to replace the person immediately.
- j. Any increase in the manpower employed shall be communicated by Authority in writing.
- k. Helper person should be having 2-3 years of relevant experience in the field (Persons deployed should be approved / confirmed by Authority, if persons deployed are found unsatisfied by Authority after necessary communication to Contractor, they have to replace the person immediately.
- l. Contractor has to prepare / follow the standard operating sheet / operation control procedure for all Maintenance work – should get approval from the Authority.
- m. All people should undergo regular training for the operation and maintenance of the plant & safety measures. The same shall be arranged and ensured by the Contractor.
- n. Contractor has to submit the manpower detail and shift wise details & get approval from the Authority.
- o. Contractor has to supply sufficient manpower after considering weekly offs and statutory leaves in a month.

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- p. Electrical supervisor should have a valid license –C license & electrical technician should have a valid B license.
- q. Housekeeping in a good manner at maintenance work spot and in the event of waste Generated from maintenance activity, same shall be collected properly and sent to storage location by Contractor employees as per hazardous & nonhazardous waste segregation process and as instructed by the Authority.
- r. In case of any safety deviation Authority can enforce % of penalty or Contractor has to replace the person who may have violated safety standards.
- s. Contractor should maintain all necessary documentation and records such as logbook / sheets, inventory registers, daily report, weekly report, monthly report, performance reports and all such other related documentation as per Authority requirement.
- t. Contractor should maintain accounts for receipts, consumption and inventory of all consumables & spares as per the consumption pattern.
- u. Contractor should prepare / adhere to the Authority maintenance schedule for mechanical, electrical & instrumentation should be approved by the Authority.
- v. Carrying out routine, preventive and break down maintenance in mechanical, electrical and instruments category and record to be maintained and submitted to Authority periodically.
- w. Before taking up major maintenance, the Contractor should inform and obtain permission from the Authority and proper approval shall be obtained and further approvals in the form of Electrical clearance / LOTO procedures shall be adopted.
- x. Spares shall be procured and supplied by the Contractor as per requirement.
- y. The damaged / repaired equipment (Mechanical / Electrical / Instrument equipment/) which are coming under warranty & guarantee the Contractor has to co-ordinate with supplier and get it replaced / serviced at free of cost from the equipment manufacture / supplier.
- z. Contractor should periodically check equipment, lubrication, adjustments etc. to ensure proper performance as per Project Manager Check sheet.
- aa. Contractor has to follow getting a safety & security permit from Authority safety for the necessary job.
- bb. Contractor should ensure that the Maintenance activities are conducted without affecting

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the production. However, it is the responsibility of the Authority to ensure availability of the equipment requested for maintenance by the Contractor.

cc. Environmental best practices to be followed as required by the Authority. Best environmental practice like Energy conservation, advance methodology in Pollution prevention etc., will be given appreciation to the Contractor.

dd. For Internal Transportation Contractor has to arrange vehicles and Maintain in Good condition (Petrol & other consumables is in Contractor scope) along with valid driving license and insurance.

ee. All Engineering spares, consumables like bulbs, fuses, contactors, chemicals, other materials etc, shall be provided by CONTRACTOR.

ff. Costs of food for persons deployed by Contractor has to be arranged and provided by the Contractor. Providing drinking water and tea for Contractor employees shall be in the account of Contractor.

gg. The rate includes the cost of services like cost of communication, transportation, tools etc. in our pricing.

hh. All costs related to testing of equipment as per statutory requirements and obtaining statutory clearances etc. shall be in the scope Contractor

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5. Miscellaneous

9.1 Digital Print, Wallpaper & Vinyl Cut

- a. Any particulars that have print in it need to be high resolution 3M Latex print with matt lamination. All the cleaning to be carried out by dusting with smooth cloth or pressure controlled Vacuum Cleaner. All the measures to be taken to avoid the damping of the print because of any moisture generated.
- b. Latex Print on the floor to be cleaned with a combination of 30% non-abrasive all- purpose cleaner and 70% water diluted liquid with sponge and to be dried immediately with soft cloth.
- c. Vinyl Cut on Glass or Acrylic to be timely dusted with soft dry cloth only to avoid peeling and scratches.

9.2 Signages

9.2.1 The Contractor needs to follow the guidelines set approved for signage, both symbolic / directional as well as descriptive throughout the site. In-lit static panels/signages to be checked regularly for the luminescence and shall be well lit, readable and located at strategic locations in approval of Authority.

9.2.2 Static Panels to be cleaned on daily basis with smooth dry cloth and once in a week with a combination of 30% non-abrasive all-purpose cleaner and 70% water diluted liquid with sponge and to be dried immediately with soft cloth.

9.2.3 Wayfinding & other signages to be cleaned once in a week with a combination of 30% non-abrasive all-purpose cleaner and 70% water diluted liquid with sponge and to be dried immediately with soft cloth.

9.2.4 Damaged signages and boards shall be replaced, repaired within seven days of detection.

9.2.5 All the Acrylic Panels to be timely dusted with soft dry cloth only to avoid any scratch marks.

9.3 Flooring

9.3.1 Contractor needs to ensure that the housekeeping team should be equipped with all the necessary tools all the time and supervised with managers to clean any kind of spill on the floor at earliest, hence avoiding the damage and any accident.

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9.3.2 Safety Display/Notice Board for the floor being cleaned along with the retractable barriers/Q - Managers to ensure no crowd movement.

9.3.3 For Deep Cleaning of stains/mud necessary chemicals or high energy agitation floor scrubbers will be required.

9.3.4 Specialist products available for the cleaning of fats, oils, scale, water deposits, antistatic surfaces, the removal of polishes, chewing gum, tire marks, stains and greases. In addition, there are products that are designed to have a specific effect such as sterilization, bactericidal activity and disinfection.

9.3.5 Basis the material/climatic condition testing of the chemical/scrubber will need to be done in advance to ensure there are no burn marks or spots on the floor. Contractor needs to document the experimentation and share the sample of the test if asked for.

9.3.6 General cleaning methods:

9.3.7 Sweep clean: The floor should be maintained and kept clean and free of any loose debris that could abrade the surface.

9.3.8 Grease and Oil Removal:

9.3.9 A regular housekeeping program will enhance the appearance of your floor.

9.3.10 However, as oil and grease stains become evident, many cleaning options are available. Sanitation chemical companies will be able to advise regarding appropriate cleaning products.

9.3.11 The degree of dirt build-up can determine the ratio of cleaning products. The cleaning product can usually be mixed at various ratios according to the manufacturer with warm water, mopped onto the floor and allowed to sit for up to 10-15 minutes. After the 15-minute interval, the area can be scrubbed with a scrubbing pad to loosen the residue. After this procedure, flush with water and remove excess solution from the floor surface.

9.3.12 Do not use black pads to clean any marks from the light reflective floor surface. The green scrubbing pad is the preferred pad for these chores and buffing pads are also acceptable. As a guide, manufacturers indicate that the darker the color of the pad denotes the coarseness of the abrasion.

9.3.13 In all cleaning applications, the work must be carried out in strict accordance to

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the manufacturer's Technical Data Sheet

9.3.14 Important for Flooring Maintenance

- a. A pH neutral chemical cleaner is recommended for general soil removal and daily maintenance.
- b. All floors should be mopped using a dry mop method of application and using a strong commercial detergent containing a water-soluble polish.
- c. Non-slip floors can be cleaned using low pressure cleaning equipment, less than 1000 psi.
- d. Once the floor is dry from this application it should be buffed using a handheld polishing buff or lightly buffed by a buffing machine.
- e. With a power-scrubbing machine, be aware of the different types of pads for different applications. Pad manufacturers generally use the same color for different types of pads however this does not always hold true so best to check.
- f. As a general rule, pad colors are as follows:
 - Black – stripping (coarse)
 - Green – scrubbing
 - Red and blue – buffing (soft)
- g. Scratches should be taken out using a commercial floor polish, preferably by hand along the scratch and then buffed.

9.3.15 Spillages:

Spillages of any kind should be wiped away and removed as soon as possible. Not only is this good practice in terms of Occupational Health

9.3.15.1 and Safety standards, but this will also maintain the condition of the floor.

9.3.15.2 Contaminations such as trolley rubber marks or scuffing from rubber soled shoes can be removed by using commercial detergents designed for this purpose.

9.3.15.3 If the floor coating has been removed by a spill or other damage, the coating should

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be re-applied as soon as possible to prevent further damage to the flooring system.

9.3.16 Maintenance of Floors Subject to Frequent Cleaning:

9.3.16.1 In areas subject to frequent cleaning, the types of cleaning solutions or compounds become even more important and all products should be of an alkaline composition to ensure the coating is not being slowly eroded over time.

9.3.16.2 Another important tip is to not allow water to sit on the floor for an extended period.

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documents & drawings/approval

Note: -

The below mentioned scope of documents and drawings/approvals in this section shall be applicable to all the aforementioned categories of works.

1. General

List of tender drawings issued at the time of calling of tenders for this work is given elsewhere in this tender document. These drawings are meant for Contractor's guidance only. The Authority will not entertain any claim for compensation for the reasons that the details as shown on "Good for Construction" drawings are different from those shown on tender drawings.

2. Architectural/ Interior drawings

2.1. Drawings for approval on award of the work / shop drawings

Contractor shall have to submit shop drawings for all relevant items like, Steel door, rolling shutter, railings, Gypsum walls, wall linings, automatic glass doors, glass partitions, Aluminum Composite panels, Structural Glazing, Screen wall with perforated aluminum panel, specialized interior and theming work etc. as mentioned in the technical specification and BOQ. Contractor is supposed to take approval of all shop drawings before procurement and execution of any specific item. Mockup samples and finishing material boards for applicable items and wherever asked by DAT/ Authority to be provided as per instruction of Authority.

3. MEPP

3.1. General

List of tender drawings issued at the time of calling of tenders for this work is given elsewhere in this tender document. These drawings are meant for Contractor's guidance only. The Authority will not entertain any claim for compensation for the reasons that the details as shown on "Good for

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Construction" drawings are different from those shown on tender drawings.

3.2. Fire Fighting works:

Tender drawings for approval /as built drawings/ installation/instruction manual/statutory regulation approval

Tender drawings

The drawings appended with the tender documents are intended to show the areas for various equipment, tentative pipe routes. The equipment offered shall be suitable for installation in the spaces shown in these drawings.

3.2.1. Drawings for approval on award of the work / shop drawings

The Contractor shall prepare and submit following drawings and get them approved from the before the start of the work. The approval of drawings however does not absolve the Contractor of his responsibility to supply the equipment/materials as per agreement. In case of any contradiction between the approved drawings and agreement the decision of the Authority shall be final and binding on the Contractor.

- a. Lay out drawings of the equipment to be installed in the pump room and terrace.
- b. Drawings showing the detail of erection of entire equipment including their foundations.
- c. Fire drawings showing the layout of the entire piping, dia. and length of pipes, hydrant, air vessel, valves and isometric drawings showing connections to various equipment.
- d. Sprinkler drawing indicating layout and sizes of pipe, location of valves, sprinklers etc.
- e. Electrical wiring diagrams for all electrical equipment and controls including the sizes and capacities of the various cables and equipment
- f. Dimensioned drawings of all electrical and control panels,
- g. Drawings showing details of supports for pipes, cable trays etc.
- h. Any other drawings relevant to the work.

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3.3. As built drawings

The following laminated drawings shall be submitted by the Contractor while handing over the installation to the Authority. Out of this one of the sets shall be laminated on a hard base for display in the fire control room. In addition, one set soft copy will be given on compact disc.

- a. Installation drawings giving complete details of all the equipment, including their foundations.
- b. Fire drawings giving sizes and lengths of all the pipes and the sizes and locations of all types of valves and including isometric drawings for the entire piping including the pipe connections to the various equipment.
- c. Line diagram and layout of all electrical control panels giving switchgear ratings and their arrangement, cable feeder sizes and their layout.
- d. Control wiring drawings with all control components and sequence of operations to explain the operation of control circuits.
- e. Schematic diagrams.

3.4. Documents to be furnished on completion of installation

The following documents shall be furnished to the Authority by the Contractor on completion of work: -

- a. As built drawings as mentioned above
- b. Manufacturer's technical catalogs of all equipment and accessories.
- c. Operation and maintenance manual of all major equipment, detailing all adjustments, operation and maintenance procedures.
- d. Approval of drawing/scheme by District fire officer.
- e. Warranty, Guarantee certificates of all applicable equipment and works as desired by the Authority

3.5. Instruction manual / training

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The Contractor shall furnish required copies of detailed instruction and operation manual to the. The Contractor shall guide Authority's staff for operation and maintenance of the entire installation for at least fifteen days.

The manual shall contain detailed technical data and drawings for each equipment installed, the erection, testing, operation and maintenance procedures, spare parts manual and recommended spares.

3.6. Statutory regulation approvals

Approval from local fire authorities as may be required as per local byelaws. (The Contractor's responsibility shall be limited to the work executed by him.)

The installation will be offered for inspection by local bodies (Chief Fire Officer). The Contractor or his representative shall attend such inspection of the Chief Fire Officer, extend all test facilities as are considered necessary, rectify and comply with all observations of the Chief Fire Officer which are part of the agreement and arrange for obtaining necessary clearance certificate in favor of the Authority. In case the Contractor fails to attend the inspection and make desired facilities available during inspection, the Authority reserves the right to provide the same at the risk and cost of the Contractor and impose penalty for the same. The installation will be accepted by the Authority only after receiving clearance from the Chief Fire Officer for the work executed by the Contractor under the agreement.

3.7. HVAC:

3.7.1. Tender drawings for approval /as built drawings/ installation / instruction manual / statutory regulation approval

The drawings forming part of the tender documents, are indicative only, of the general arrangement of the entire installation. The Contractor shall follow these drawings and specifications in preparation of his shop drawings and subsequent installation. He shall check the drawings of other trades to verify space for his installation and other coordination. The Contractor shall examine all relevant architectural, structural, plumbing, electrical and other services layout drawings before preparing the shop drawings for this installation and report to the Authority any discrepancy and obtain clarifications. Any changes found necessary for coordination and installation of this work with other services and trades shall be made with prior approval of the Authority without any cost to the Authority

3.7.2. Drawings for approval on award of the work / shop drawings

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After the award of the Contract, the Contractor shall furnish for the approval of the Authority, the detailed shop drawings of all equipment and materials including plant room, ducting, piping, ventilation system, electrical work associated with the HVAC system required to complete the project as per Specifications and as required by the Authority.

These drawings shall contain details of construction, size, and arrangement, operating clearances, performance characteristics and capacity of all items of equipment, as also the details of all related items of work by other Contractors. Each item of equipment proposed shall be a standard catalog product of an established manufacturer, as per specifications.

If the Authority makes any amendments in the above drawings, the Contractor shall submit drawings with the amendments duly incorporated, along with the drawings on which corrections were made. After final approval has been obtained from the Authority, the Contractor shall submit shop drawings for the exclusive use of and retention by the Authority.

No material or equipment may be delivered or installed at the job site until the Contractor has in his possession, the approved shop drawings for the particular material or equipment.

The shop drawings shall be submitted for approval sufficiently in advance of planned delivery and installation of any material to allow the Authority ample time for scrutiny. No claims for extension of time shall be entertained because of any delay in the work due to his failure to produce shop drawings at the right time, in accordance with the approved project schedule.

Samples, drawings, specifications, catalogs, pamphlets and other documents submitted for approval shall be in duplicate, each item in each set shall be properly labeled, indicating the specific service for which material or equipment is to be used, giving reference to the governing section and clause number of specifications clearly identifying in ink the items and the operating characteristics.

Approval rendered on shop drawings shall not be considered as a guarantee of measurements of building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail nor does it in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract.

Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawings which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign and all new drawings and detailing required thereof, shall be prepared by the Contractor at his own cost and approved by the Authority.

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3.7.3. Documents to be furnished on completion of installation

Required copies of operation manuals/catalogs of all standard equipment are to be furnished by the Contractor immediately after commissioning of the plant.

Required copies of write up on preventive maintenance, troubleshooting and operating instructions of the system along with as-built drawings are to be supplied by the Contractor at the time of commissioning.

On completion of the work in all respects, the Contractor shall supply five portfolios (300x450 mm), each containing complete set of drawings on approved scale, clearly indicating complete plant room layouts, ducting and piping layouts, location; wiring and sequencing of automatic controls, location of all concealed piping, valves, controls, dampers, wiring and other services. Each portfolio shall also contain consolidated control diagrams and technical literature on all controls. The Contractor shall frame under glass, in the air-conditioning plant room, one set of these consolidated control diagrams.

3.8. Internal and external plumbing

3.8.1. Tender drawings for approval /as built drawings/ operation and maintenance manuals manual/statutory regulation approval material samples and shop drawings

It shall also be the responsibility of the Contractor to submit without any extra charge the samples of the materials/equipment as and when asked by the Authority. If the Contractor wishes to use an alternative make due to non-availability of the approved one, he should take the prior approval of the Authority. Under such situations the Contractor shall show such promptness as not to hamper the progress of the work.

The Contractor shall submit for 's approval the shop drawings of all the custom- built equipment, including pumping system, pump house layout, piping, valves, positions of all type of sleeves in structural members, piping layout for soil/waste/rainwater disposal and water supply, sewerage and drainage network etc., he proposes to install.

The Contractor shall also submit catalog, manufacturer's drawings, equipment characteristics data, performance charts, test certificate as required by the Authority.

The plumbing drawings issued from time to time to the Contractor are diagrammatic but shall be followed as closely as actual construction and work will permit. Any deviation from the drawings required to conform to the building construction shall be made by the Contractor at his own

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expenses. The architectural drawings shall take precedence over the services drawings as far as the civil and other trades works are concerned.

3.8.2. As built drawings and operation and maintenance manuals

The Contractor shall submit, after the completion of the work, required set of prints of the as built drawings / Completion drawings, giving the following information:

- a. Position of all sanitary fixtures.
- b. Runs of all water lines with diameters on all floors and vertical risers / drops.
- c. Runs of all soil, waste, vent & rainwater piping with diameters on all floors and vertical stacks.
- d. Position and sizes of all types of control valves and all other plant and equipment.
- e. Position, Run, Sizes, ground levels and Invert Levels of all manholes and catch pits of external sewer lines / drain lines / water lines.
- f. Position of cleaning eye / access doors and opening panels in soil/waste disposal system.
- g. Original installation and Maintenance manual, test certificate of all types of equipment.
- h. Location of all mechanical equipment with layout and piping connections.
- i.

3.8.3. STATUTORY REGULATION APPROVALS

All sanitary and water supply works shall be carried out only by those Contractors who are licensed by the concerned local authorities to execute this type of work.

It shall be the responsibility of the Contractor to comply with the regulations laid down by the local authorities. The Contractor shall also be responsible for obtaining all the statutory approvals/certificates for the work from the concerned Departments and these certificates shall be handed over to the Architects/Authorities at the completion.

It shall also be the responsibility of the Contractor to get the sewerage & water supply connections from the concerned authorities. However, the Authority will bear all the statutory expenditures.

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3.9. Electrical:

3.9.1. Internal electrical works

- a. Tender drawings for shop drawings/statutory regulation approval/ completion drawings / as built drawings
- b. The engineering activities shall comprise the submission for approval of the following from Authority.
- c. Quality assurance procedures.
- d. Factory manufacturing & testing / testing procedures.
- e. Detailed coordination with other services, shop drawings for various electrical layouts such as equipment layout, lighting layouts, cabling layouts, earthing layouts, including equipment installation and cable termination details etc. Prior to the start of work.
- f. Preparation of bill of materials for cabling, earthing and miscellaneous items etc.
- g. Lighting panel schedule.
- h. Interconnection drawing.
- i. Protection coordination drawings/tables for complete power system.
- j. Shop inspection and testing procedures.
- k. Preparation of as built drawings.

3.9.2. Statutory regulation and approvals

All electrical works shall be carried out only by those Contractors who are licensed by the concerned local authorities to execute this type of work. Only "A" Class government approved Contractors shall execute the job.

The Contractor shall obtain all approval of drawing / electrical safety and permits required for the electrical installation work. All actual fee payable in this regard will be reimbursed against receipt/documentary evidence. On completion of work, the Contractor shall obtain NOC from

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The installation shall comply in all respects with the requirements of Indian Electricity Act 1910, Indian Electricity Rules (IER) 1956 and other related Laws and Regulations as amended up to date, there under and special requirements, if any, of the State Electricity Boards etc. The Contractor is liable to furnish the list of authorized licensed persons/ employed/deputed to carry out the works/perform the assigned duties to fulfill the requirement of Rule No.3 of IER 1956 as amended up to date

The electrical drawings issued from time to time to the Contractor are diagrammatic but shall be followed as closely as actual construction and work will permit. Any deviation from the drawings required to conform to the building construction shall be made by the Contractor at his own expenses. The architectural drawings shall take precedence over the electrical drawings as far as the civil and other trades works are concerned. If there is any discrepancy due to in-complete description, ambiguity or omission in the drawings and other documents relating to this Contract found by the Contractor either before starting the work or during execution or after completion, the same shall be immediately brought to the attention of the Authority and his decision would be final and binding on the Contractor.

