E-TENDER DOCUMENT

For

Construction of Science Park Pathways, Exhibit foundations, Parking space and Driveway at Science Centre (category-II) at Jorbeer Residential Scheme, Block-C, Bikaner, Rajasthan.

TENDER INVITING AUTHORITY

Birla Industrial & Technological Museum
(A unit of National Council of Science Museums)
19A,Gurusaday Road, Kolkata – 700019

Ministry of Culture
Government of India

INSTRUCTIONS TO THE CONTRACTOrs/BIDDErs FOR THE E-SUBMISSION OF THE BIDS ONLINE THROUGH TENDER SITE
https://eprocure.gov.in/eprocure/app

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

REGISTRATION

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

SEARCHING FOR TENDER DOCUMENTS

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

PREPARATION OF BIDS

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

SUBMISSION OF BIDS

1) Bidder should log into the site well in advance for bid submission so that he/she upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.
2) The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.
3) Bidder has to select the payment option as "offline" to pay the Tender Fee & EMD and enter details of DD/any other accepted instrument.
4) Bidder should prepare the TENDER FEE & EMD as per the instructions specified in the tender document. The original should be posted/couriered/given in person to the Tender Processing Section, latest by the last date and time of bid submission or as specified in the tender documents. The details of the DD/any other accepted instrument, physically sent, should tally with the details available in the
5) Scanned copy and the data entered during bid submission time otherwise the Tender will be summarily rejected.
6) The Tender Inviting Authority (TIA) will not be held responsible for any sort of delay or the difficulties faced during the submission of bids online by the bidders The bidder should see that the bid documents submitted should be free from virus and if the documents could not be opened, due to virus, during tender opening, the bid is liable to be rejected
7) Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. The price bid has been given as a standard BoQ format (BoQ_xxxx.xls) with the tender document, then the same is to be downloaded and to be filled by all the bidders Bidders are required to download the BoQ file, open it and complete the green colored (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BoQ file is found to be modified by the bidder, the bid will be rejected. In e-Tendering, intending bidder can quote his rate in figures only. The rate in words, amount of each item and total is generated automatically. Therefore, the rate quoted by the bidder in figures shall be taken as correct. The Comparative Statement is also generated automatically. The Comparative statement and rate quoted by each bidder shall be downloaded. **The manual calculation check of bids and comparative statement shall be final. In case, any discrepancy is noticed, the decision of appropriate BITM authority shall be final and binding.**
8) The server time (which is displayed on the bidders" dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission. The bidders are requested to submit the bids through online e-tendering system to the **Tender Inviting Authority (TIA)** well before the bid submission end date & time (as per Server System Clock).
9) All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized person until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128-bit encryption technology. Data storage encryption of sensitive fields is done.
10) The uploaded tender documents become readable only after the tender opening by the authorized bid openers
11) Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.

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

ASSISTANCE TO BIDDERS

1) Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the **Tender Inviting Authority(TIA), Birla Industrial & Technological Museum, 19 A Gurusaday Road, Kolkata:700019 or may call us on Mob:- 9477345291, 9477345292 or Email at.: director@bitm.gov.in.**
2) Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is **1800-3070-2232.**

NOTICE INVITING TENDER
(ONLINE)

Ref. No. BM- 49 (6) /W/Bikaner/2025 Dated 14.02.2025

1. The **Birla Industrial & Technological Museum** is a constituent unit under the National Council of Science Museums, Kolkata* (*hereinafter referred to as the Museum/Centre).

2. Online e-tender (Percentage Rate Bid) are hereby invited from reputed and experienced Engineering/Technical contractors capable of carrying out the work of **"Construction of Science Park Pathways, Exhibit foundations, Parking space and Driveway at Science Centre (category-II) at Jorbeer Residential Scheme, Block-C, Bikaner, Rajasthan"** with excellent finishing quality. Documents are to be submitted online to the Central Public Procurement Portal website https://eprocure.gov.in/eprocure/app, before the prescribed date & time, using the valid Digital Signature certificate (DSC) obtained from the authorized agencies of NIC & valid GST registration no.