3.9.3. Shop drawings

a. The Contractor shall prepare detailed coordinated electrical shop drawing and cable Schedule with other relevant services and submit to the Authority for approval before commencing the work. The shop drawings shall indicate all setting out details, physical dimensions, layouts and positions of various services, such as

- i. Conduiting for entire electrical and low voltage works
- ii. Switches / outlets / Switch Boxes
- iii. Distribution Boards.

b. All work shall be carried out on the approval of these drawings. However, approval of these drawings does not relieve the Contractor of his responsibility for providing a maintenance free and fool proof system including any missing component/accessories to meet with the intent of the specifications. Contractor will submit 2 prints for preliminary approval and finally six prints for distribution.

3.9.4. Completion drawings / as built drawings

a. On completion of the work and before issue of certificate of virtual completion, the

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Contractor shall submit to the Authority required sets of prints along with soft copy of 'As Built' drawings of the work along with originals including write up (troubleshooting, installation, operation and maintenance manual with instructions) incorporating all such changes and modifications during engineering and execution.

b. These drawings must provide:

- i. Run and size of conduits, inspection, junction and pull boxes.
- ii. Size of conductor in each circuit.
- iii. Location and ratings of sockets and switches controlling the light/fan and power outlets.
- iv. Location and details of distribution boards, mains, switches, switch gears and other particulars.
- v. A complete wiring diagram as installed and schematic drawings showing all connections in the complete electrical system.
- vi. Location of telephone / TV outlets, junction boxes and sizes of various conduits.

3.9.5. external electrical works

The engineering activities shall comprise the submission for approval of the following from Authority. Basic engineering documents e.g., overall single line diagram, overall cable layout, testing, type test at

Factory and report, guaranteed particulars of all equipment and maintenance manuals.

- i. Quality assurance procedures.
- ii. Factory manufacturing & testing / testing procedures.
- iii. Field testing and commissioning procedures.
- iv. Basic engineering calculations viz. fault level calculations, voltage drop calculations. (For bus duct, cables & switch boards etc.)
- v. Control and protection schemes with relay setting charts with back-up calculations etc.

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- vi. Load sharing and annunciation scheme,
- vii. Sizing calculation for cable and cable trays.
- viii. Calculation for earthing system.
- ix. Contractors shall be responsible for:

Detailed coordination with other services, shop drawings for various electrical layouts such as equipment layout, lighting layouts, cabling layouts, earthing layouts, including equipment installation and cable termination details etc. Prior to the start of work.

- x. Preparation of bill of materials for cabling, earthing and miscellaneous items etc.
- xi. Cable schedule.
- xii. Lighting/power panel schedule.
- xiii. Interconnection drawing.
- xiv. Protection coordination drawings/tables for complete power system.
- xv. Shop inspection and testing procedures.
- xvi. Field testing and commissioning procedures.
- xvii. Preparation of as built drawings.

3.9.6. Statutory regulation and approvals: -

All electrical works shall be carried out only by those Contractors who are licensed by the concerned local authorities to execute this type of work. Only "A" Class government approved Contractors shall execute the job.

The Contractor shall obtain all sanctions, electrical loads, approval of drawing / Electrical Substation from the concerned authorities / electrical safety and permits required for the electrical installation work. All actual fee payable in this regard will be reimbursed against receipt/documentary evidence. On completion of work, the Contractor shall obtain NOC from SEB & Chief Electrical Inspector, a copy of the same shall be delivered to the Authority through. The Authority shall have full power regarding the materials or work that were tested by an independent agency at the Contractor's expenses in order to prove their soundness and

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adequacy. The Contractor will rectify the defects/suggestions pointed out by an independent agency through the Authority at his own expenses.

The installation shall comply in all respects with the requirements of Indian Electricity Act 1910, Indian Electricity Rules (IER) 1956 and other related Laws and Regulations as amended up to date, there under and special requirements, if any, of the State Electricity Boards etc. The Contractor is liable to furnish the list of authorized licensed persons/ employed/deputed to carry out the works/perform the assigned duties to fulfill the requirement of Rule No.3 of IER 1956 as amended up to date.

The electrical drawings issued from time to time to the Contractor are diagrammatic but shall be followed as closely as actual construction and work will permit. Any deviation from the drawings required to conform to the building construction shall be made by the Contractor at his own expenses. The architectural drawings shall take precedence over the electrical drawings as far as the civil and other trades works are concerned.

- i. Earthing details with location of pits and conductor run
- ii. HT Panel
- iii. Transformers
- iv. D G Sets with exhaust pipe run, cooling system
- v. LT Panel Boards
- vi. Control and relay panels
- vii. Capacitor panels
- viii. Schematic diagram for power distribution
- ix. Bus Ducts
- x. Cable layouts
- xi. Control wiring
- xii. Cable trays
- xiii. Lightning Protection

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All work shall be carried out on the approval of these drawings. However, approval of these drawings does not relieve the Contractor of his responsibility for providing a maintenance free and fool proof system including any missing component/accessories to meet with the intent of the specifications. Contractor will submit 2 prints for preliminary approval and finally six prints for distribution.

3.9.7. Completion drawings / as built drawings

On completion of the work and before issue of certificate of virtual completion, the Contractor shall submit to the Authority required sets of print along with soft copy of 'As Built' drawings of the work along with originals including write up (troubleshooting, installation, operation and maintenance manual with instructions) incorporating all such changes and modifications during engineering and execution.

These drawings must provide:

- a. Location of all earthing stations, route and size of all earthing conductors etc.
- b. Layout and particulars of all cables.
- c. Location and details of PCC's, MCC's, capacitor control panels, PLC, D.G. set panel and relay panels with description detailed control wiring diagram.
- d. Layout of cable trays with support and their fixing details.
- e. Layout and particulars of the bus duct with fixing details.

3.9.8. Battery & battery charger

4.9.8.1. Drawings and Information

- a. To be furnished in accordance with the supplier's data requirements. Generally following drawings shall be furnished:
- b. General Arrangement (GA) Drawings for Battery giving basic room requirements. Floor/wall finish, number of air-changes, requirements of exhaust fan and sinks etc.
- c. Installation, operation, maintenance manual for battery.
- d. Charging and discharging characteristics of batteries.

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- e. Other technical particulars as called for in data sheets.

3.10. Instrumentation

3.10.1. Access control system:

- a. Manufacturer's Product Data: Submit manufacturer's data sheets indicating systems and components proposed for use.
- b. Shop Drawings: Submit complete shop drawings indicating system components, wiring diagrams and load calculations.
- c. Record Drawings: During construction maintain record drawings indicating location of equipment and wiring. Submit an electronic version of record drawings for the Security Management System not later than Substantial Completion of the project.
- d. Operation and Maintenance Data: Submit manufacturer's operation and maintenance data, customized to the Security Management System installed. Include system and operator manuals.
- e. Maintenance Service Agreement: Submit a sample copy of the manufacturer's maintenance service agreement, including cost and services for a two-year period for Authority's review.

3.10.2. CCTV control system:

- a. General: Submittals shall be made in accordance with the conditions of the Contract and Submittal Procedures Section.
- b. Shop Drawings and Schematics: Shall depict system in final proposed "as built" configuration. The following must be provided:
- c. Connection diagrams for interfacing equipment
- d. List of connected equipment
- e. Locations for all major equipment components to be installed under this specification
- f. Product Data: The following shall be provided:

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- g. Technical datasheets
- h. A complete set of instruction manuals
- i. Quality Assurance Submittals: The following shall be submitted:
- j. Checkout Report: The Contractor shall provide the Authority with a checkout report for each system. The report shall include:
- k. A complete list of every device
- l. The final test report shall indicate that every device was tested successfully
- m. Manufacturer's Instructions: The Contractor shall deliver a set of System Operation and Maintenance Manuals (if available) to the Authority.
- n. Notice of Completion: When the final acceptance has been satisfactorily completed, the Authority shall issue a notice of completion to the Contractor

3.10.3. Fire detection & alarm system:

Tender drawings for shop drawings/statutory regulation approval/ completion drawings / as built drawings

4.10.3.1. Tender drawings

The drawings appended with the tender documents are intended to show the areas for various detectors, MCP, conduits, panels etc. The equipment offered shall be suitable for installation in the spaces shown in these drawings.

4.10.3.2. Drawings for approval on award of the work / shop drawings

- a. The Contractor shall prepare and submit following drawings and get them approved from the Authority before the start of the work. The approval of drawings however does not absolve the Contractor of his responsibility to supply the equipment/materials as per agreement. In case of any contradiction between the approved drawings and agreement the decision of the Authority shall be final and binding on the Contractor.
- b. Fire Alarm drawings showing the Location of all devices, detectors, manual call points, hooters and response indicators, exit signs, control panel etc. and conduits showing connections to various

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equipment.

- c. Electrical wiring diagrams for all electrical equipment and controls including the sizes and capacities of the various cables and equipment
- d. Dimensioned drawings of all electrical and control panels,
- e. Run and size of conduit with number of wires on all floors.
- f. Position of all control panels etc.
- g. Any other drawings relevant to the work.

4.10.3.3. Completion drawings

- a. The following laminated drawings shall be submitted by the Contractor while handing over the installation to the Authority. Out of this one of the sets shall be laminated on a hard base for display in the fire control room. In addition, one set will be given on a compact disc.
- b. Line diagram and layout of all electrical control panels giving switchgear ratings and their arrangement, cable feeder sizes and their layout.
- c. Control wiring drawings with all control components and sequence of operations to explain the operation of control circuits.
- d. Location of all detectors, manual call points, hooters and response indicators.
- e. Run and size of conduit with number of conductors each.
- f. Schematic diagrams.

Name of The work:- Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

Approved Make List

Civil, Architecture and Interior		
Sr. No.	Description	Approved Make/ Approved Vendor
1	PVC Flooring	Euronics, Gerflor, Jeoflor,, Alphtahs, or eqv.
2	Vitrified Tiles	Kajaria, Qutone, AGL, NITCO
3	Granite stone	Best Locally available
5	Marble stone	Best Locally available
6	Carpet	Armstrong, Euronics, Geggus, Alphtahs, or eqv.
8	Aluminium skirting C Profile	Bottom Line / Eqv.
9	Gypsum Board	Saint Gobain, USG-Boral, Knauf
12	Laminated Wooden Flooring	Royal Touch / Eqv.
14	Gypsum Board Partition	Saint Gobain, USG-Boral, Knauf, ASSA ABLOY
15	Gypsum Ceiling section	Gyp xpert/ USG-Boral/ Eqv.
16	Plywood	Century, Green ply / eqv.
18	Vinyl Print (Backlit, edgelit, translit, signages etc)	3M, Avrey, LG (Approved vendor universal signage or equivalent)

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

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20	Water proofing cement paint	MYKARMENT, Asian paint, Nerolac, Jotun, Pidilite
21	Enamel paint	Asian paint, Nerolac, Jotun, berger
22	Primer	Asian paint, Nerolac, Jotun, berger
23	Putty	Birla putti, Asian paints, Gyprock, jotun
24	Acrylic Emulsion Paint	Asian paint, Nerolac, Jotun, berger
25	Metal Carpet Flooring	Euronics / Eqv.
27	Water Proofing	Pidilite, Basf, Sika / eqv.
30	Cement	Ultratech, Ambuja, Siddhi, Sanghi
31	Laminate	Greenlam, Century, Royal touch, Merino
32	AAC Block	Brixo, Aercon, Magicrete, Approved local brand
33	Fire Doors	Dhonaadhi Hitec / Eqv.
36	All Hardware And Hardware Fittings	Dorma/Hafele/Blue/Geze/ozone/Hettich or Eqv.
37	Patch fittings / friction fittings, Floor spring, Door closer/automatic sliding door	Dorma/Hafele /Kitchen/Geze/ozone/Hettich
38	Door Lock C Handle	Dorma/Hafele /Kitchen/Geze/ozone/Hettich
39	Sealing Compounds	MYKARMENT/FOSROC/dow corning/sika/BASF/Pidilite

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

National Science Centre

40	MS Pipe	M/S Tata Steel/ Jindal
41	Steam Beach Wood frame	Durian/ Eqv.
42	Laminated Flush Door	Durian/Eqv
43	Plain mirror	Modi Guard /Saint Gobain / Asahi / AIS
44	Glass/Float Glass/ Toughened/lacquered	Saint gobain, AIS, Modi / eqv
45	All modular Furniture (bought out) including auditorium chairs, Reeption, Conference, Translator Chair	Featherlite / Eqv.
46	MDF	Century, Green ply / Eqv.
47	Solid Surface Acrylic	Dupont, LG, Rehau / Eqv.,
49	Bathroom Cubical Partition	Marino, Green Ply/ Eqv.
51	Air Curtain	Eurrnics / Eqv.
52	Vision glass	Saint gobain, AIS, Modi / Eqv.
53	Patch fittings / friction fittings, Floor spring, Door closer	Dorma/Hafele /Geze/ozone / Eqv.
55	Entry Exit Emergency Signages	Prolite / Eqv.
56	Roller Blinds	Vista, Hunter douglas/ eqv.
57	Motorised Stage Curtain	Dooya/ Eqv.

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

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58	Epoxy Grout	MYK laticrete, dow / Eqv.
59	Aluminium Section	Jindal/Hindalco/Eqv.
60	C.P, sanitary Fittings	Jaquar, Kohler, Cera/ Eqv.
2- Electrical		
82	Rising Mains	Legrand / EAE / Godrej/ Schneider
83	L.T. Panel / MDB: PTA -- do -- : TTA	Adlec / Tricolite / Vidhyut Control / Ambit / Shivalic/ Innovic Legrand / Schneider / LCT / Siemens / LS Electric
84	MCB-DB / SDB (Factory built)	Legrand / Hager / Schneider / LCT/ Siemens
85	Feeder Pillar	Adlec / Tricolite / Vidhyut Control / Ambit / Shivalic / Innovic
86	Air Circuit Breaker	Siemens (3WL) / LCT (C Power) / Schneider (Master pact NW)/ Legrand (DMX3) / LS Electric
87	MCCB	LCT (d sine) / Schneider (Compact NSX) / Legrand (DPX) / Siemens (Sentron-3VL). / LS Electric
88	MCB	Legrand (Lexic) / Hager / LCT / Schneider (Acti-9)/ Siemens (Beta Gard) / Panasonic / Eaton/ / LS Electric
89	RCCB / RCBO / ELCB	Legrand / Hager / LCT / Schneider / Siemens / Eaton
90	ON LOAD changeover switch	LCT / HPL- Socomec / ASCO

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

National Science Centre

91	Fuses	Legrand / LCT / Schneider / Siemens
92	Contactor	Legrand / LCT / Schneider / Siemens / Hager / LS Electric
93	Relays	Rishabh / Essen / LCT / Minilec / Siemens / Schneider
94	Timer	LCT / Siemens / Hager / Legrand / Schneider
95	Indication Lamps (LED)	LCT / Siemens / ESPEE / Essen / CCS- Raas control
96	Selector Switch / Push Button	Siemens / Key Cee / BCH / LCT / Rishabh
97	Instruments (A / V / Frequency)	A M / A E / IMP / Rishab / Minilec
98	Digital Meter / Multifunction Meters	LCT / Schneider / Konzerv / AE / Neptune / Rishabh / Minilec
99	Digital Energy Meter	LCT / Konzerv / Secure / Rishabh / Minilec
100	Terminals	Elmax / Tosha / Essen / Wago / Connectwell
101	Clamp-on type terminal strip	Elmax / WAGO / Connectwell
102	CT C PT	AE / Ind Coil / LCT / Kappa / Rishabh (CTs only) / Neptune
103	L T Armored-Al / Cu Cable: (XLPE) Control Cable-Cu: (PVC)	Polycab / Finolex / Universal / Havells / RR / KEI
104	Lugs / Thimbles etc.	Dowells / Reychem / Commet
105	Compression Glands	HMI / Commet / Dowells / Siemens / Raychem / Gripwell

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

National Science Centre

106	PVC insulated single core stranded Cu wire- (Cl-2)	Polycab / Finolex / Universal (satna) / Havells / RR / KEI / Bonton
107	Perforated Cable tray (IEC)	OBO Betterman / Unistrut / Legrand
108	Perforated Cable tray (IS)	Venus/ Slotco/ Pilco/ Reeco / Indiana
109	Wire Cable Tray (IEC)	OBO Betterman / Legrand / CCS-Gewis
110	PVC Conduit / Accessories	AKG / BEC / Polycab
111	HDPE PIPE	Dura-line / Rex Poly-extrusion / Tirupati
112	Steel Conduit / Accessories	RM CON / BEC / Steel Craft
113	Steel Pipes	RM CON / BEC / Surya / Indian Tube Co / Jindal
114	Switches and Sockets	North West / Legrand / Schneider / Norisys / Panasonic. (Model to be approved-minimum 3rd range from basic model shall be used)
115	Metal Clad Industrial Power Socket with MCB	Legrand / Siemens / Hager/ cape electric
116	Weather-proof Industrial plug C socket 3/4/5/6 pin	Schneider / Legrand / CCS-Gewiss / Cape Electronics
117	Floor Duct	Legrand / MK / OBO Bettermann
118	Unit DOL/Star-Delta Starters	LCT / Schneider / Siemens

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National Science Centre

119	Luminaries (Indoor)- LED Luminaries (Outdoor)-LED	XAL/ ERCO/ Iguzzini/ Trilux/Regent/Lighting Technology Cariboni/ Heper/LEC/Lumen-pulse/ IGuzzini
120	Flame Proof Luminaries	Baliga / FCG / Bajaj / Cromton
121	Exit signage	Prolite / Instapower / CG / Rax
122	Ceiling fans	Bajaj / Crompton / Usha / Havells / Panasonic / Eveready
123	Exhaust fans	Bajaj / Havells / Crompton / Kruger
124	D G Set	Cummins / Caterpillar / MTU
125	Anti Termite	Pidillite/ Eqv.
126	Servo Voltage Stabilizer	Automatic Electric / Piyush (PACT) / Servel / Consul- Neowatt
127	L T Capacitor bank	Epcos-TDK / LCT / ABB / Schneider / Legrand
128	APFC Relay	LCT / Epcos-TDK / Legrand / Schneider / Neptune (Ducati)
129	Active Harmonic Filter	P2 Power / Schneider / Siemens / Delta / LCT
130	SPD	OBO Bettermann / DEHN / ERICO / Legrand/ Eaton
131	Lightning protection system	OBO Bettermann / DEHN / JEF
132	Street Light Pole	Bajaj / Transrail / Valmont / LMI
133	Lifts	Otis / Kone / Schindler / Johnson Lift / ThyssenKrupp

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National Science Centre

134	: ON LINE UPS (with Isolation Transformer)	Fuji Electric / Legrand-Numeric / Delta / Powertron-Products, Delhi./ Schneider/ Vertib.
135	SMF chargeable Battery	Exide / Amar raja / AMCO
136	Occupancy Sensors	Lutron/ Crestron/ Schneider/ Legrand/ Cape Elect.
137	Transformer (11/0.433KV)	Ames Impex/ ABB / Raychem / Danish Tr. PL / ECS/ Siemens
138	Vacuum Circuit Breaker	Schneider / ABB / Siemens / LCT
139	Ring Main Unit (RMU)	Schneider / ABB / Siemens / LCT
140	33/11KV (E/UE) XLPE Cable	Universal / Gloster / Skytone / Havells / KEI / Polycab/ RR
141	33/11KV Cable Termination Kit	Raychem / MECP-M Seal / 3M
3- HVAC		
142	2-Way/ 3-Way Pressure Independent Balancing C Control Valve and Actuator	Danfoss/Belimo/Honeywell/Flowcon
143	Adhesives for Insulation	Pidilite SR- 998/ Paramount Polytreat/ Armacell
144	Adjustable Frequency Drive/ Automatic AFD Bypass/ Pump Controller/ Differential Pressure Sensor/ Transmitter	ABB/Danfoss/LCT
145	Air cooled package units	Danhumbush/York/ Daikin/Trane/ Carrier

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

National Science Centre

146	Air C Dirt Separator/Dirt Separator	Spirotech/ Caleffi/ Optivent /Spirotherm/ Anergy
147	Air Distribution (Ducting) -GI/GSS Sheets	SAIL / TATA Steel/ Jindal
148	Air Handling Units with Coils etc.	VTs/ System Air/ Flaktwood
149	Air Purifier	Daikin/Sharp/Pureair
150	Air washer	VTs/ System Air/ Flaktwood
151	Aluminium Sheet for Ducts	Jindal/ Hindalco/ Balco
152	Automatic Air Vent	Anergy / Rapid Cool/Emerald/CIM
153	Axial Flow Fans	Kruger/ REVO/ Crystal/ Greenheck/ Airflow
154	Balancing Valves (Water Duty)	Advance /Honeywell/Danfoss
155	Ball valves (With C W/o strainers)	Audco /Advance/ LCT
156	Butterfly Valves (Water Duty)	Audco /Advance/ LCT
157	Cable Lugs/Thimbles/Glands	As per Approved Makes of Electrical Works
158	Cable Tray	As per Approved Makes of Electrical Works
159	Centrifugal Fans/Fan section/Plug Fans	Kruger/Nicotra/ Greenheck
160	Check Valve/Foot Valve/Sluice Valve/NRV	Audco /Advance/ LCT
161	Chilled Water Pump (Primary/Secondary)/ Condenser/Hot Water Pumps etc.	Grundfos/Xylem/ Armstrong
162	Control Cables	As per Electrical Makes