3. The work primarily involves **construction of Science Park Pathways, Exhibit foundations, Parking space and Driveway** and comprises of civil works such as RCC, factory made Paver Block, Kerb stone, Brick work, Plaster, Earth work, Finishing & Plumbing etc. (refer tender drawings & BOQ)

4. The place of work would be at: **Jorbeer Residential Scheme, Block- C, Bikaner, Rajasthan, PIN-334001.**

Important Information & Dates:

Estimated cost of work	Rs.81,41,611/- (including GST & LWC)
EMD	Rs.2,04,000/-
Period of completion	120 (One Hundred and Twenty) Days
Bid Document Published Date	February 14, 2025 (As per portal time)
Bid Document Download Start Date	February 14, 2025 (As per portal time)
Bid Document Download End Date	March 07, 2025 (As per portal time)
Bid submission Start Date	February 14, 2025 (As per portal time)
Pre-Bid Meeting date	N.A.
Bid submission End Date	March 08, 2025 (As per portal time)
Bid Opening (Technical) Date	March 10, 2025 (As per portal time)
Address of Tender Inviting Authority	**Birla Industrial & Technological Museum, 19A, Gurusaday Road, Kolkata-700019, West Bengal.**

5. Time for carrying out the work will be **120 (One Hundred and Twenty) Days** from the **date of issue of Award of Contract (AoC).**

6. **ELIGIBILITY CRITERIA:**

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

6.1 **Financial: -**

6.1.1 **Average Annual Financial Turnover on construction work should be at least 30%** of the estimated cost put to tender during the immediate last three consecutive financial years.

6.2 Technical (For Construction):-

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

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

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

OR

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

OR

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

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

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

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

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

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

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

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

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

i) Scanned copy of Demand Draft / Pay order or Banker`s Cheque of any Nationalised / Scheduled Bank /Insurance Surety Bonds/Fixed Deposit Receipt/ Bank Guarantee from any of the Commercial Bank/ Online payment transfer receipt towards Earnest Money Deposit (EMD) @2.5% of the tender value in pdf format in favour of National Council of Science Museums payable at Kolkata. Details of Bank account is as under: -

Name of the Account Holder	**Birla Industrial and Technological Museum**
Account No.	**10513451673**
IFSC Code	**SBIN0001749**
Branch	**Syed Amir Ali Avenue, Park Circus, Kolkata-700017**
Bank Name	**State Bank of India**

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

iii) Scanned copies of WORK EXPERIENCE CERTIFICATES / COMPLETION CERTIFICATE issued by Govt./ Semi-Govt./ Autonomous/ PSUs and/or Reputed Institution of requisite magnitude with appropriate Authority as per NIT in .pdf format and scanned copies of GST registration and PAN Card, ESI, EPF, and license for engagement of labourers from appropriate authority etc. in .pdf format.

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

v) Duly filled prequalification format as per **Annexure "B" & "C"** with supporting document in pdf format. Affidavit as per **Annexure "D"** in pdf. format

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

vii) Relevant document for **Average Financial Turnover** on construction work which should be at least **30%** of the value of the estimated cost put to tender during the immediate last 03 (three) consecutive financial years.

viii) **Bank Solvency Certificate** of the amount equal to **40 %** of the estimated cost put to Tender.

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

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

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

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

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

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

18. All taxes including GST, labour cess, duties, etc. on materials freight & transit Insurance F.O.R. site in respect of this contract will be payable by the successful tenderer. Nothing extra will be payable for increase in such taxes, duties, Labour Cess, etc. even if imposed or levied either before or after the e-tenders are opened or during currency of contract.

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

20. The successful e-tenderer selected for the work shall deposit requisite performance security/Guarantee for the total tenure of the contract covering the defect liability period and subsequently sign the formal agreement in non-judicial stamp paper of appropriate value within 15 days from the date of issue of Letter of Intent (LoI) to them by the Museum/Centre failing which the LOI for award of work is liable to be cancelled and EMD forfeited.

21. On completing the signing of agreement and other formalities, the selected e-tenderer will be issued an **Award of Contract (AoC**) by the Museum/Centre and given 15 days mobilisation time which shall be counted from the date of issue of the **AoC**. Within the mobilisation time the tenderer must scrutinise all the tender drawings, CPM/PERT/BAR CHART, specifications, etc. as applicable and obtain clarifications from the Architect wherever necessary and submit a BAR CHART to the Museum/Centre. During the mobilisation time, the tenderer shall also mobilise all his resources including men and materials, obtain the supply of water and electricity necessary for construction, erect a temporary cement go-down at site. ***The date of commencement of work shall be the date of issue of AoC***.

22. The validity period of the e-tender shall be **at least 180 days** 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.

23. **In case EMD is submitted in the form of Bank Guarantee, the validity of the same should be at least 45 days beyond the bid validity period.**

Appendix to NIT

1. SUMMARY CONDITIONS OF CONTRACT

Defect Liability Period	:	One year from the date of virtual completion as certified by the Museum/Centre.
Time for Completion	:	**120 (One Hundred and Twenty) Days** from the date of **AoC** as per NIT Clause 5 read with NIT Clause 21.
Minimum value of work for Interim Certificate/Payment.	:	10 % of the tendered value or less at the discretion of the Museum/Centre but not more than one running bill in a month.
Earnest Money to be deposited with the tender	:	**Rs. 2,04,000/-** (being 2.5% of the estimated value of tender, rounded off to nearest thousand).
Liquidated damages for non-completion of work in time (Clause 39d of the general conditions of contract).	:	One percent per week of the total cost of the work awarded subject to a maximum of 10% of gross value of work done or cost of the work awarded whichever is greater.
Liquidated damages for insufficient progress of work (Clause 39c of the general conditions of Contract).	:	Half percent per week of the total cost of the work awarded subject to a maximum of 10% of gross value of work done or cost of the work awarded whichever is greater.

2. RETENTION MONEY FOR INTERIM PAYMENT

	:	**Total:- 10% as per the following detail**
i) Performance Security/Guarantee	:	3% of tendered value (After adjusting EMD deposited with tender) to be deposited on issue of LoI before signing of agreement through Demand Draft/Banker's cheque/ Bank Guarantee from any of the Commercial Bank/ online bank transfer/ Insurance Surety bonds/ fixed deposit receipt issued by nationalized / scheduled bank to be drawn or duly pledged as the case be, in favour of the **Birla Industrial and Technological Museum, payable at Kolkata.**
ii) Security deposit	:	7 % of the value of work done to be recovered from R.A. Bills so as to make up 10% of gross value of work done including Performance Guarantee.
Period of submitting final bill by the successful e-tenderer	:	3 months from the date of virtual completion.

FORMAT FOR BANK GUARANTEE BOND
(For EMD only)

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

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

3. We, (Name of Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period as mentioned in Clauses 20 and 21 of the said NIT (including appendix) or/and the period stipulated under clause 22 and 23 for deciding the e-tender and that it shall continue to be enforceable till the dues of the Museum/Centre under or by virtue of the said NIT (including appendix) have been fully paid and its claims satisfied or discharged or the Museum/Centre certified that the terms and conditions of the said NIT (including appendix) have been fully and properly honoured and carried out by the said prospective e-tenderer for participation in the e-tender and accordingly discharges the guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the periods stipulated above, we shall be discharged from all liability under this guarantee thereafter.

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

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

Dated, the …….. day of ……..…….

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

FORMAT FOR BANK GUARANTEE BOND *

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

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

…….....…….. (hereinafter called "The Museum/Centre") having agreed to exempt ……..……..…… ..
……..
(Hereinafter called the "successful e-tenderer' from the demand, under Clause 20 of the Notice inviting E-tender No. …… dated …… and/or the terms and conditions of an Agreement dated …….. Made between the Museum/Centre and successful e-tenderer(s) …… for ……..(hereinafter called "the said agreement") of Performance guarantee /Earnest Money/Retention Money for the due fulfilment by the said Contract(s) of the terms and conditions contained in the said NIT or the conditions of (execution of work) or the agreement on production of a bank guarantee of Rs…… (Rupees ……
…… only), We ……..……..(hereinafter referred to as "The Bank") do hereby undertake to pay to the Museum/Centre an amount not exceeding Rs……..…….. against any loss or damage caused to or suffered or would be caused to or suffered by the Museum/Centre by reasons of any breach by the said successful e-tenderer of any of the terms or conditions contained in the said NIT, the conditions of Contract or the Agreement.