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

National Science Centre

163	Cooling Tower	Bell / Paharpur/Advance/Delta
164	CO/CO2 Sensor	ELT /Amphenol/harmontronics
165	CPRX Compound/Tar felt	Shalimar tar product / Asian / Pidilite
166	DRY Scrubber	Crystal/ Trion/ Airwave
167	Duct Dampers/Grills/Diffuser/ VCD/ Collar Damper etc.	Caryaire / Systemair/Airtrack Concept/ Mapro
168	DX Coils Air Cooled	Zeco/ VTS/Flaktwod/Crystal
169	Dehumidifier a) Portable Type	Sharp/Honeywell/aprilaire
170	b)Centralised Dehumidifier	Bryair/Casilica/origincorp
171	Electric Motor	ABB/ Siemens/ Crompton Greaves / Havells- Lafert
172	Electric motor (Fire Rated)	Marathon/ Havells-Lafert/Bharat
173	Expansion Tank (closed type)	Xylem/ Armstrong/ Grundfos
174	Factory Fabricated Duct C Flanges	Crystal/ Zeco / Ductofab / Technofab/ GPS Spiro
175	Fan Coil Units with Fans	REVO/ Crystal/ Balance Air/ Edgetech/ Zeco
176	Fasteners-Dash	HILTI / Fischer / Cannon / Wurth
177	FCU Copper Connection Set/ FCU Link	ATS/ Oventrop/ CSI
178	Filters -Pre/ Fine/ HepaC BIBO	Thermadyne / Spectrum/ Camfil
179	Fire Damper Actuator	Belimo/Siemens/Honeywell

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

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180	Fire Dampers / Smoke Dampers	Trox/ Greenheck/Ruskin Titus/Systemair
181	Flexible Duct Connection	Airflow/ Pyroguard / Rolastar/ UP Twiga
182	Flexible Pipe Connection	Resistoflex/ Easyflex/ Diamond/ Dunlop
183	FRP lining for condenser piping	Owen-corning/UP Twiga/Binani
184	GI/ MS Piping (chilled/condenser/drain/hot)	Jindal-Hissar/TATA/SAIL
185	Globe/Gate Valve	Audco / Advance /LCT
186	Heat Recovery Exchanger/ Ventilator/ Wheel	Ostberg/DRI / Flaktwoods/ BryAir
187	Hot Water Generators	KEPL / Rapid cool /Enmax
191	a) Fiber Glass – Aluminium faced Insulation	UP Twiga / Owens Corning/Kimmco
192	b) Polyurethane Foam (PUF) Insulation	Styrene Packaging C Insulations/Lloyd Insulations
193	c) Nitrile Rubber /EPDM Insulation with antimicrobial	K-Flex/Superlon/Armacell/ Thermobreak
194	d) XLPE Insulation	Supreme/ Trocellene/ Paramount
195	e) Expanded Polystyrene Insulation	Styrene Packing/ Mettur Beardsell/ Toshiba/ Thermobreak
196	Jet Fans	Nicotra/ Greenheck/ Airflow
197	Air Separator	Hydronic Solutions/ Anergy/ Danfoss
198	Magnehelic Gauges	Mitbraus Instruments/ Dwyer / Omicron

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

National Science Centre

199	Motorized Butterfly Valve	Honeywell/Belimo/Danfoss/Siemens
200	Paints	As per Civil Works Makes
201	Pre insulated Ducts	UP Twiga/ Asawa/ Mecheasy
202	Pipe Supports	Easyflex/ Resistoflex/ Diamond
203	Pipe Supports-PUF	Llyod insulation/ Malanpur/ Beardsell
204	Pot Strainer	Sant/ VTM/ Rapid Cool
205	Power Cables	As per Electrical Makes
206	Pressure /Temperature Gauges	H.Guru / Feibig / Warree/H.D/BRC
207	Propeller Fans	System Air/ Crompton/ Khaitan/ Alstom/ Bajaj
208	Thermostat /Humidistat	Honeywell / Johnson / Siemens
209	Purge Valve/ Drain Valve	Anergy/Sant/ LCT
210	PVC /uPVC pipe	Polypack/ Supreme/Astral/Finolex
211	Red Oxide/ Zinc Chromate Primer	As per Civil Works Makes
212	Refrigerant Copper Pipes	MANDEV Tubes/Rajco Metal/Mehta Tubes (Max Flow)
213	Room Thermostat	Honeywell/ Johnson/ Siemens
214	RP Tissue	UP Twiga/ Styrene Packing or equivalent
215	Pressurised Expansion tank	Hydronic Solutions/ Grundfos/ Anergy

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

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216	Split AC Units	Daikin/ Mitsubishi/General
217	Starters/ change over switch/ push buttons/ Indication Lamps/ Rotary switches/ 1-phase preventor/ Soft starter/ MCB/ MCCB/ ACB/ Contactor etc.	As per respective Electrical Makes
218	Strip Heater	Das Pass/ Escorts/KEPL
219	UV C Weather protective Coating	Pidilite/ Foster/ Amicon
220	UVGI System (Ultraviolet Germicidal-Irradiation System)	Ruks/ Trimed/Pure Air/Magneto
221	V Belt	Dunlop/ Fenner/ Hilton
222	Vacuum Degasser	Spirotech/ Optivent/ Caleffi/ Comfort/ Spirotherm
223	Variable Frequency Drive	Siemens/Danfoss/ABB/ LCT
224	VAV Box	Trox/ System Air / Ruskin Titus / Johnson's Control
225	VRV/ VRF Outdoor/ Indoor Units/ Refnet Joints/Remote Controllers	General/ Mitsubishi Electric/ Daikin/ Toshiba
226	Water/Air cooled Screw/Scroll/Centrifugal Water Chillers	Dunham bush/York/ Daikin/Trane/ Carrier
227	Water Flow Switch	Honeywell/ Belimo/ Rapid Cool
228	Welding Rod	Advani/ Vector/Mangalam
229	Y- Strainer	Sant /Emerald/ Rapid cool

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230	BMS	Inferrrix/Siemens/ Legrand/ Honeywell
231	Radiant Cooling	Kantherm / Rehau/Uponor
4- Fire Fighting		
263	MS Pipe	Jindal Hissar / Tata/ Jindal Star
264	Orifice Plate	Minimax/ Superex/ Exflame /Lifeguard
265	Ball Valve	Castle / Zoloto /Advance
266	Butterfly Valve	Castle / Zoloto /Advance
267	Non-Return Valve	Sant / Zoloto /Advance
268	Air Cushion Tank	Minimax/ Superex/ Exflame /Lifeguard
269	Rubber Expansion Joint	Minimax/ Superex/ Exflame /Lifeguard
270	Landing Valve	Minimax/ Superex/ Exflame /Lifeguard
271	CP Hose	Minimax/ Superex/ Exflame /Lifeguard
272	RRL Hose	Minimax/ Superex/ Exflame /Lifeguard
273	Branch Pipe	Minimax/ Superex/ Exflame /Lifeguard
274	Standard Fire Man Axe	Minimax/ Kalpex/ Exflame /Lifeguard
275	Fire Brigade 2 Way Inlet	Minimax/ Kalpex/ Exflame /Lifeguard
276	Fire Brigade 4 Way Inlet	Minimax/ Kalpex/ Exflame /Lifeguard
277	Fire Brigade Suction Hose Coupling	Minimax/ Kalpex/ Exflame /Lifeguard
278	Fire Hose Cabinet Internal	Minimax/ Kalpex/ Exflame /Lifeguard
279	Fire Hose Cabinet External	Minimax/ Kalpex/ Exflame /Lifeguard
280	Fire Extinguisher	Minimax/ Kalpex/ Exflame /Lifeguard
281	Pressure Gauge	H Guru/ Fiebig/ Weksler
282	Flow Indicating Switches	Minimax/ Kalpex/ Exflame /Lifeguard
283	Pressure Switches	Minimax/ Kalpex/ Exflame /Lifeguard
284	Sprinklers	Tyco / HD/ Exflame

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285	Gas Flooding System	Minimax/ Kalpex/ Exflame /SVS Life Safety
286	Fire Sealant	Hilti/FISHER/ Technico
287	Inspection C Testing Assembly	Minimax/ Kalpex/ Exflame /Lifeguard
288	Flexible Hose Coupling	Kanwal / Resistoflex/ Easyflex
289	Pot Strainer	Sant / Zoloto/ Water Engineering
290	Suction C Delivery Header	Jindal Hissar / Tata/ Jindal Star
291	Installation Control Valve Assembly	Minimax/ Kalpex/ Exflame /Lifeguard
292	Fire PUMPS	Kirloskar / CRI/ Wilo

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S.NO.	5- Technology	Make / Model
1	Video wall	Samsung/LG/Delta/ Eqv
2	Server Processor	Intel/ Eqv
3	Smart Android 4K UHD Professional Displays	Samsung/Sony or eqv.
4	Optical Zoom PTZ Camera Full HD 1080p60	Clearone or eqv.
5	HDMI matrix switcher	Kramer MV-4X
6	4x4 USB 3.2 Matrix	Milestone or eqv.
7	Capture video Audio Card	Milestone or eqv
8	Digital signal processor	Xilica or eqv.
9	Sound card	Standard or eqv.
10	4-Channel Digital Power Amplifier	Toa or eqv.
11	1U rack mountable Digital speaker processor - 2 inputs and 6 outputs.	Toa or eqv.
12	DUAL WIRELESS SET (LAVALIER)	Toa or eqv.
13	MICROPHONE STAND + GOOSENECK MICROPHONE desk-top microphone stand base	Toa or eqv.
14	4" Coaxial In-Ceiling Loudspeaker - 30 Watts continuous, 120 Watts peak power, Multiple transformer taps for 70 V and 100 V line systems or 80hm	Sennheiser or eqv.
15	Speech Line Digital Wireless Charging Base Sennheiser	Sennheiser - CHG or eqv.
16	SUBWOOFER SYSTEM	Toa or eqv.
17	SPEAKER SYSTEM 15" LF speaker Well-controlled sound coverage	Toa or eqv.
18	MOUNTING BRACKET HS-150B / HS-1500BT	HY or eqv.
19	STAGE MONITOR SPEAKER SYSTEM Active Portable loudspeaker system with 2 combo	Bose OR Eqv.

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20	13.2 ch preout (XLR 15.2) - Dolby Atmos (upto 7.1.6 or 9.1.4), DTS:X and Auro-3D (up to 13.1) - HEOS. C	Marantz or Eqv.
21	32 Channel Touch Screen Digital Mixer.	QSC or eqv.
22	Optical interactive monitor	Adduness or eqv.
23	Conference (Stage) Prompter Kit Shipping - Stand-alone unit, Built-in 15" monitor with integrated DV prompter Plus. - Control via Ethernet,	Datavideo or eqv.
24	2x8 HDMI 2.0 Splitter / DA 18 Gmakes	Liberty / Eqv.
25	Enclosures Boxes C case type-MS Box 250x250x100 , Connectivity-2 Power Point, 1 HDMI, 1 Audio, 2 USB Power, 1 Lan Etc	Standard or eqv.
26	Cable Cubby with HDMI, Power C Data	Standard or eqv.
27	4K HDMI 2.0 Tranmitter Receiver Set - 100 m	Liberty or eqv.
28	High-quality matrix with eight HDMI inputs independently routable to eight HDMI outputs.	Kramer or eqv.
29	high-performance control processor with a powerful 4-Series™ control engine.	Crestron or eqv.
30	iPad	Apple or Eqv.
31	All Required Cables (Audio C Microphone) /Connectors, C Accessories	Multy or eqv.
32	Equipment Rack for housing all rack mountable equipments	Custom/Various or eqv.
33	Installation, Testing, Training and Commissioning all Equipment	SI or eqv.
34	98" Full Array LED, 120HZ Refresh	LG / Samsung / Sony or eqv.
35	85" Deep Black Non-Glare Technology, Very High Brightness Smart Android 4K UHD Professional Displays,	LG / Samsung / sony.
36	20 x Optical Zoom PTZ Camera Full HD 1080p60 video, 20x optical zoom plus 16x digital zoom Clearone or eqv.	Clearone or eqv.
37	HDMI matrix switcher	Kramer or eqv.
38	4x4 USB 3.2 Matrix. It allows 4 x USB	.Milestone Mp-mu44 3.1 or eqv.

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39	Capture video and audio from HDMI sources HDMI video resolution is up to 4K@60Hz 4:4:4, HDR10 Supports HDMI loop	Milestone - MP-HU3VC-H2 or eqv.
40	0.4W monitor speaker 2 headphone jacks	Toa or eqv.
41	0.4W monitor speaker 2 headphone jacks	Toa or eqv.
42	Supply of Master Control Unit, USB Audio In/Out (USB 2.0 type-B port) Supports up to 32 conference units Mic In	Toa or eqv.
43	Digital signal processor with minimum 8no. Or more.	Xilica or eqv.
44	Supply of USB Sound card for soft VC Makes-Standard or eqv.	Standard
45	High performance yet cost-effective mixer power amplifier, 5 mixing inputs	Toa or eqv.
46	Impedance speaker systems and include a built-in 25/70.7/100 V	Toa or eqv.
47	LED Screen Size 15.6 inch, with lift comes a high quality LED screen, ultra thin to 78 mm	Lift or eqv.
48	2x8 HDMI 2.0 Splitter / DA 18 GMakes-Liberty or eqv.	Liberty - DL-HD28A-H2
49	Elclosures Boxes C case type-MS Box 250x250x100 , Connectivity-2 Power Point, 1 HDMI, 1 Audio, 2 USB Power, 1 Lan Etc.	Standard
50	4K HDMI 2.0 Transmitter Receiver Set - 100 mMakes-Liberty or eqv.	Liberty - DL-HDE100-H2
51	4K wireless presentation system, Device Resolution supported Minimum 4K@30Hz Minimum Required Interface ports 1 x HDMI Input, 1 x HDMI Output, 2 x USB 2.0 Host Type-A	ScreenBeam or eqv.
52	High-quality matrix with eight HDMI inputs	Kramer or eqv.
53	Control processor with a powerful 4-Series™ control engine.	Crestron or eqv.
54	iPad	Apple or Eqv.
55	All Required Cables (Audio C Microphone) /Connectors, C Accessories etc to complete the job.Makes-Multy or eqv.	Imported
56	Equipment Rack	Custom/Standard
57	Laser Phosphor projector or better with complete dust protection as per IP60 standards,	DP / CHRISTEI

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

National Science Centre

58	Tab-Tension electric projection screens Durable black casing for wall/ceiling installations	Custom
59	All-in-one design to simplify streaming workflow – Integrates 1080p video capture, video recorder, video switch, streaming encoder, video converter, video splitter, and audio mixer	Kramer, Atten or Eqv,
60	16 Channel Digital Infrared Transmitter	VISVL or Eqv
61	CCU	VISVL or Eqv
62	Digital Infrared Radiator high power version, wider IR signal coverage	VISVL or Eqv
63	1+63 Channel interpreter unit	VISVL or Eqv
64	Gooseneck Microphone 410mm	VIS or Eqv
65	headset for interpreter with MIC input	VIS or Eqv
66	Headset for interpreter	Imported
67	Receiver	VIS or Eqv
68	Cable and Connectors	Imported
69	1-chip LASER Multimedia Projection system having, 7000-12,500 Lumens 20000 hours lamp life, 2,304,000 pixels (1920 x 1200) WUXGA	DP / CHRISTEI
70	Tab-Tension electric projection screens Durable black casing for wall/ceiling installations	Custom
71	All-in-one design to simplify streaming workflow – Integrates 1080p video capture, video recorder, video switch, streaming encoder, video converter, video splitter, and audio mixer	Atten or Eqv

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc. at National Science Centre, Delhi.

National Science Centre

72	Ipad 10.2-Inch Display with 2160 x 1620 pixels resolution, Stereo Speakers with Dual microphones, 64GB Storage helps you to store your files easily	Apple or Eqv.
73	Server	Custom/Various

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

National Science Centre

E	6- PHEWORK	
1	VITREOUS CHINA AND FIRECLAY	HINDWARE SANITARYWARE / KOHLER/GROHE
2	STAINLESS STEEL SINKS	KINGSTON/JAYNA/NIRALI
3	C.P. FITTINGS C ACCESSORIES	JAQUAR/ PARKO /KOHLER
4	C.P. WASTE, SPREADERS, URINAL	JAQUAR FLUSH PIPES / PARKO/ORIENT
5A	CENTRIFUGALLY CAST SPUN CAST IRON PIPES (IS:3989)	NECO /SKF /HEPCO
5B	UPVC PIPES AND FITTINGS	APL-APOLLO /SUPREME /AKG
6	RCC PIPES	PRAGATI CONCRETE /UDYOG JAIN /SPUN PIPE CO.
7	STONE WARE PIPES C GULLY TRAPS	PERFECT /BURN/RK
8	CPVC PIPES C FITTINGS	ASTRAL /ASHIRVAD/ SUPREME
9	G.I. PIPES	JINDAL /HISSAR/ PRAKASH SURYA /APL-APOLLO
10	G.I. FITTINGS	BRAND (MALLEABLE CAST IRON) /KS-BRAND/ TATA Pipes/ Jindal pipes
11	BALL VALVES	ZOOTO/SANT/ LEADER
12	BUTTERFLY VALVES	ZOOTO/SANT /LEADER
13	NON-RETURN VALVES	ZOOTO/SANT /LEADER
14	WATER METRES	CAPSTAN/KRANTI/ANAND
15	BALL COCKS	GPA/SANT/L C K
16	C.I. MANHOLES COVERS AND FRAMES	NECO/RIF/BC
17	RCC MANHOLE COVERS C FRAMES	KK MANHOLE C GRATINGS CO.PVT. LTD/ Sintex/ Ultratec cement/
18	FASTNERS	HILTI / INTELLOTECH/ Kapson

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

National Science Centre

19	WATER HEATER	RACOLD/VENUS/JAQUAR
20	HOT WATER INSULATION	ARMACELL/KAIFLEX/ARMAFLEX
21	PIPECOAT	IWL LIMITED/PYPKOTE/STP
F	7- CCTV	
1	Integrated CCTV Systems	Hikvision / Bosch / Axis / Honeywell/Seagate / WD/Net gear / D-Link / HP/LG/ Panasonic / Samsung
2	24 Ports, 10/100Mbps, +2 Port 1000Base-T Unmanaged Standalone Switch.	D-Link (Model no. DES-1026G) / Schneider / Legrand / Alcatel / Netgear / Cisco/ HP
3	19" 6U Rack with accessories	Cormack/ val rack / Rittal
4	Patch panel	Digilink-Schneider / Legrand / Alcatel / Netgear / Cisco/ HP
5	Cable Manager	Digilink-Schneider / Legrand / Alcatel / Netgear / Cisco/ HP
6	Hardware Packet	Digilink-Schneider / Legrand/ Godrej
7	Patch Cord	Digilink-Schneider / Legrand/ Godrej
8	RJ-45 Connector	Digilink-Schneider / Legrand/ Godrej
9	Information outlet (I/O)	Digilink-Schneider / Legrand/ Godrej

Sr.No.	8-LIGHTING	
1	Lighting	iGuzzuni/IBL/Fagerhult/Erco/Forma/Aura
2	Surface Mounted Tile	Wipro/ SigniFy/Regent/Eqv.
3	Optical Fibre	UFO/FOLI/Oytiano

Technical Specification - General Notes for Auditorium Works

1. Civil s Architectural Works

- All civil works shall be executed as per approved architectural and structural drawings.
- Finishing materials (flooring, cladding, paint, ceiling systems, acoustic panels, etc.) must conform to IS/ASTM/BIS standards and must be approved by the architect/consultant before execution.

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

- Any deviation from approved design must be brought to the notice of PMC and architect in writing and prior approval must be obtained.

2. MEPH (Mechanical, Electrical, Plumbing s HVAC)

- All MEP services shall be as per relevant NBC, IS codes, and local authority regulations.
- All equipment (AHUs, VRV systems, electrical panels, fire fighting pumps, fixtures, etc.) shall be of reputed make and with compliance certifications.
- Proper coordination and clash detection with architectural and structural services must be ensured through BIM/Shop Drawings before execution.

3. Lighting (General + Stage/Performance)

- Lighting design must adhere to lux levels prescribed for auditorium and performance spaces.
- Stage lighting and dimming systems to be DMX compatible and shall be programmed as per approved lighting control schedule.
- Emergency and exit lighting to be provided as per fire norms.

4. Technology Systems (AV, IT, CCTV, Networking)

- All technology installations (Audio-Video, Sound Reinforcement, Projection, CCTV, Access Control, Wi-Fi, Digital Signage, etc.) must be as per design intent and brand specified in BOQ.
- No substitution in make/model is permitted unless approved in writing by the consultant.
- Cabling (data, AV, control) to be in shielded and labeled conduits, routed as per coordinated drawings.

5. CCTV s Surveillance

- CCTV cameras to be installed at strategic locations as per security plan.
- All NVRs, network switches, racks, and servers to be installed in designated tech rooms with proper ventilation and access control.
- All camera feeds to be accessible from central security console and archived for minimum 30 days.

6. Guarantee s Warranty

- All technology equipment (AV, Lighting Control, Stage Systems, HVAC, Electrical) to have a **minimum 3-year onsite warranty** unless specified otherwise.
- OEM warranty certificates and AMC contracts to be submitted at handover.
- All systems must undergo successful testing, commissioning, and training before final handover.

7. DLP (Defect Liability Period)

- A minimum **12-month DLP** shall be applicable from the date of final completion and handover.
- Any defects, malfunctions, or breakdowns during this period shall be rectified by the contractor/vendor without any additional cost.

8. On-Site Security s Material Handling

- Contractor is fully responsible for safety and security of their material and installed equipment till project handover.
- Any **theft, vandalism, or material damage** during execution shall be borne by the contractor.