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

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

3. We, ……..…….. further agree that the guarantee herein contained shall remain in full force and effect during the period as mentioned in Clause 20 of the said NIT read with clause 32 of the conditions of contract, or the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till the dues of the Museum/Centre under or by virtue of the said NIT or the conditions of contract or the Agreement have been fully paid and its claims satisfied or discharged or the Museum/Centre certified that the terms and conditions of the said NIT or the conditions of contract or the Agreement have been fully and properly honoured and carried out by said successful e-tenderer and accordingly discharges the guarantee.

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

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

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

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

   Dated, the ……. day of ……

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

FORMAT FOR LETTER OF INTENT(LOI)*

…… Date…….

(Mention file number)

Sub: Letter of Intent for the work of ……

Dear Sirs,

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

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

You are, therefore, requested to sign an agreement as per standard format already printed in the e-tender documents purchased by you while e-tendering for this job. For this purpose, you are requested to deposit requisite Performance security send us a non-judicial stamp paper of appropriate value for preparing the contract Agreement within 15 days from the date of this letter for subsequent issue of **AoC.**

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

Please note that all formalities for signing of Contract agreement the work has to be completed within 15 days from the date of issue of this LoI.

Thanking you,

Yours faithfully,

Sd/-
CoA/Dy.CoA/S.O.(Admn.)

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

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

FORMAT FOR ARTICLES OF AGREEMENT

INSTRUCTIONS (not to be typed in Agreement)

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

ARTICLES OF AGREEMENT made at …….

…….
(Place)

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

between the ……

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

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

and……
……

……
……
(name of the successful e-tenderer)

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

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

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

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

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

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

……

(exact amount in words)

the amount being 3% of tendered value (after adjusting EMD) rounded off to the nearest thousand) with the Museum Centre as Initial Security/Performance 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 5 and 21) 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 as attached with the tender or as submitted by the successful tenderer herewith and forming a part of this agreement. At any stage during execution, if any work lags behind the target as indicated in the CPM/PERT/BAR CHART for reasons directly attributable to the successful e-tenderer, he shall pay or allow the Museum/Centre to deduct from any money due to him a liquidated damage as per Clause 39 of the conditions of contract.

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

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

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

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

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

Signed by for and on behalf of the Museum/Centre ……..
……
(CoA/Dy.CoA/S.O.(Admn.))

In the presence of

1. ……

Seal *(Dy.F&A./S.O.(F&A))*

2. ……
(Project Co-coordinator/D.S.O./Engineer)

Signed by the said Successful e-tenderer …….

In the presence of

(1)……

Seal

(2)……..

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

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

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

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

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

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

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

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

2. ENGINEER

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

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

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

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

3. SCOPE OF THE CONTRACT

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

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

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

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

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

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

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

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

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

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

4. SCOPE OF WORK

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

5. INSPECTION OF SITE

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

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

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

6. WATER, ELECTRICITY AND CEMENT GODOWN

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

7. SUCCESSFUL E-TENDERER TO PROVIDE EVERYTHING NECESSARY

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

The Successful e-tenderer shall supply, fix and maintain at his cost during the execution of any works, all the necessary centering, scaffolding, staging, planking, timbering, shuttering, shoring, pumping, fencing, boarding, watching and lighting by night as well as by day required for the proper execution and protection of the public and the safety of any adjacent roads, streets, cellars, vaults, eves, pavement, walls, houses, buildings and all erections, matters or thing, and they shall take down and remove any or all such centering, scaffolding, etc. as occasion shall require or when ordered to do so and shall fully reinstate and make good all matters and all things disturbed during the execution of the works to the satisfaction of the Engineer before a Virtual Completion Certificate is issued.
The Successful e-tenderer shall make his own arrangements for laying temporary water and electrical power lines including excavation if necessary so as not to cause any obstructions along locations approved by the Engineer. The water supply lines, hose pipes, electrical lines, underground or overhead etc. belonging to them should not cause damage to the property of the museum/centre including gardens, plants, flowers, hedges, flower pots in the Campus etc. Any expenditure incurred by the museum/centre due to damage so caused shall be debited to the Successful e-tenderer's account. It is their complete responsibility to ensure that the garden area and its approaches and other areas not allocated to them are not encroached upon by their men and materials. They have to