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc.at National Science Centre, Delhi.

- Proper documentation and entry of all material brought to site must be maintained and shared weekly with PMC.

G. Make Substitution

- No changes in the approved **make or brand** shall be allowed without prior written consent of the Client/Consultant.
- Any unauthorized substitution will lead to **rejection of installed item** at contractor's cost.

10. General Notes

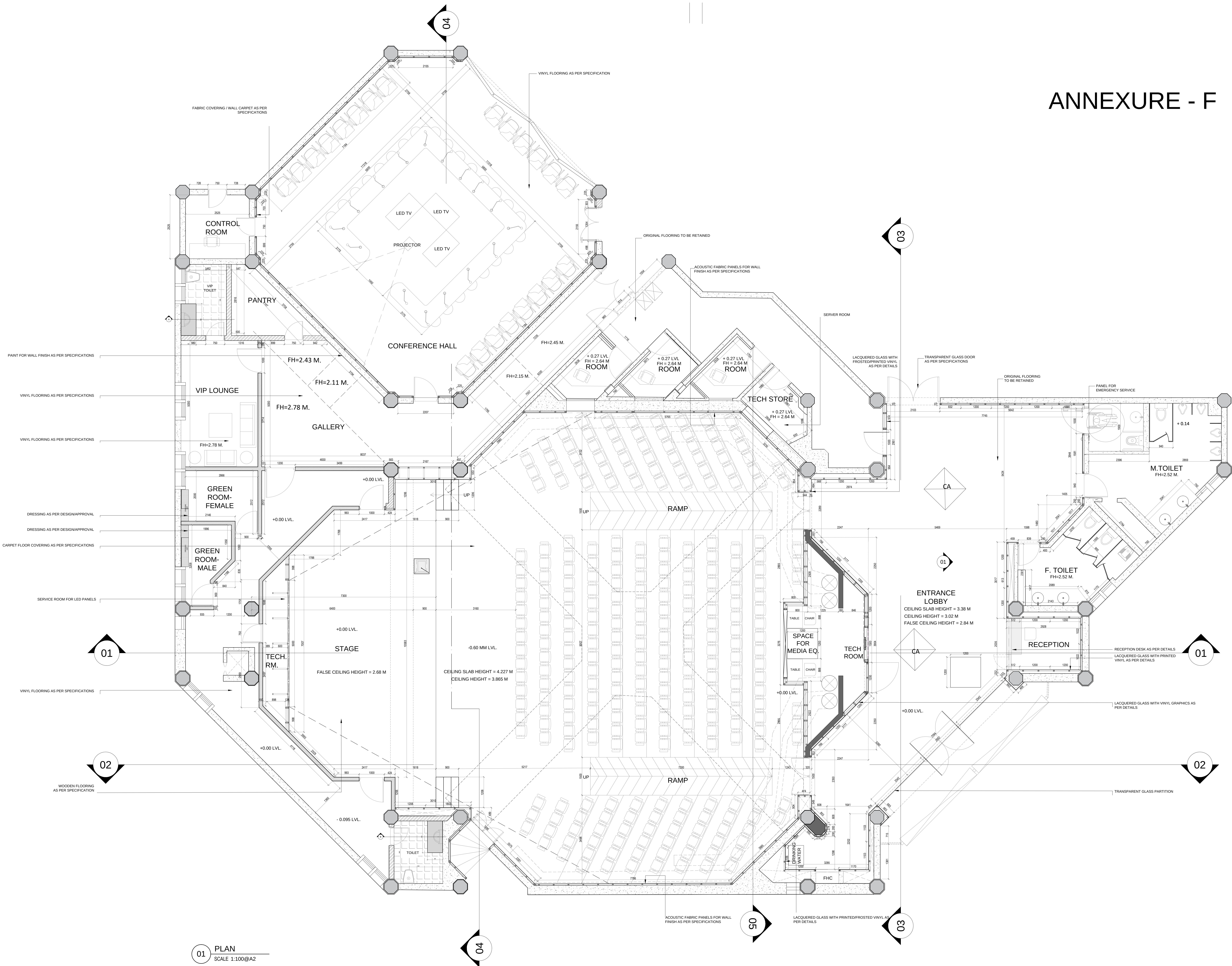
- All works to be executed with highest level of workmanship and finish.
- Final commissioning must include training to client's technical team.
- Contractor to maintain daily progress log and coordinate with PMC and other agencies.
- Statutory compliance for fire, safety, and electrical inspections is contractor's responsibility.

Note:

- Contractor shall submit samples to Authority for approval.
- For best locally available makes, the Contractor shall take prior approval from Authority.
- Authority can insist on any make.
- Make C Model No. of Sanitary C Bath Fixtures will be finalized by the Authority.
- Contractor shall procure the material from approved make list only. If two options are available in the Approved Make/ Approved Vendor list, then Contractor shall procure the materials from them only. In case only a single option is available from the Approved Make/ Approved Vendor then Contractor may suggest another vendor for the procurement to the Authority with all required technical details. Authority at its sole discretion may approve or reject the suggested vendor without any obligation.
- If any item that is required for the commencing of operations for this project and is not mentioned in the table above, Contractor shall take prior approval from Authority.

Complete renovation of Auditorium including replacement of seating, electrical installation, stage preparation & lighting; acoustic & false ceiling; LED video wall; Wi-Fi based simultaneous translation system; etc. at National Science Centre, Delhi.

ANNEXURE - F



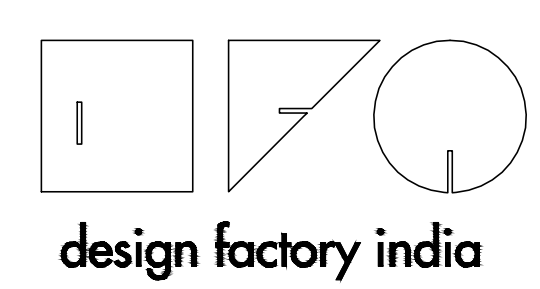
01 PLAN
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NOTE:
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2. ALL DIMENSIONS GIVEN IN THIS DRAWING ARE IN MILLIMETERS.
3. ALL DRAWINGS SHOULD BE READ IN CONJUNCTION WITH OTHER RELEVANT ARCHITECTURAL DRAWINGS. ANY DISCREPANCY OR AMBIGUITY IN EITHER SHOULD BE BROUGHT TO NOTICE OF THE ARCHITECT.

R4				
R3				
R2				
R1				
NO.	DATE	DESCRIPTION	DONE BY	

PROJECT:
NATIONAL SCIENCE CENTER, DELHI

CLIENT:
NATIONAL SCIENCE CENTER, DELHI



G-24, Sector - 11,
Noida - 201301 (U.P.)
T: 91 120 46 40 300
F: 91 120 42 46 788
mail@designfactoryindia.org
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DRG.NO.:
NSC-A05-01

DATE:
28/03/2025

DRAWN BY:
KK

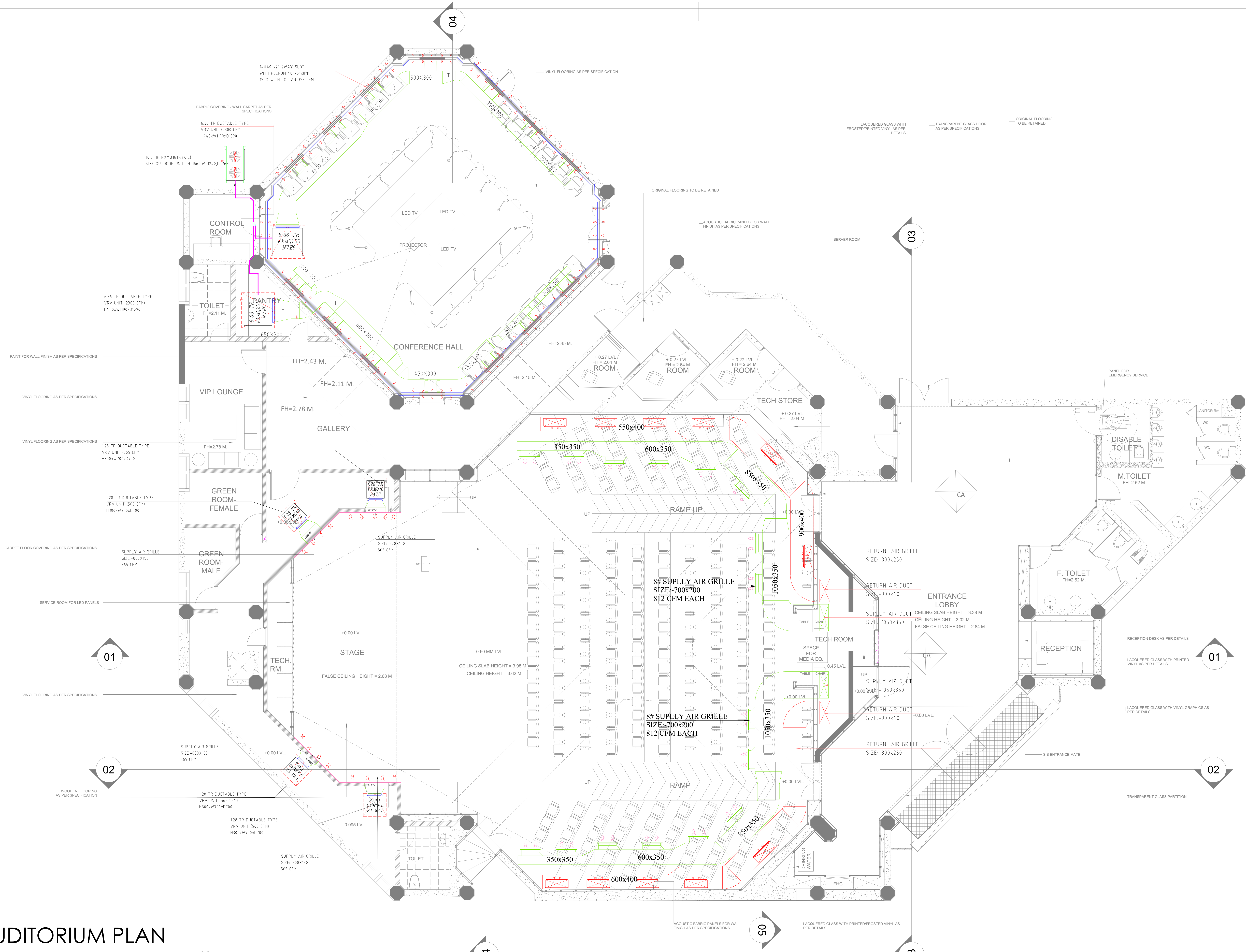
SCALE:
1:50 @ A0

DESIGN BY:
RITIKA

PROJECT NO.
-

R01

DRAWING TITLE:
NSC AUDITORIUM



AUDITORIUM PLAN

NOTE:

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- 3. ALL DRAWINGS SHOULD BE READ IN CONJUNCTION WITH OTHER

PLAN

R4 SCALE 1:50@A0

R3

R2

R1

NO.

DATE

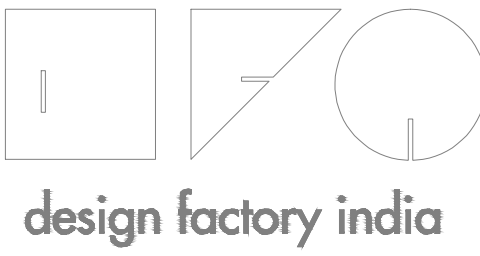
DESCRIPTION

DONE BY

NATIONAL SCIENCE CENTER, DELHI

PROJECT:
NATIONAL SCIENCE CENTER, DELHI

CLIENT:
NATIONAL SCIENCE CENTER, DELHI



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UMMAN

MUSHEER

R0

HVAC LAYOUT
AUDITORIUM

MEP - CONSULTANTS



WAC Engi
INDIA PVT.
MEP Consultants & E

DRG.NO.:

-

DATE:

07/04/2025

DRAWN BY:

KK

SCALE:

1:50 @ A0

DESIGN BY:

RITIKA

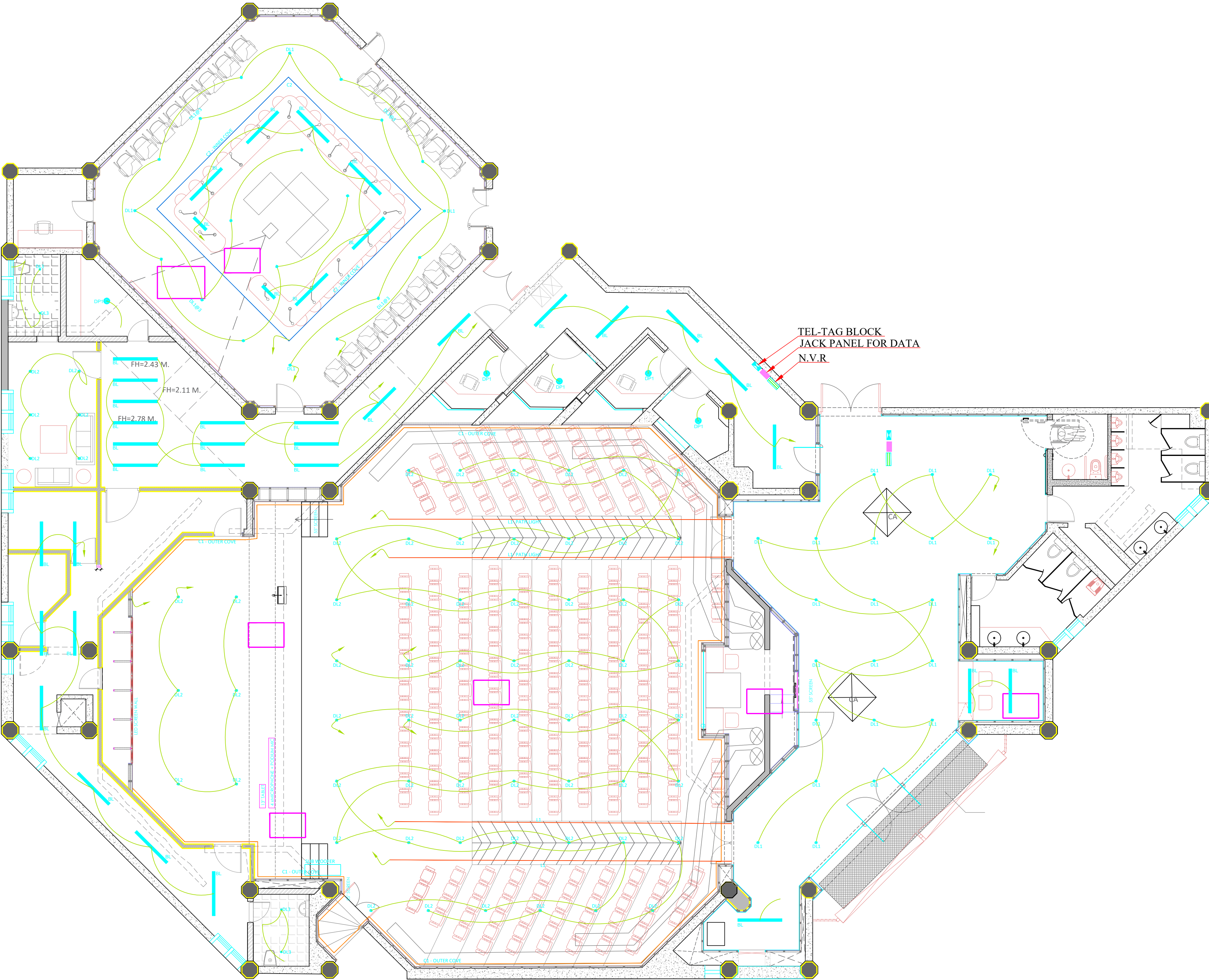
PROJECT NO.

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R01

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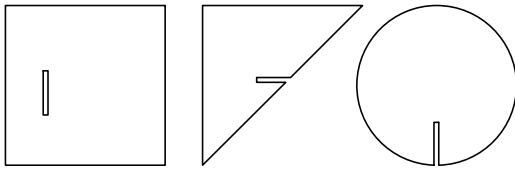
NSC AUDITORIUM



PROJECT - NATIONAL SCIENCE CENTER DELHI- AUDITORIUM, GREEN ROOM, VIP LOUNGE, TOILET, CORRIDOR , RECEPTION AREA LIGHTING LEGEND					
S. NO.	SYMBOL	REF. NO.	DESCRIPTION	MAKE & CODE	QTY.
1.		DL1	DARK ROUND 80 CEILING RECESSED DOWNLIGHT 12W, 50°, 4000K, CRI 90, IP20	IBL - 23431L50.1DC4XC12C	36 Nos.
2.		DL2	DARK ROUND 80 CEILING RECESSED DOWNLIGHT 12W, 50°, 3000K, CRI 90, IP20	IBL - 23431L50.1DC3XC12C	66 Nos.
3.		DL3	DARK ROUND 80 CEILING RECESSED DOWNLIGHT 9W, 50°, 3000K, CRI 90, IP20	IBL - 23231L50.1DC3XB9C	04 Nos.
4.		C1	Cove led strip 9.6W/m LED strip, IP20, 3000K (Note: Qty is approx. final qty. as per site requirement)	IBL- 6412.C303510+ L SHAPE	80 MTR.
5.		L1	Cove led strip 4.8W/m LED strip, IP20, 3000K (Note: Qty is approx. final qty. as per site requirement)	IBL- 6412.C303205+ U PROFILE	40 MTR.
6.		G1	LINEAR GRAZER, 13W/M, 10°, 4000K, IP40 (Note: Qty is approx. final qty. as per site requirement)	LED LINEAR- L120, ECO SW13, Grazer 10° Lens, 4000K, IP40	02 MTR.
7.		DP1	LED PANEL, 10W, 4000K (Note: Qty. is approx. final qty. as per site requirement)	OTHER BRAND	Nos.
8.		BL	BATTEN LIGHT, 10W, 4000K (Note: Qty. is approx. final qty. as per site requirement)	OTHER BRAND	Nos.
9.		EF	EXHAUST FAN		
10.		SO	6A SOCKET OUTLET FOR EXHAUST FAN		
11.		EL	EL-LOOPING		

PROJECT - NATIONAL SCIENCE CENTRE DELHI- AUDITORIUM LIGHTING LEGEND- CONFERENCE ROOM					
S. NO.	SYMBOL	REF. NO.	DESCRIPTION	MAKE & CODE	QTY.
1.		DL1	DARK ROUND 80 CEILING RECESSED DOWNLIGHT 12W, 50°, 4000K, CRI 90, IP20	IBL - 23431L50.1DC4XC12C	36 Nos.
2.		C2	Cove led strip 14.4W/m LED strip, IP20, 4000K (Note: Qty. is approx. final qty. as per site requirement)	IBL- 6412.C403614+ L SHAPE	75 MTR.

PROJECT - NATIONAL SCIENCE CENTRE DELHI- AUDITORIUM LIGHTING LEGEND- INTERPRETER ROOM, CORRIDOR					
S. NO.	SYMBOL	REF. NO.	DESCRIPTION	MAKE & CODE	QTY.
1.		DP1	BATTEN LIGHT, 10W, 4000K (Note: Qty. is approx. final qty. as per site requirement)	OTHER BRAND	09 Nos.



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Project Number PROJ.NO.

Client

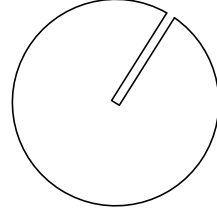
Notes

Key Plan

MEP — CONSULTANTS

WAC Engineers INDIA PVT. LTD.
MEP Consultants & Project Managers
B-78, Sector-6, Noida, UP-201301
Ph.: 0120-4504693, E-mail: wac@wacmep.com

North



Revision Date Remarks Done by

Drawn By Vishal Checked By ATHAR

Date

30.12.2024

Drawing No. A-PROJ-SET-NO. Sheet

EL-POWER LAYOUT (AUDITORIUM)

A2 TYPE R

01 PLAN
SCALE 1:50@A0

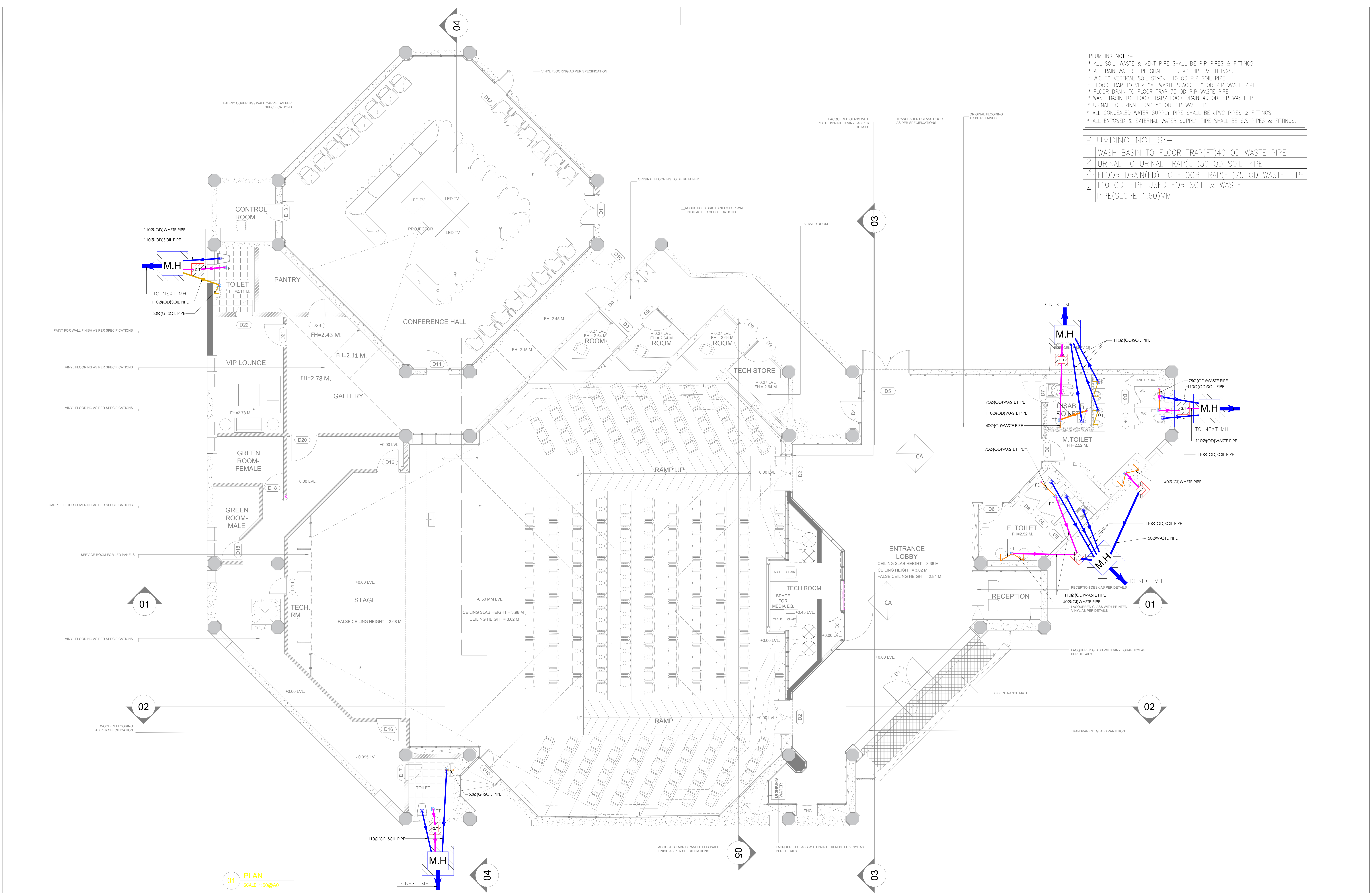
PROJECT - NATIONAL SCIENCE CENTRE DELHI- AUDITORIUM LIGHTING LAYOUT

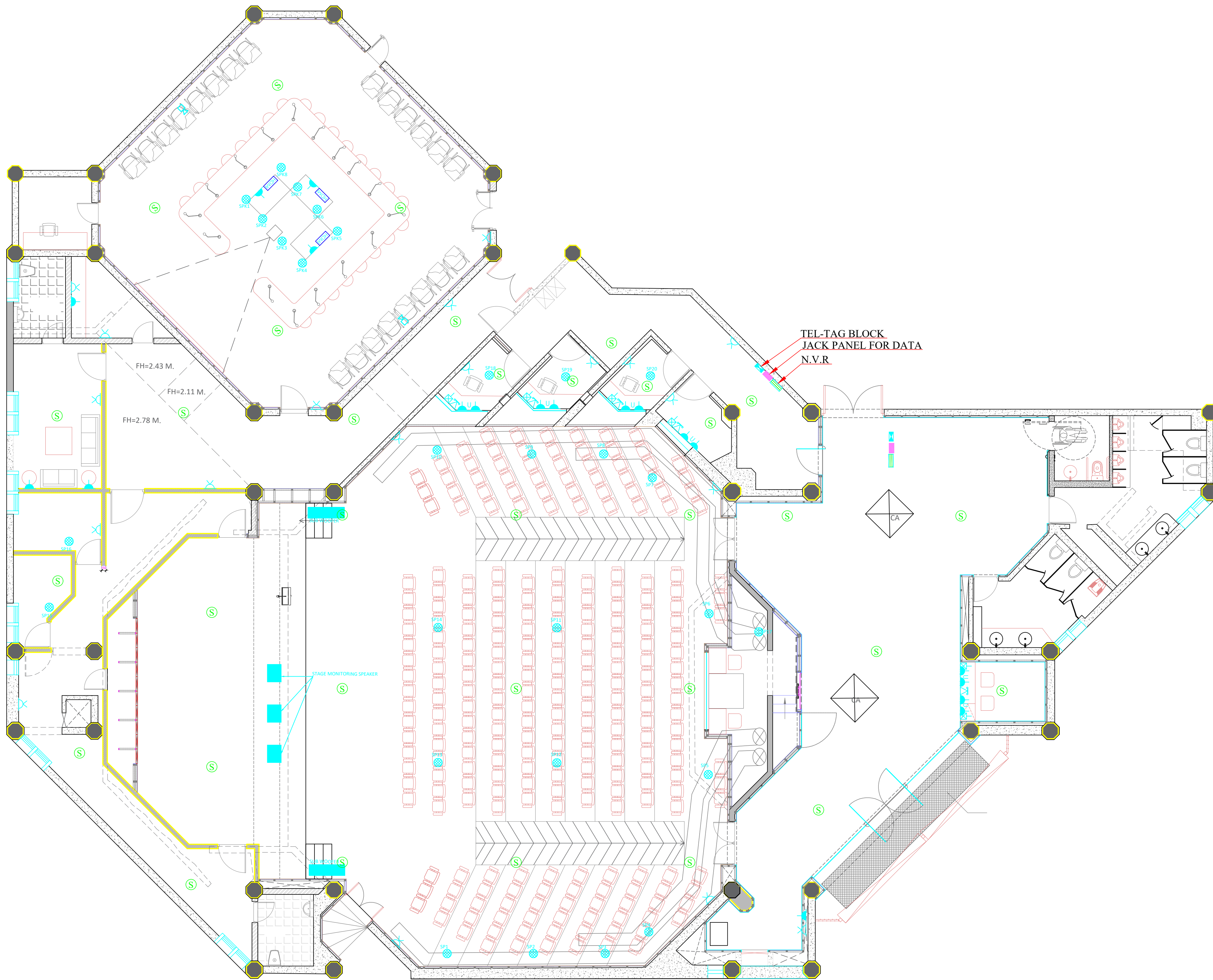
PLUMBING NOTE:-

- * ALL SOIL, WASTE & VENT PIPE SHALL BE P.P. PIPES & FITTINGS.
- * ALL RAIN WATER PIPE SHALL BE uPVC PIPE & FITTINGS.
- * W.C. TO VERTICAL SOIL STACK 110 OD P.P. SOIL PIPE
- * FLOOR TRAP TO VERTICAL WASTE STACK 110 OD P.P. WASTE PIPE
- * FLOOR DRAIN TO FLOOR TRAP 75 OD P.P. WASTE PIPE
- * WASH BASIN TO FLOOR TRAP/FLOOR DRAIN 40 OD P.P. WASTE PIPE
- * URINAL TO URINAL TRAP 50 OD P.P. WASTE PIPE
- * ALL CONCEALED WATER SUPPLY PIPE SHALL BE cPVC PIPES & FITTINGS.
- * ALL EXPOSED & EXTERNAL WATER SUPPLY PIPE SHALL BE S.S. PIPES & FITTINGS.

PLUMBING NOTES:-

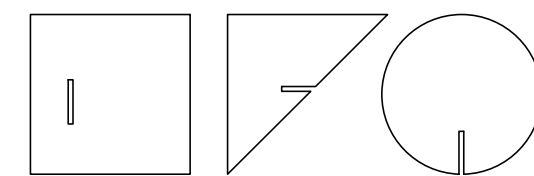
1. WASH BASIN TO FLOOR TRAP(FT)40 OD WASTE PIPE
2. URINAL TO URINAL TRAP(UT)50 OD SOIL PIPE
3. FLOOR DRAIN(FD) TO FLOOR TRAP(FT)75 OD WASTE PIPE
4. 110 OD PIPE USED FOR SOIL & WASTE PIPE(SLOPE 1:60)MM





01 PLAN
SCALE 1:50@A0

PROJECT - NATIONAL SCIENCE CENTRE DELHI- AUDITORIUM LIGHTING LAYOUT



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Client

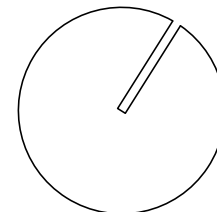
Notes

Key Plan

MEP - CONSULTANTS

WAC Engineers
INDIA PVT. LTD.
MEP Consultants & Project Managers
B-78, Sector-6, Noida, UP-201301
Ph.: 0120-4504693, E-mail: wac@wacmep.com

North



Revision Date Remarks Done by

Drawn By Vishal
Checked By Athar

Date

30.12.2024

Drawing No. A-PROJ-SET-NO. Sheet

EL-POWER LAYOUT
(AUDITORIUM)

A2

TYPE R

LEGEND		
SYMBOL	DESCRIPTION	MOUNTING HEIGHT ABOVE FFL
	5/15A SWITCH SOCKET (RAW POWER)	450MM OR AS MENTIONED
	13/5A SWITCH SOCKET (RAW POWER)	450MM OR AS MENTIONED
	5/15A SWITCH SOCKET (ON UPS)	450MM OR AS MENTIONED
	13/5A SWITCH SOCKET (ON UPS)	450MM OR AS MENTIONED
	LAN SOCKET	450MM OR AS MENTIONED
	POS- DEVICE POINT	
	TELEPHONE SOCKET	300MM OR AS MENTION
	DB PANEL	MOUNTED ON WALL (TOP OF DB 1800MM FROM FFL)
	2no. x 50mm Conduit for Projector/Speakers	
SERVER		
	For UPS	
	For TFT	
	LAN SOCKET	
AMPLIFIER @ 5/15A SWITCH SOCKET		
For PROJECTORS		
	LAN SOCKET	
	HDMI Cable	
	5/15A SWITCH SOCKET	
Above projector details in server depends on no. of projectors connection the server per installation		
For SCREENS		
	LAN SOCKET	
	HDMI Cable	
	5/15A SWITCH SOCKET	
Above screen details in server depends on no. of screen connection the server per installation		
	Full Range 6" Ceiling Speaker (Hole cutout diameter 222 mm, In Ceiling depth 249mm)	
	PoE based Wall mount touch screen controller	
For TABLET		
	LAN SOCKET	
	5/15A SWITCH SOCKET	
Above screen details in server depends on no. of screen connection the server per installation		
	LIGHT POINT ONLY	FLOOR POINT
	CAMERA	
	SUBWOOFER	
	STAGE MONITORING SPEAKER	
LEGEND:-		
	SMOKE DETECTOR	ON FALSE CELING
	HEAT DETECTOR	ON FALSE CELING
	SPEAKER	ON FALSE CELING
	CCTV	ON WALL



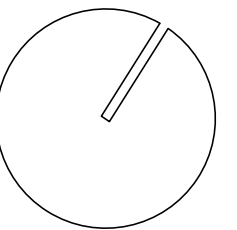
Project Number PROJ.NO.

Client

Notes

Key Plan

MEP – CONSULTANTS



Revision	Date	Remarks	Done by
Drawn By		Checked By	
VISHAL		ATHAR	

Date _____

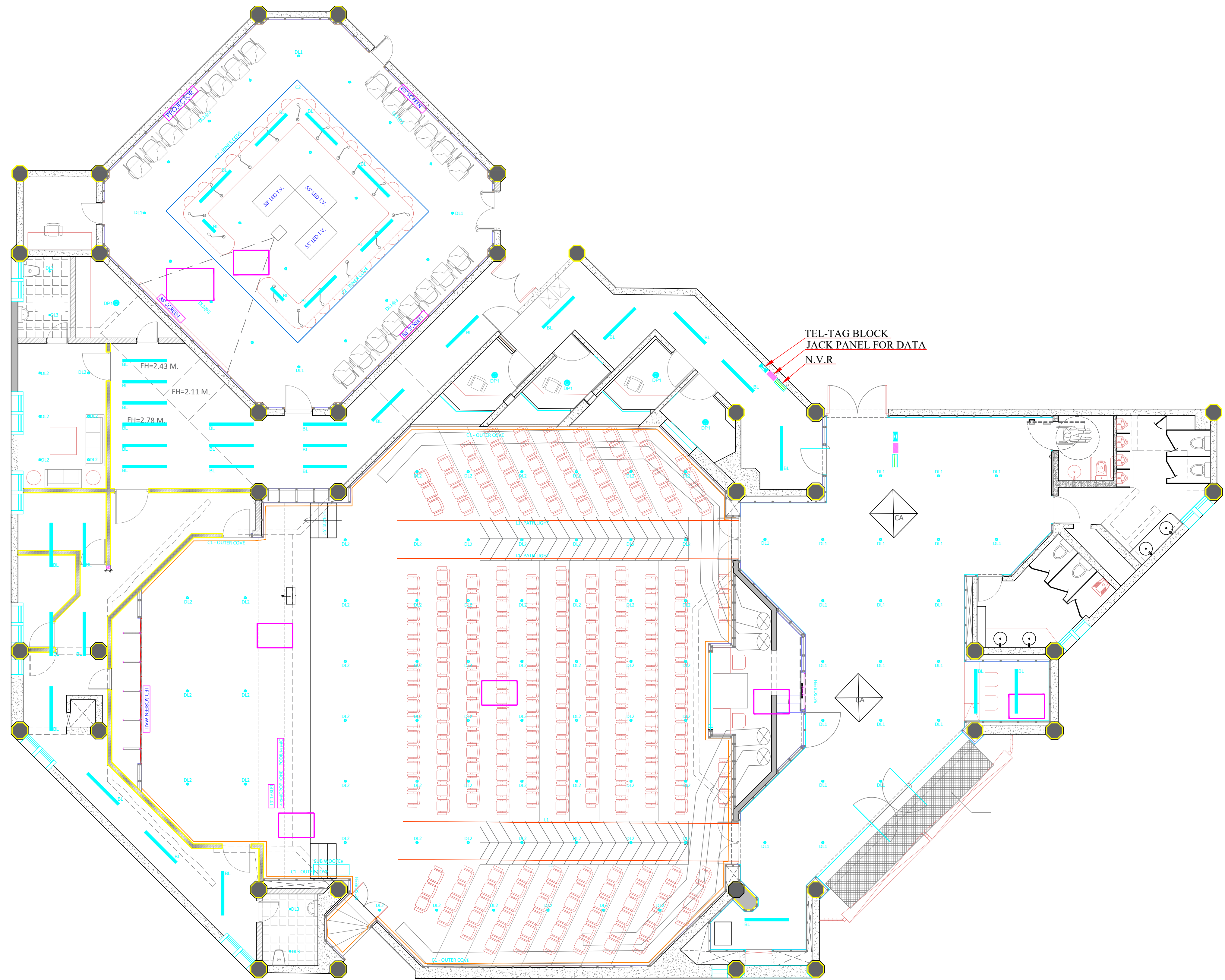
30.12.2024

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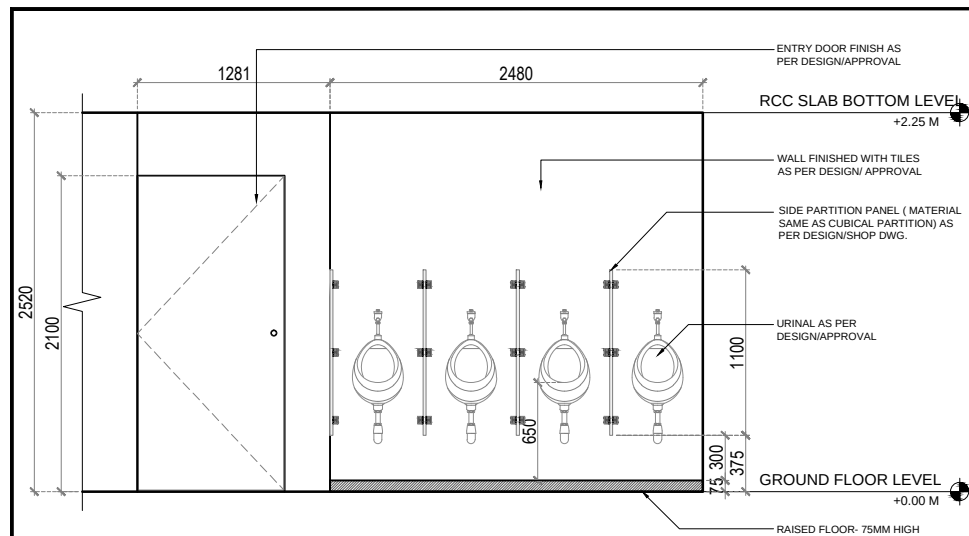
TECH DRAWING
(AUDITORIUM)

A2

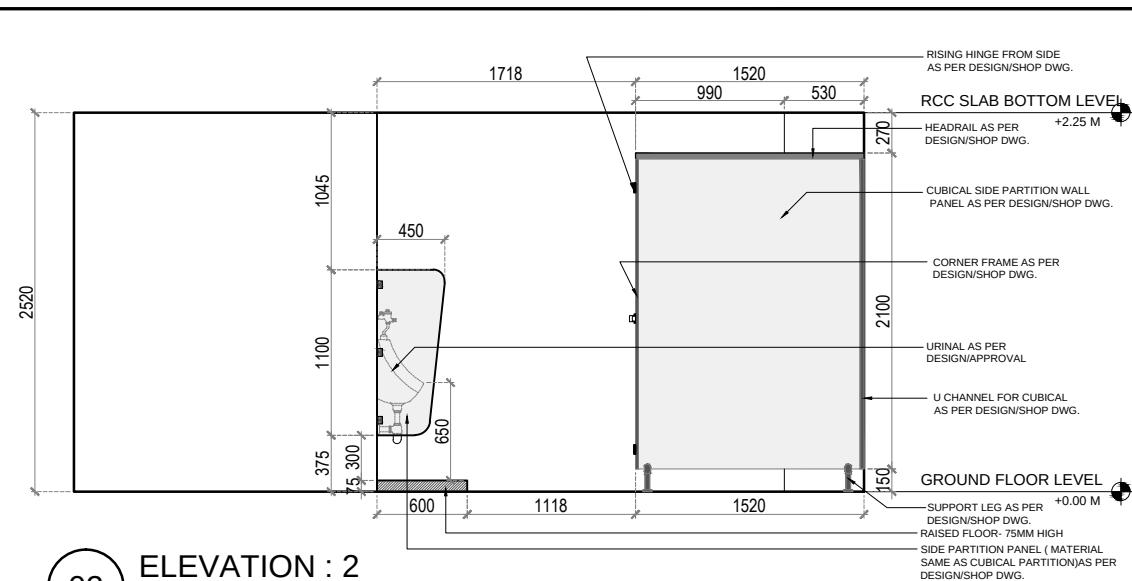
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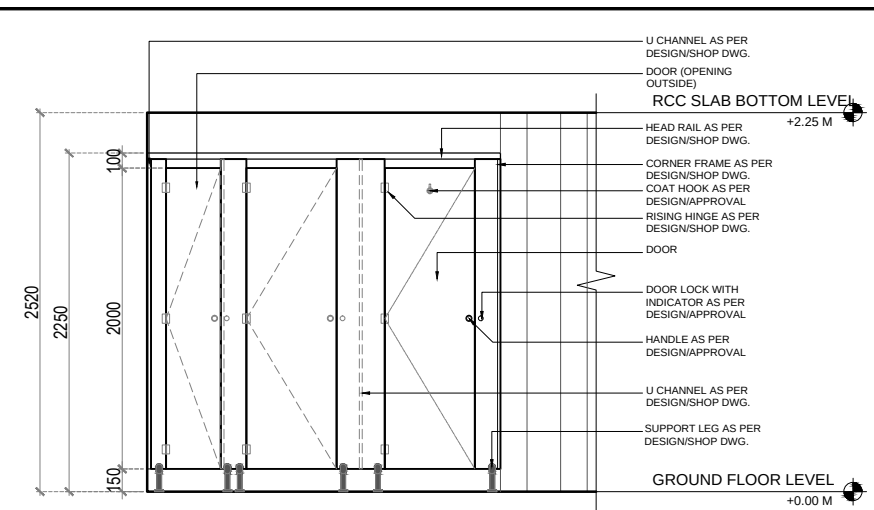
PROJECT - NATIONAL SCIENCE CENTRE DELHI- AUDITORIUM LIGHTING LAYOUT



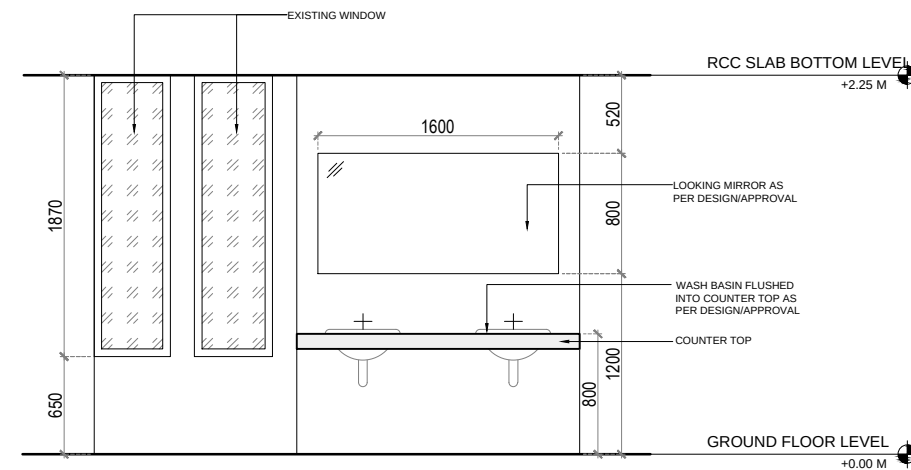
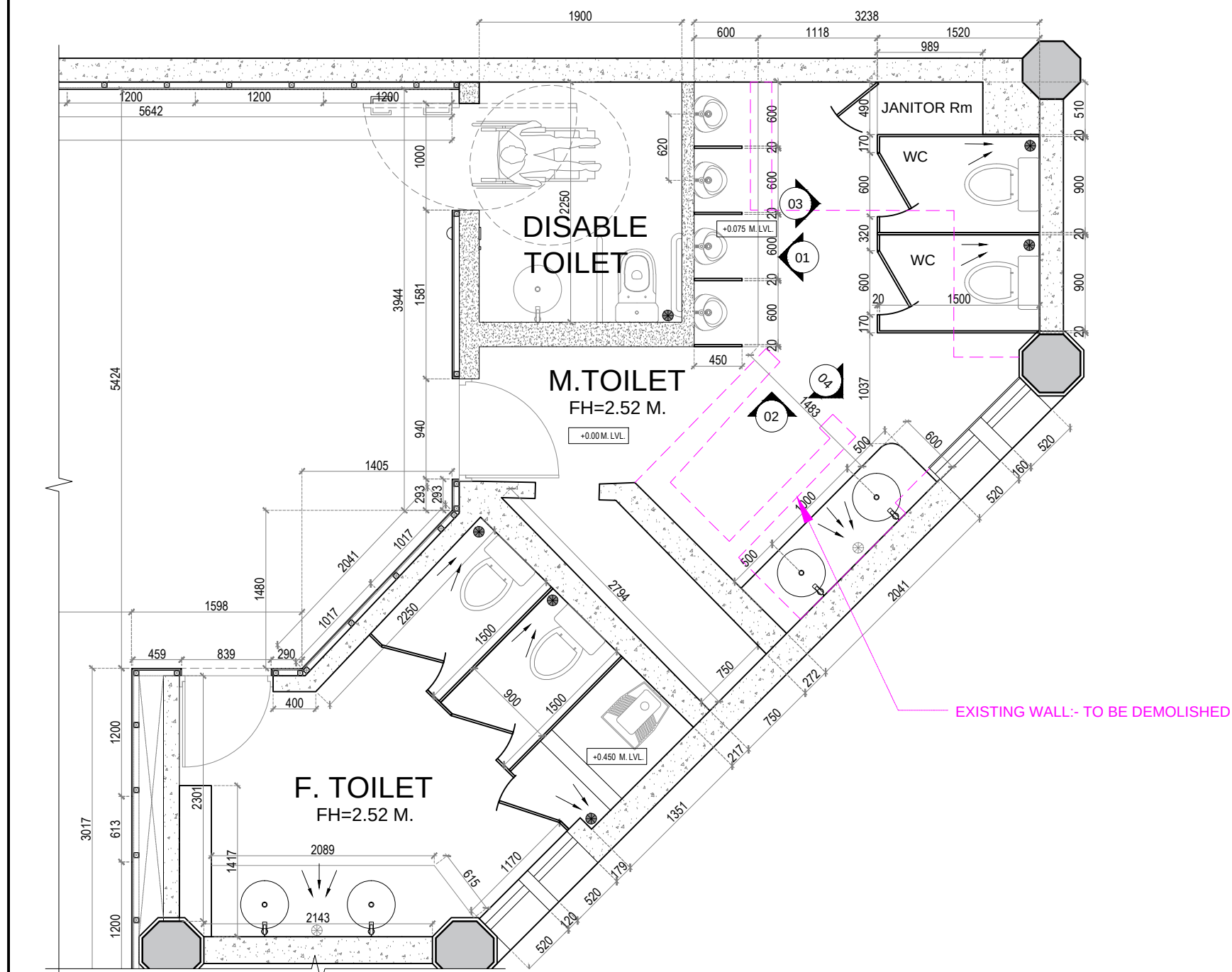
01 ELEVATION : 1
SCALE 1:50 TOILET BLOCK- AUDITORIUM RECEPTION AREA



02 ELEVATION : 2
SCALE 1:50 TOILET BLOCK- AUDITORIUM RECEPTION AREA



03 ELEVATION : 3
SCALE 1:50 TOILET BLOCK- AUDITORIUM RECEPTION AREA



04 ELEVATION : 4
SCALE 1:50 TOILET BLOCK- AUDITORIUM RECEPTION AREA

00 PART PLAN: TOILET BLOCK
SCALE 1:50 TOILET BLOCK- AUDITORIUM RECEPTION AREA

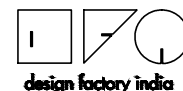
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R4			
R3			
R2			
R1			
NO.	DATE	DESCRIPTION	DONE BY

PROJECT:
NATIONAL SCIENCE CENTER, DELHI

CLIENT:
NATIONAL SCIENCE CENTER, DELHI



G-24, Sector - 11,
Noida - 201301 (U.P.)
T: 91 120 46 40 300
F: 91 120 42 46 788
mail@designfactoryindia.org
www.designfactoryindia.org

DRG.NO.:
NSC-A05-03

DATE:
10/06/2025

DRAWN BY:
KK

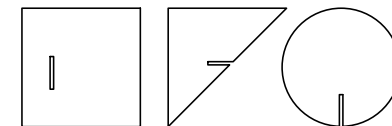
SCALE:
1:50 @ A3

DESIGN BY:
RITIKA

PROJECT NO.
-

R01

DRAWING TITLE:
NSC AUDITORIUM
: M. TOILET : ELEVATION



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Project Number PROJ.NO.

NATIONAL SCIENCE CENTRE NEW DELHI

Client
NATIONAL SCIENCE
CENTRE

Notes

Key Plan

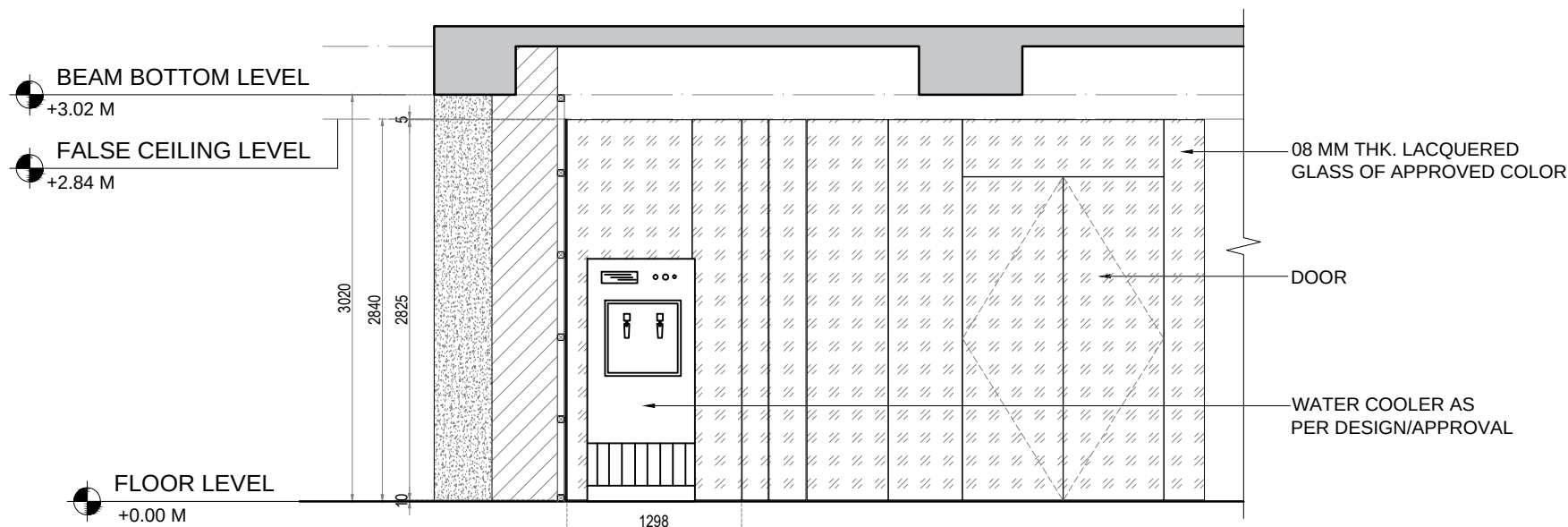
Revision	Date	Remarks	Done by
Drawn By		Checked By	
AB		NS	

Date
31.05.2025

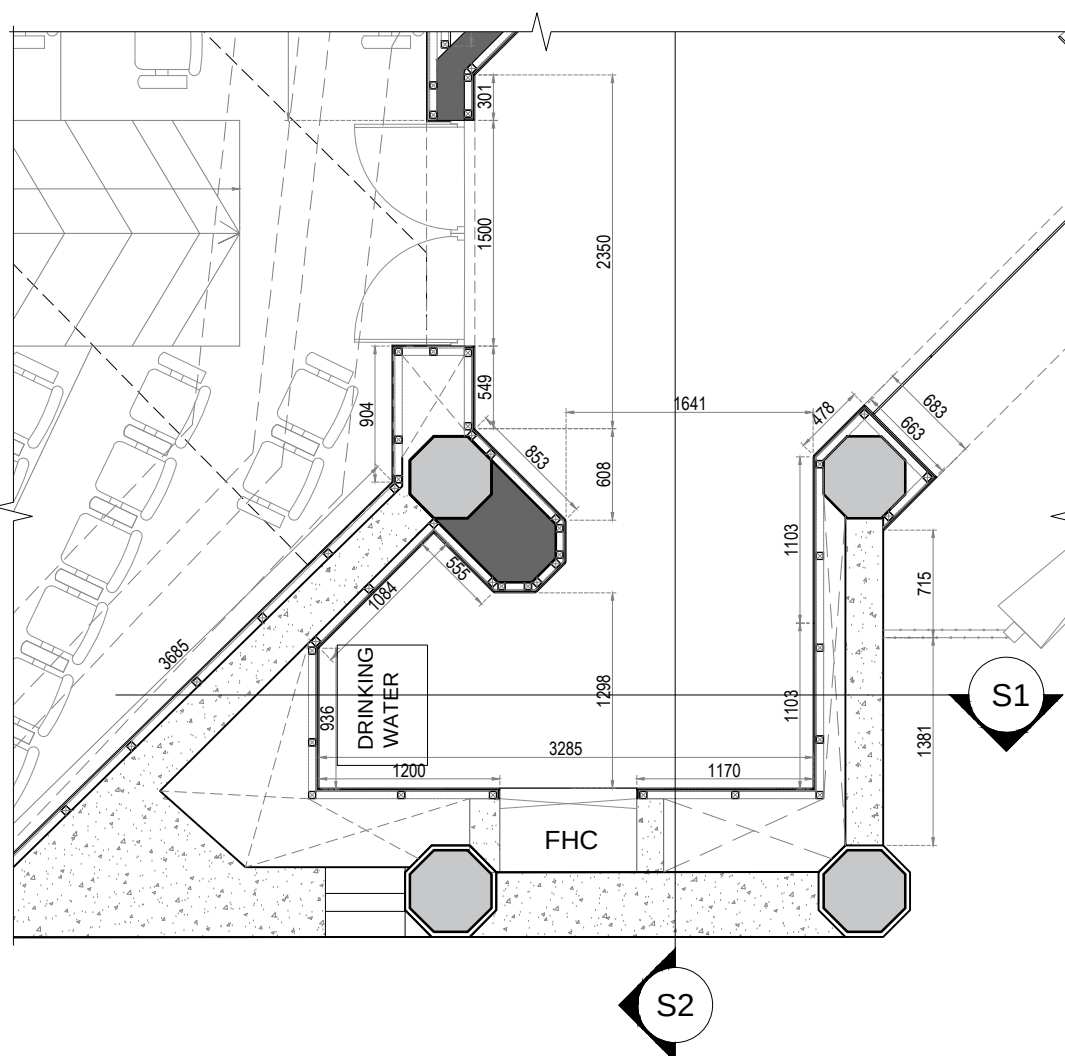
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**WATER COOLER
LAYOUT**

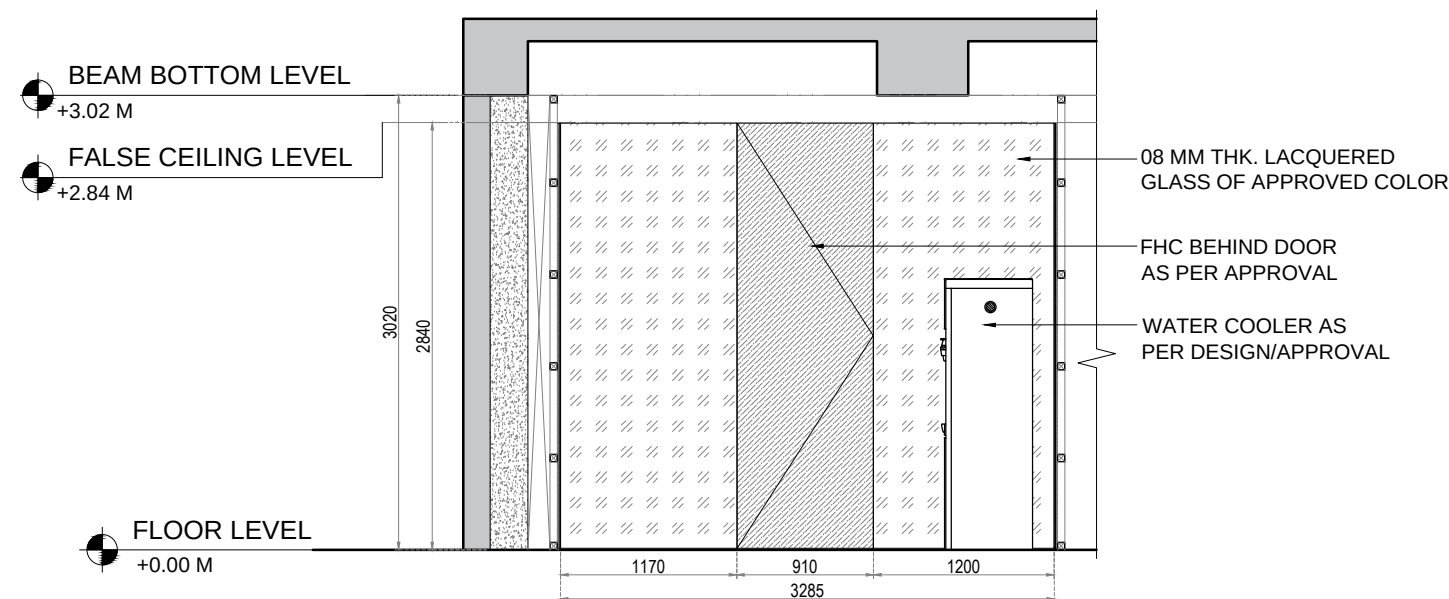
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S2 SECTION 02
SCALE 1:50 AUDITORIUM,NSC



P1 PLAN: DRINKING WATER AREA
SCALE 1:50 AUDITORIUM,NSC



S1 SECTION 01
SCALE 1:50 AUDITORIUM,NSC



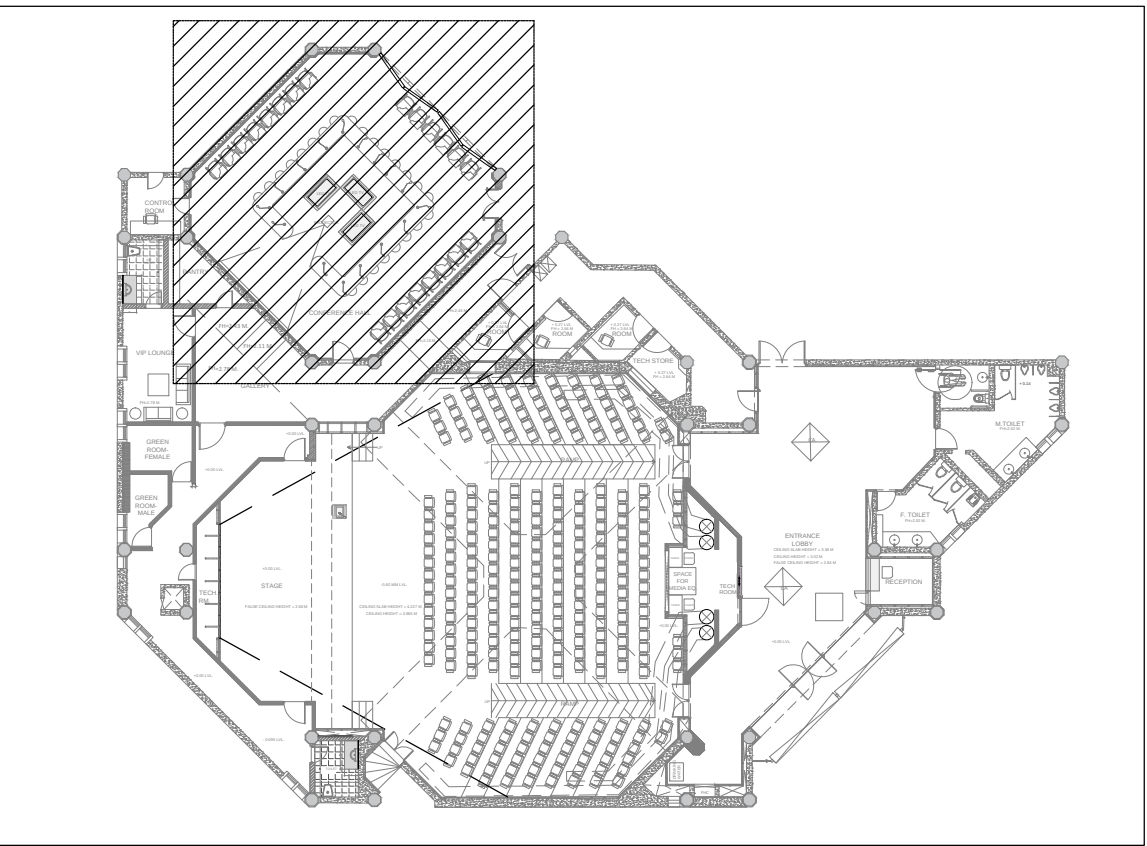
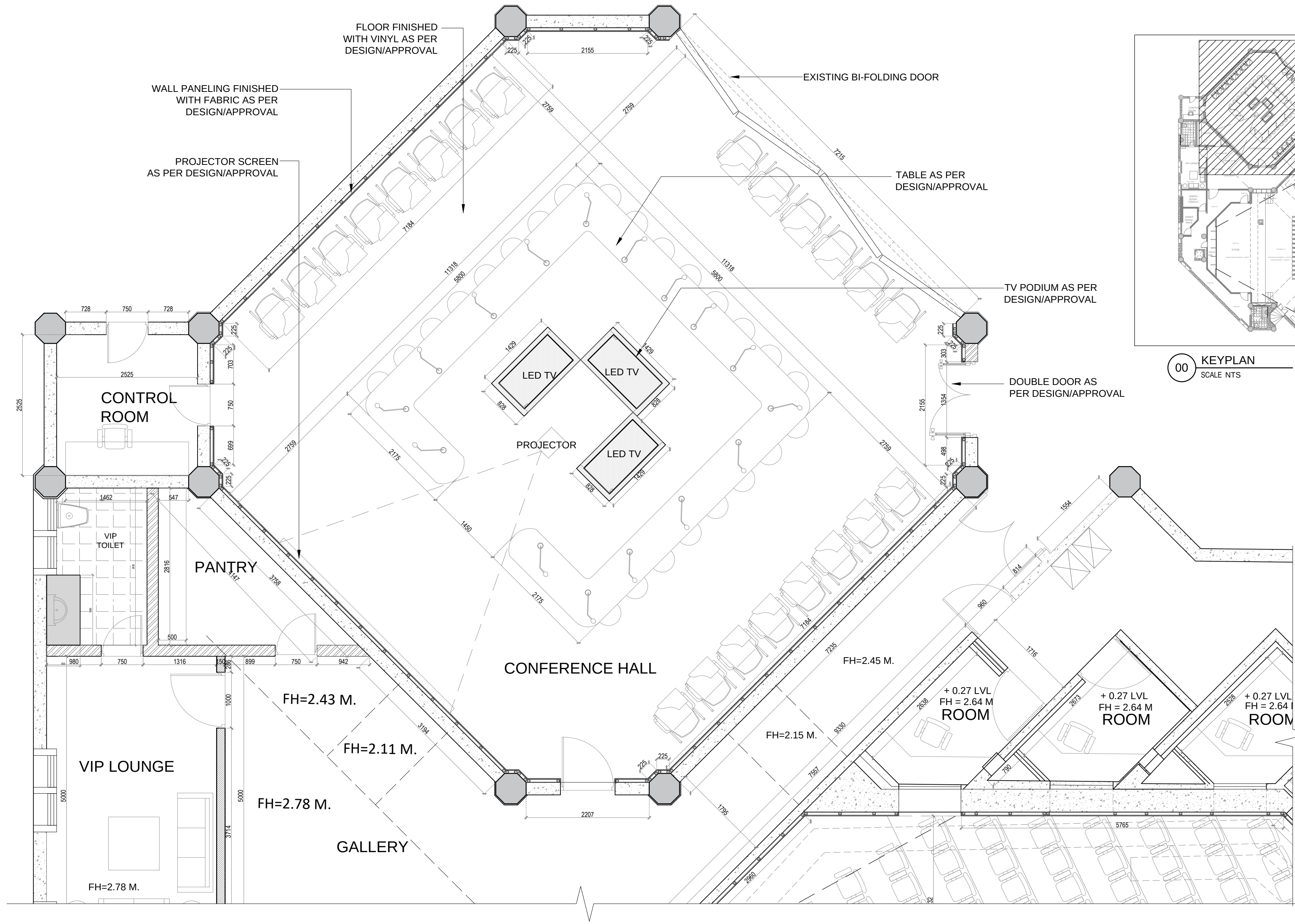
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DESIGN BY:	
RITIKA	
PROJECT NO.	
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DRAWING TITLE:	
NSC AUDITORIUM : SECTIONS	



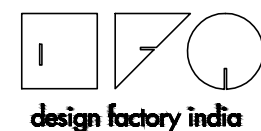
00 KEYPLAN
SCALE NTS

P1 PLAN:- CONFERENCE ROOM
SCALE 1:50@A2
AUDITORIUM.NSC

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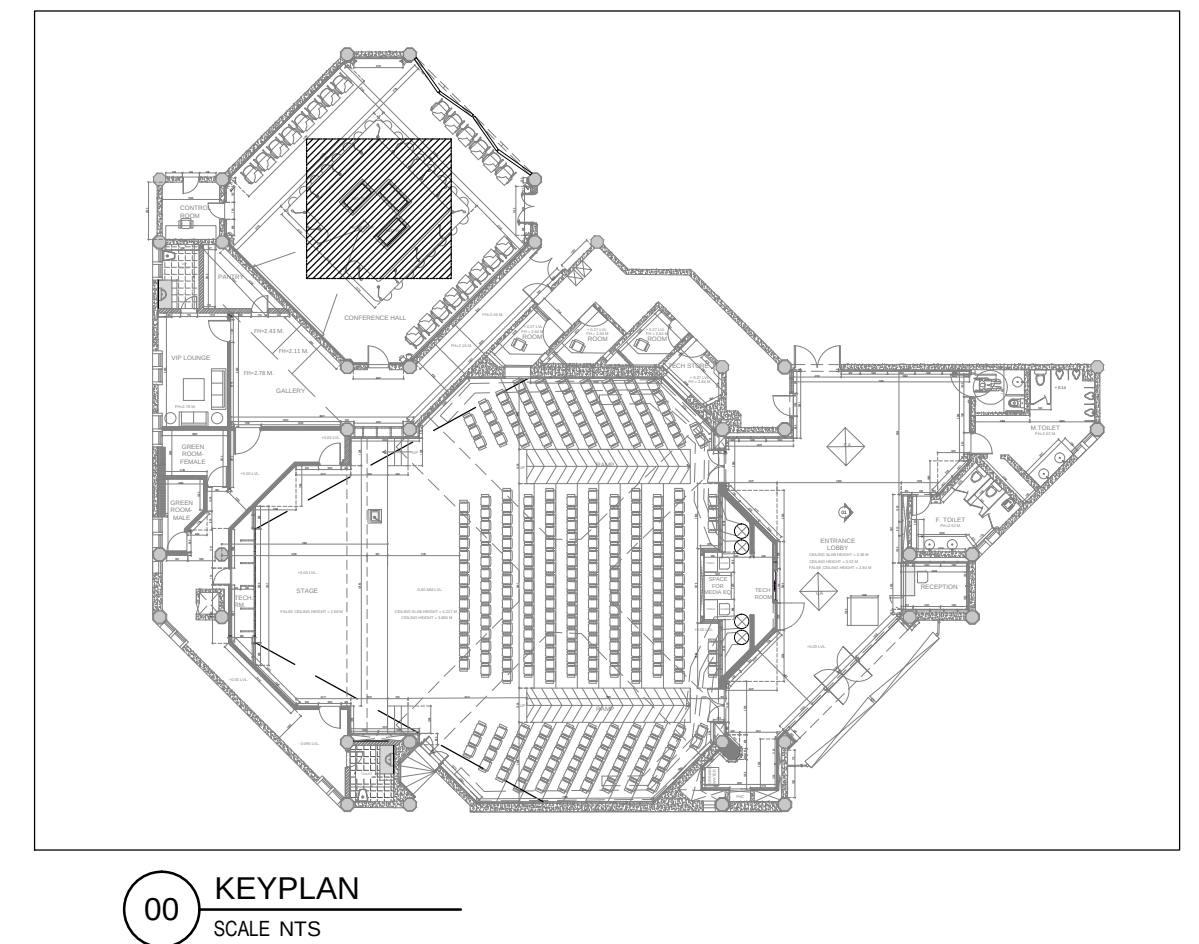
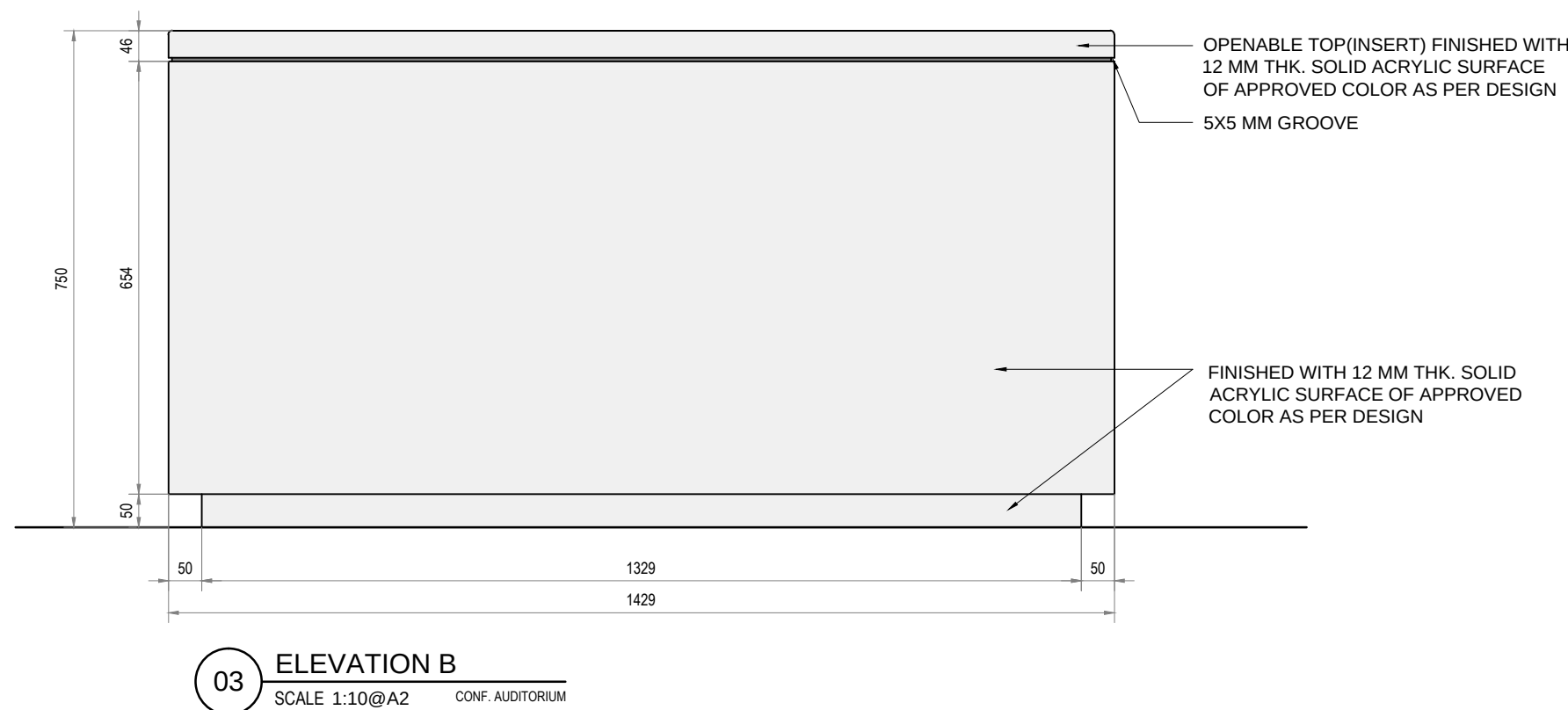
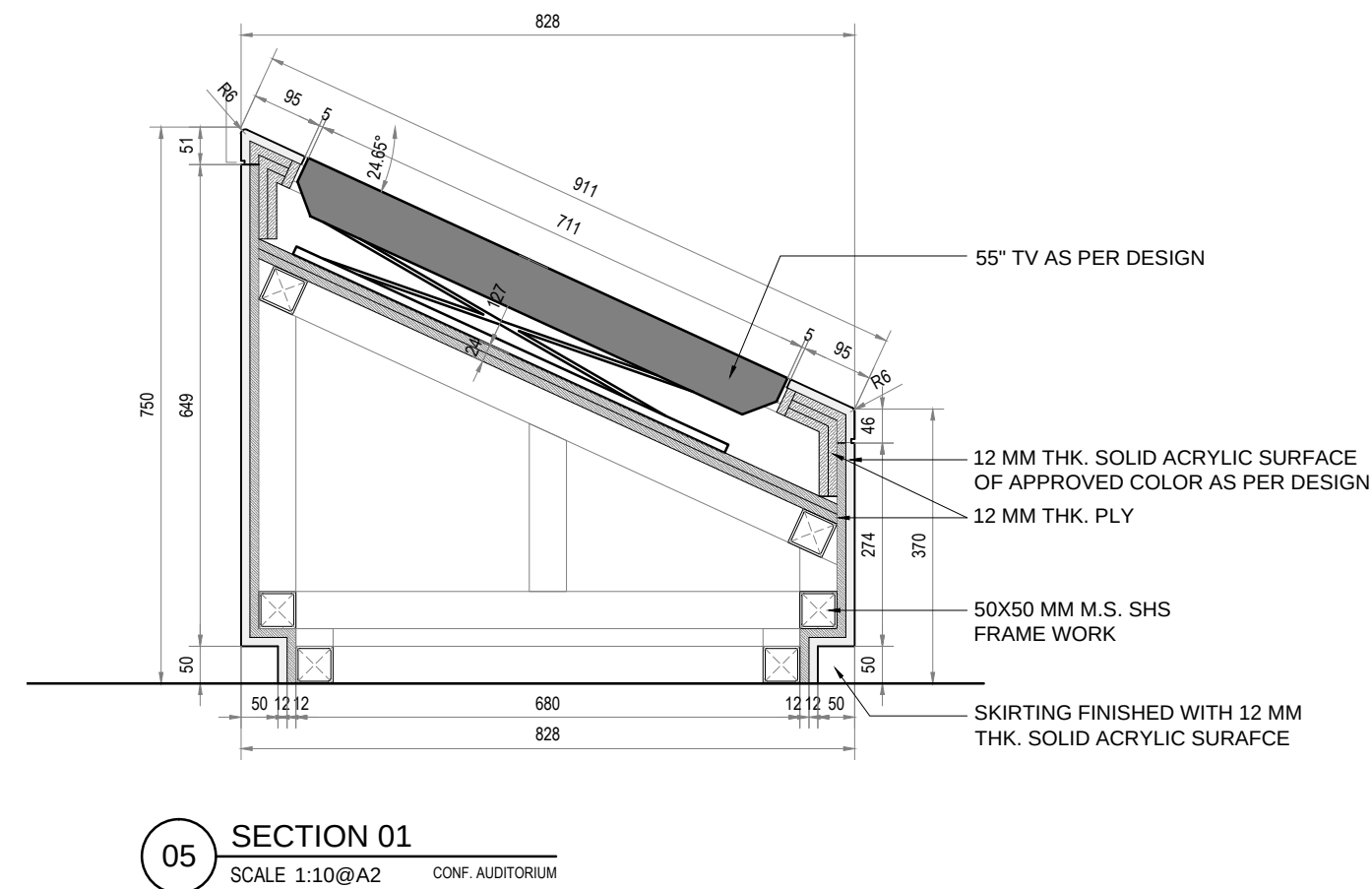
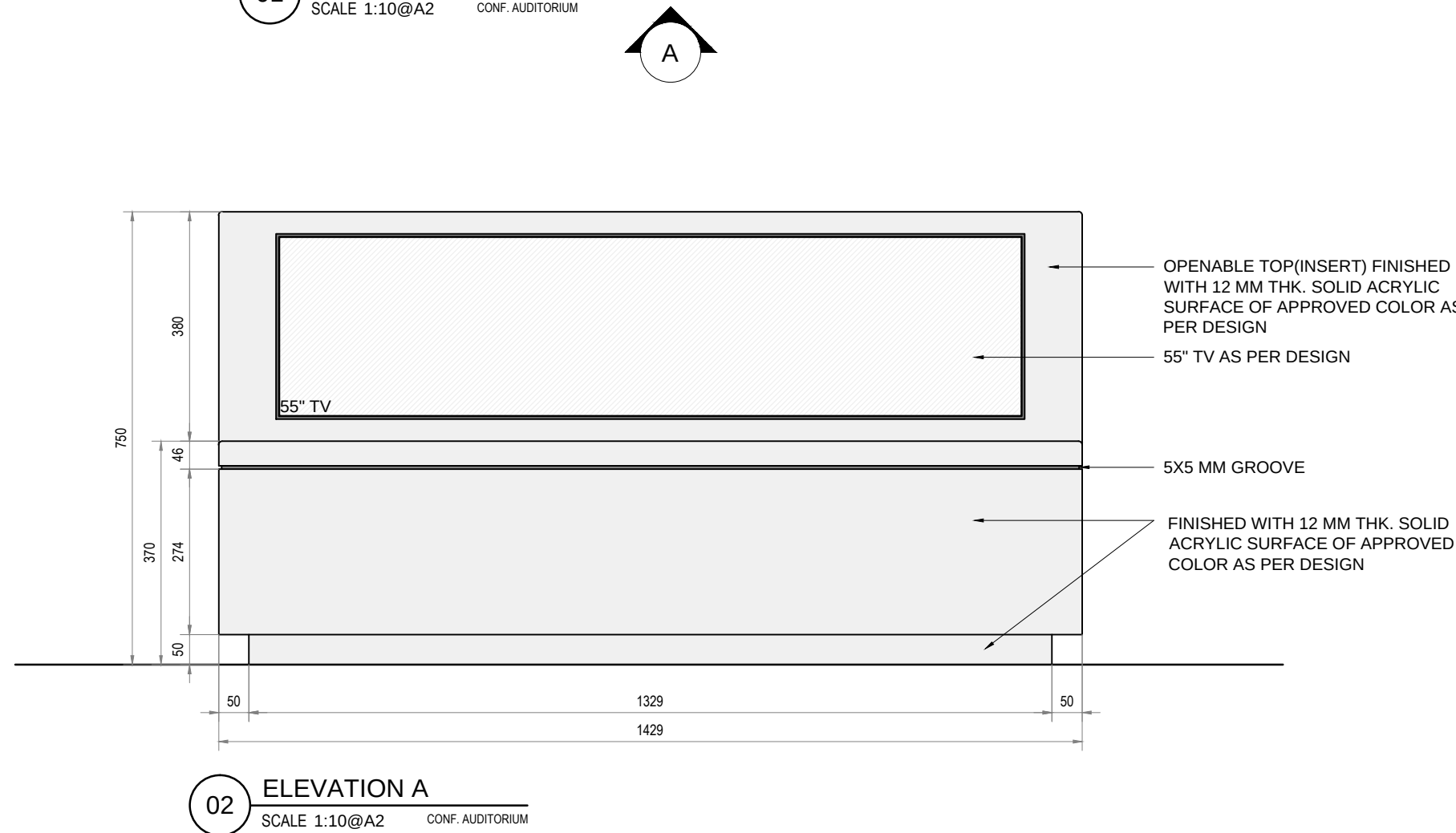
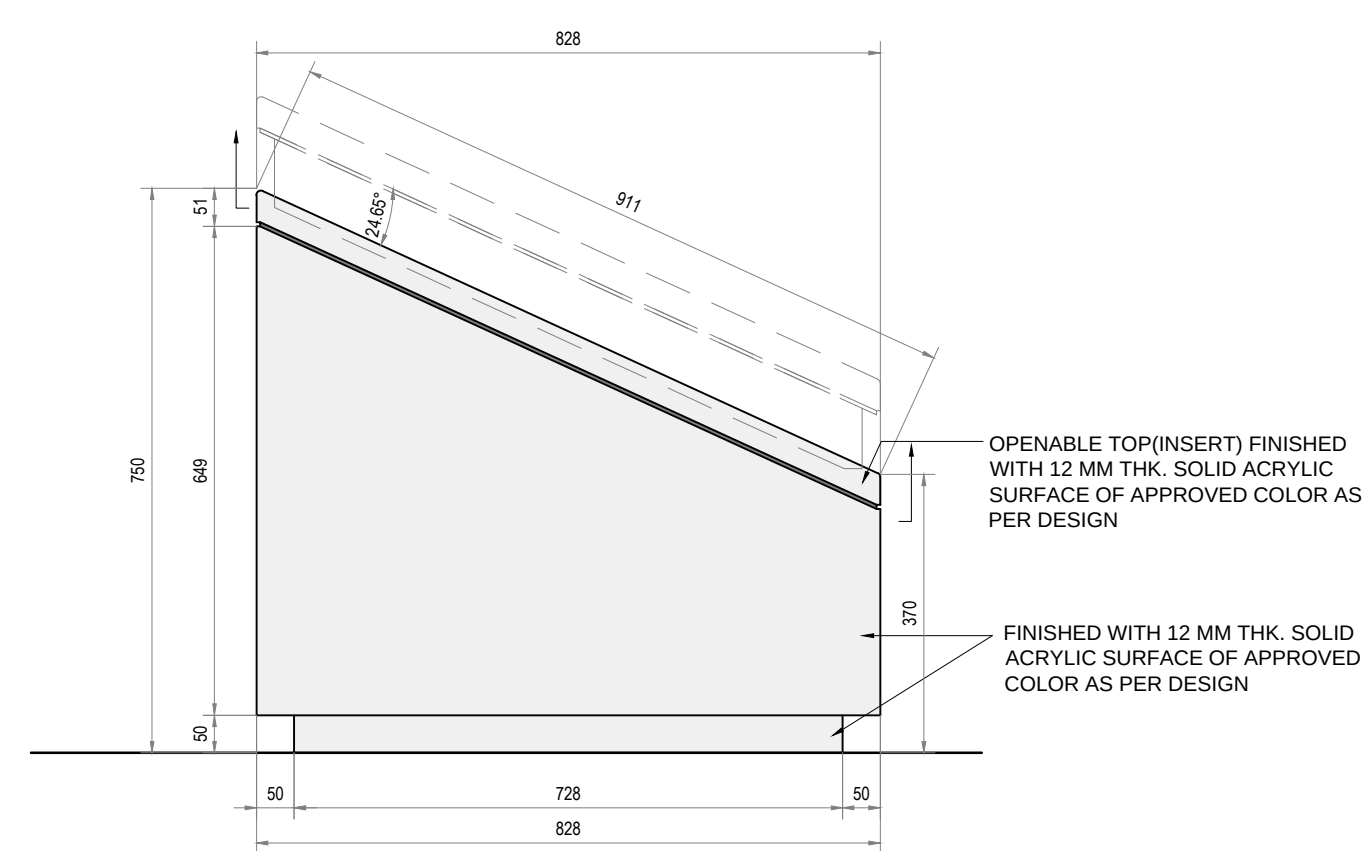
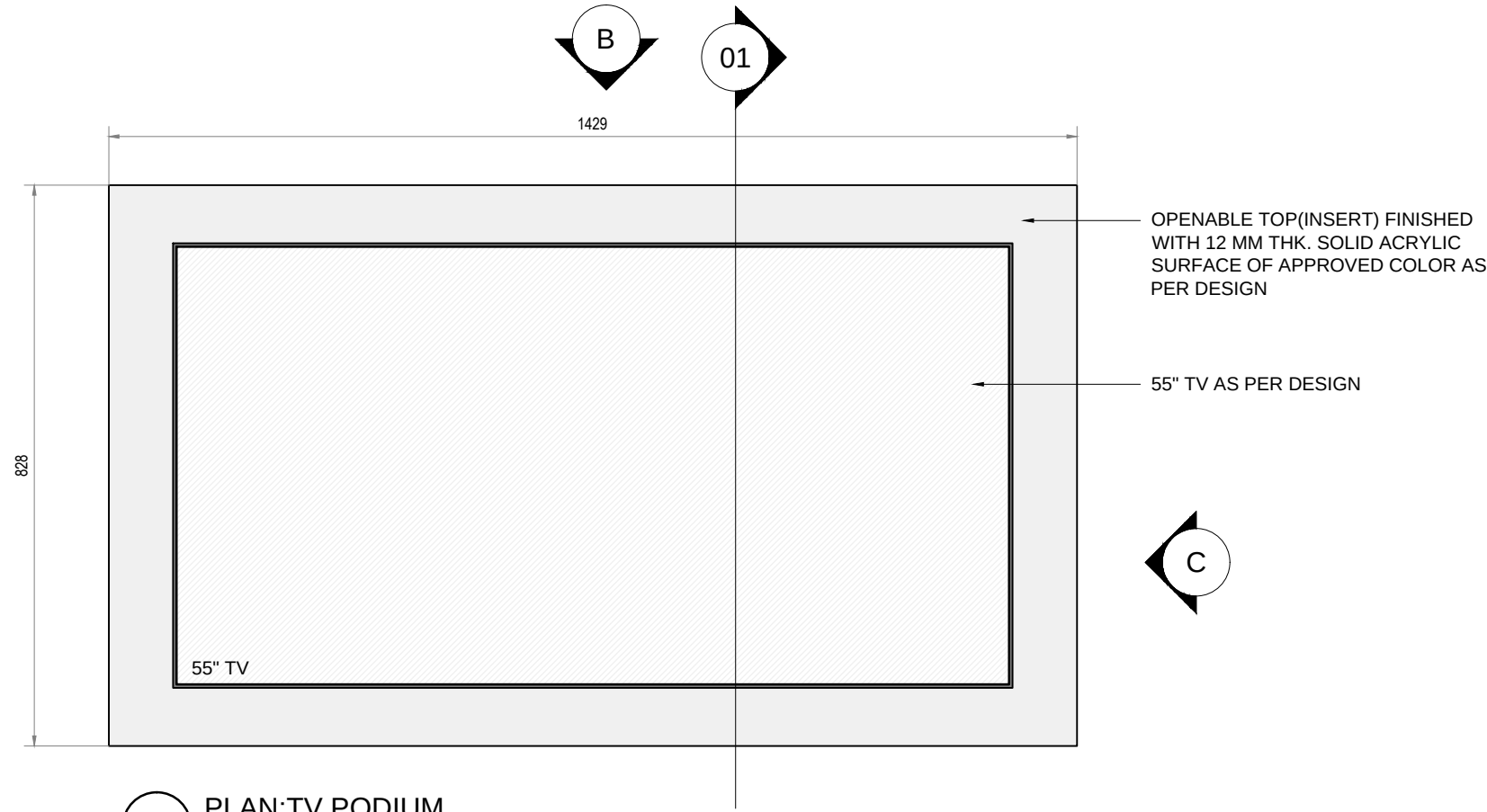
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NSC-A05-08
DATE:
12/06/2025

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AB
SCALE:
1:50@ A2

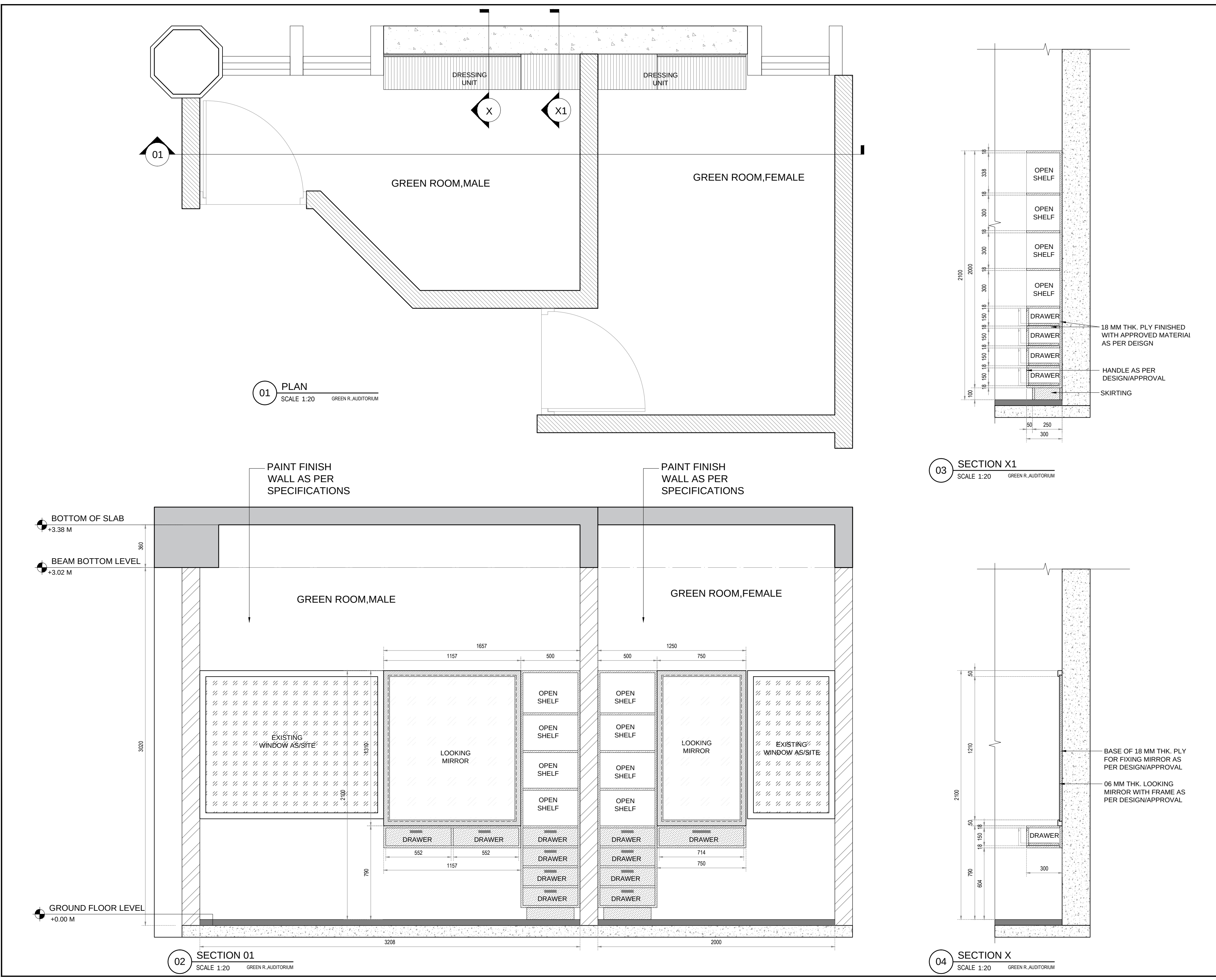
DESIGN BY:
RITIKA
PROJECT NO.
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R01

DRAWING TITLE:
CONFERENCE ROOM LAYOUT



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	R3											
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	R1											
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NEW DELHI

Client

NATIONAL SCIENCE CENTRE

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Key Plan

North

Revision

Date

Remarks

Done by

Drawn By

AB

Checked By

NS

Date

10.06.2025

Drawing No.

NSC-A05-04

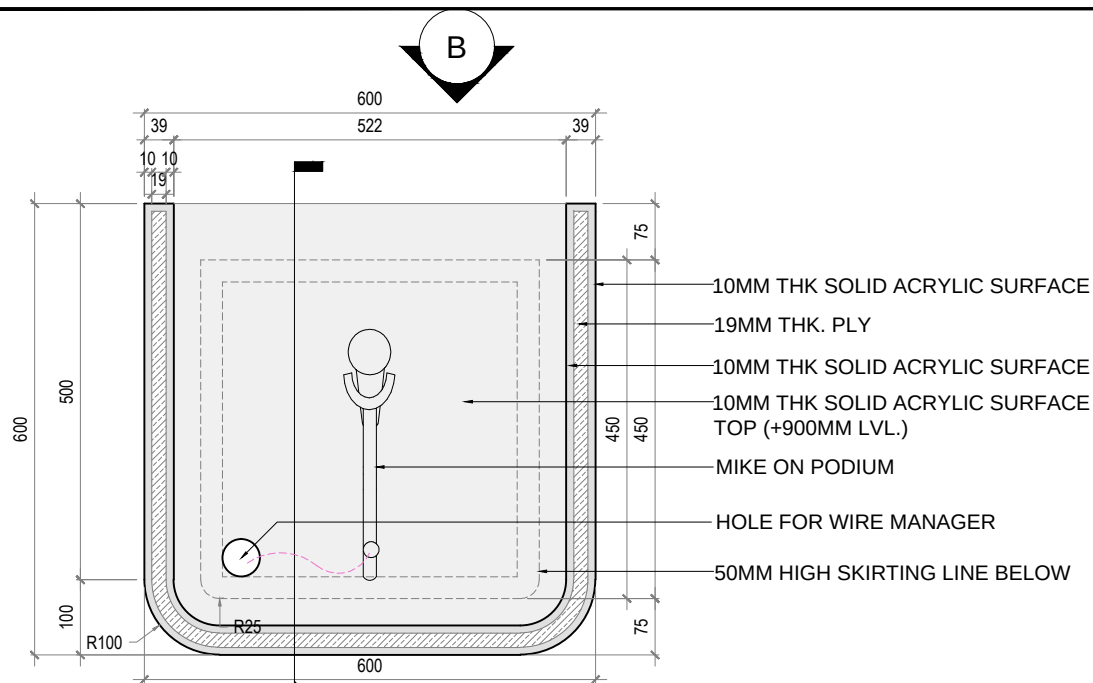
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GREEN ROOM-DRESSING

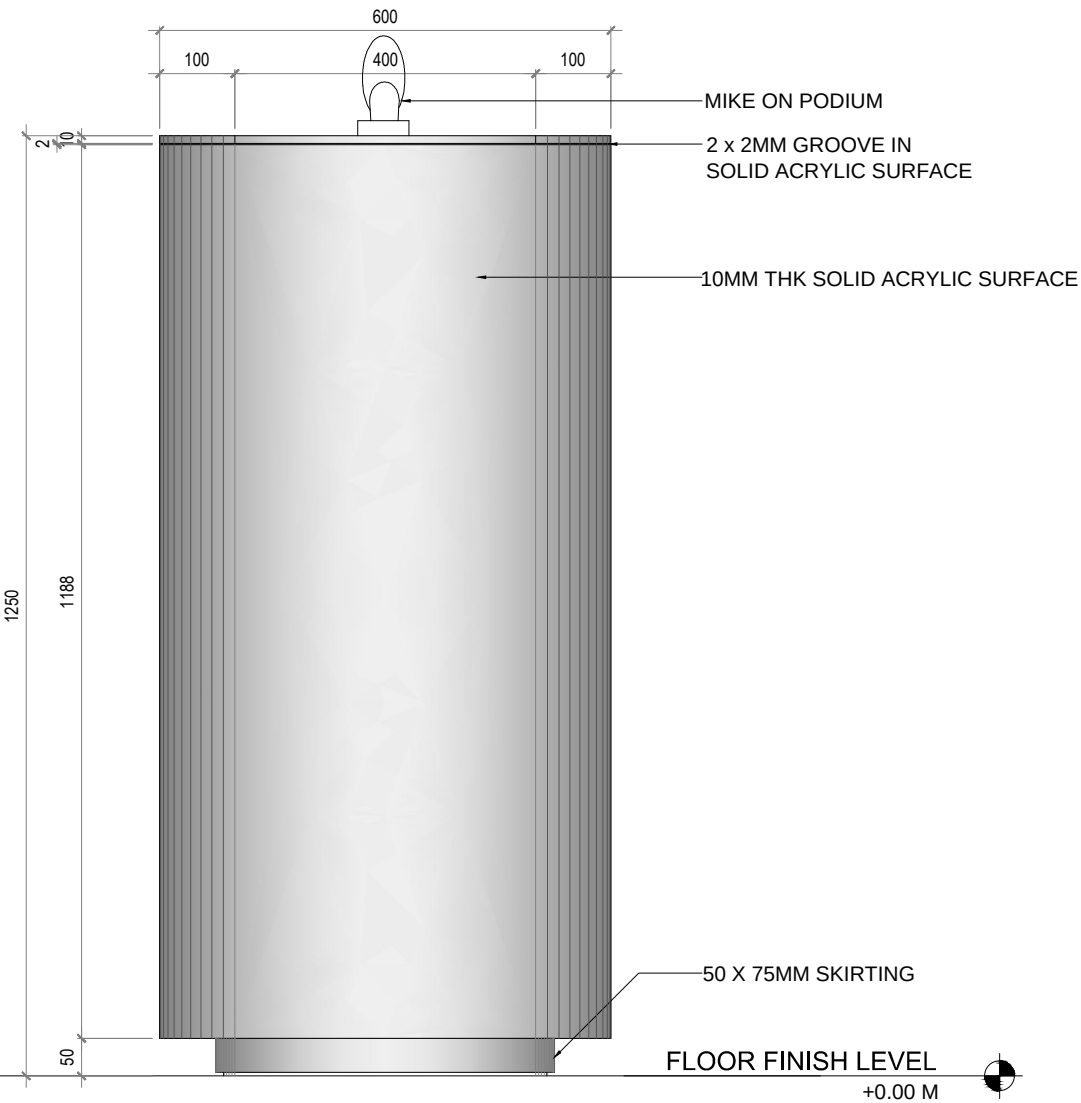
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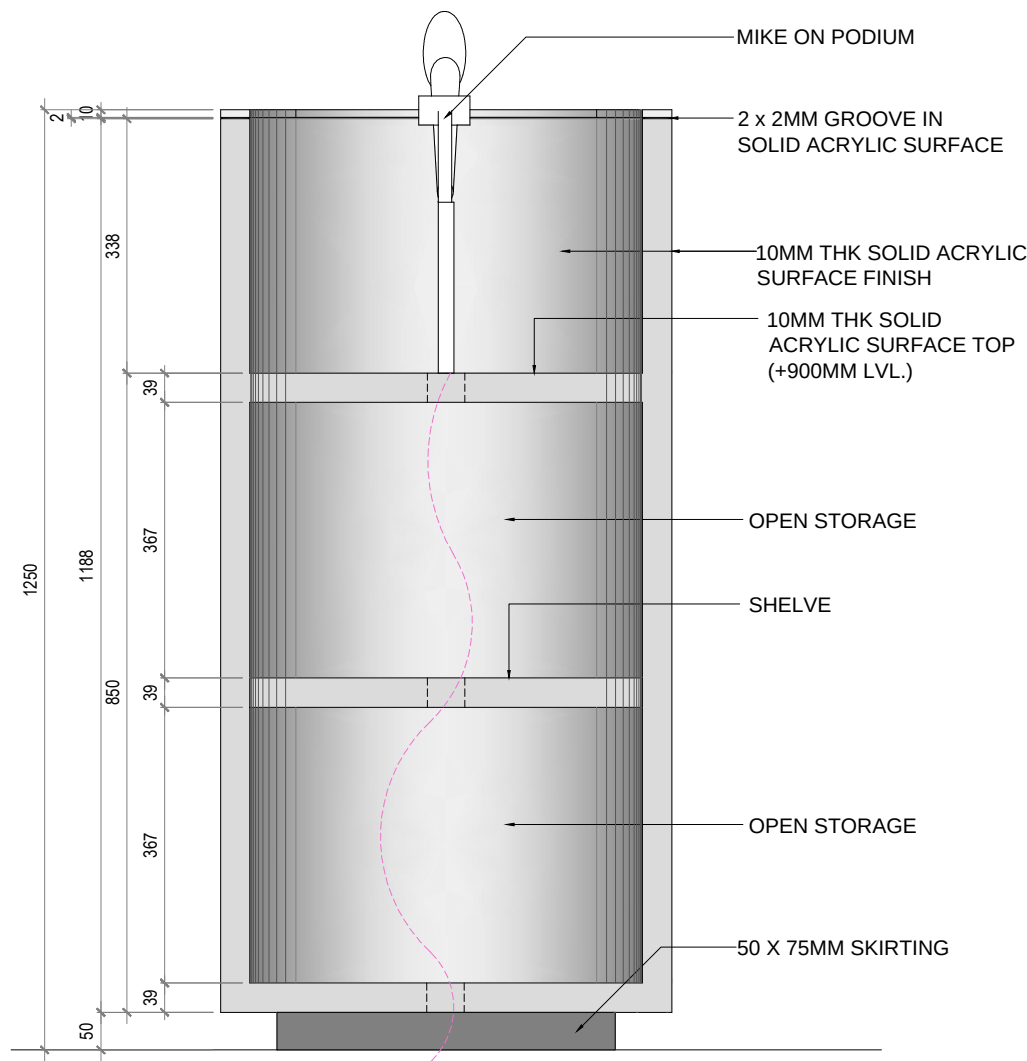
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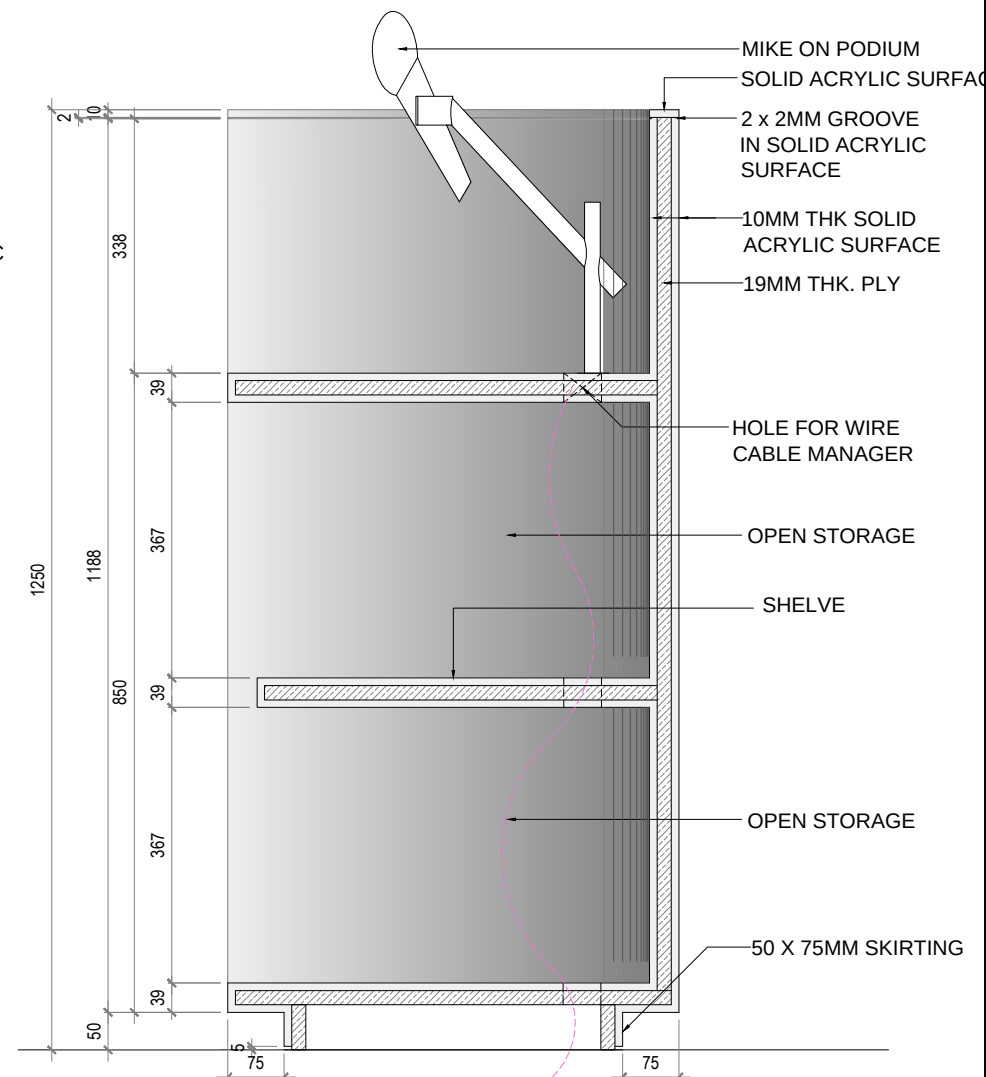
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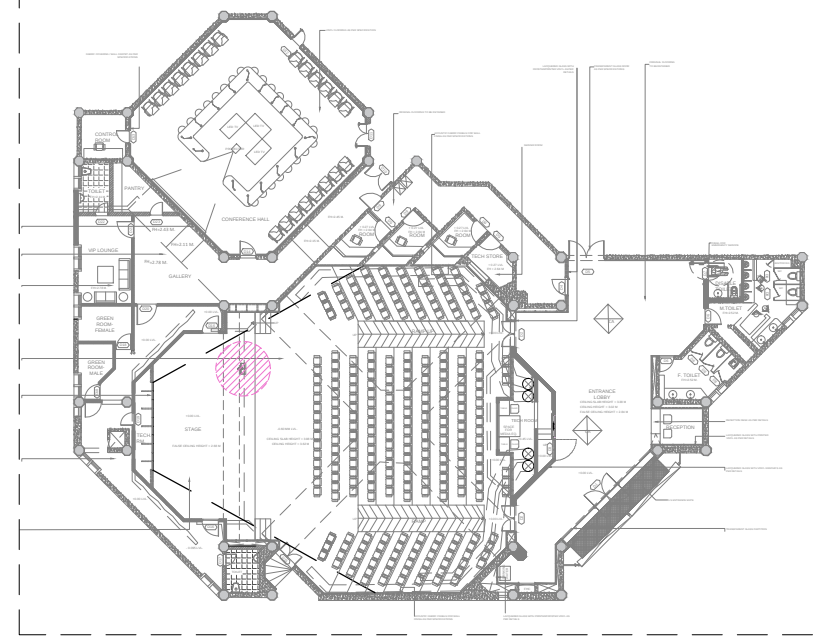
02 ELEVATION: A
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03 ELEVATION: B
SCALE 1:10 SPEAKER PODIUM -AUDITORIUM



04 SECTION: A
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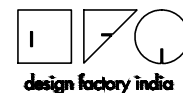


00 KEY PLAN
SCALE NTS SPEAKER PODIUM -AUDITORIUM

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PROJECT NO.
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R01

DRAWING TITLE:
NSC AUDITORIUM
SPEAKER PODIUM