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

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

8. DRAWINGS, DESIGNS ETC.

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

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

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

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

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

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

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

9. REFERENCE DRAWINGS & SHOP DRAWINGS

Reference Drawings

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

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

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 Panelling, 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 appointed and maintained by the Successful e-tenderer at his own expense.

b. Inspection and Testing of Materials

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

18. FAULTY MATERIALS AND WORK

(a) The Engineer shall during the progress of the work has power to order in writing from time to time the removal from the work, within such reasonable time or times as may be specified in the order, to any materials and/or Workmanship which in

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

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

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

19. ACCESS

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

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

20. DEFECT LIABILITY PERIOD AND DEFECTS AFTER COMPLETION

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

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

21. OPENING OF WORK

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

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

22. WORK IN SUBSOIL WATER/RAIN WATER/WATER

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

23. HEIGHTS

Successful e-tenderer's rates shall include lifts upto 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 multifloor heights, which may require multiple staging, scaffolding, centering and shuttering. Since the payments will be made to the successful e-tenderer at net quoted rates, irrespective of the heights involved the e-tenderers must see and study the drawings carefully before e-tendering their rates.

25. GLAZING

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

26. WOOD WORK

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

27. SITE CLEARANCE AND CLEAN UP

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

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

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

28. RATES

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

29. QUANTITIES

All the quantities given in schedule of quantities are provisional.

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

30. ESCALATION CLAUSE

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

31. SECURED ADVANCE

(a) The Successful e-tenderer shall not be entitled to be paid for the materials brought to site, which remains unused or unfixed. The Engineer, with the concurrence of the Museum/Centre may pay an advance upto 85% of the cost of such material as

calculated from the respective e-tender item. When in any certificate, of which the Successful e-tenderer has received payment the value of material at site has been included, such materials shall become the property of the Museum/Centre but the Successful e-tenderer shall be liable for any loss or damage to any such material. They shall furnish an indemnity bond in the prescribed form along with their claim for advance against materials brought to site for bonafide use in specific items under the schedule of quantities.

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

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

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

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

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

32. RETENTION OF MONEY

This shall mean and be 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 Commercial 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. Provided all defects are removed and the retention money is not forfeited or has not become liable to be forfeited under this contract.

100% of the retention money without interest will be refunded to the successful e-tenderer **after satisfactory completion of one year (Defect Liability Period) from the date of virtual completion of work and after the successful e-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 the Birla Industrial and Technological Museum payable at KOLKATA.

33. AUTHORITIES, NOTICES AND PATENTS

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

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

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

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

34. DEVIATIONS

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

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

35. PRICE FOR DEVIATIONS

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

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

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

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

36. MEASUREMENTS

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

37. PREPARATION OF RUNNING AND FINAL BILLS

Minimum value of work for interim certificate/payment shall be 10% of the tendered value (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 upto the extent of 75% of net final bill amount may be paid to the successful e-tenderer, with the approval of the Engineer at his direction even after the completion date is over.

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

38. CERTIFICATES AND PAYMENTS

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

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

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

(d) All intermediate payments shall be recorded as payments by way of advance against the final payment only and not as payment for work actually done and completed. The final bill shall be submitted by the Successful e-tenderer within 3 months of the date fixed for completion of the work. The measurement of the work taken by the Engineer or his representatives after one week's notice to the Successful e-tenderer shall be final and binding on him unless objected to within one month of their being recorded in the measurement books.

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

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

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

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

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

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

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

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

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

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

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

40. EXTENSION OF TIME

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

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

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

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

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

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

(f) in case of the total value of the work exceeds the total value of the e-tender owing to deviation in quantities or extra items, the successful e-tenderer will be entitled to ask for extension of time in proportion to the increased value of work

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

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

41. SUSPENSION OF WORK BY THE SUCCESSFUL E-TENDERER

If the successful e-tenderer suspends the works without obtaining extension of time or in the opinion of the Engineer neglects or fails to proceed with due diligence in executing his part of the contract or if he makes default more than once in the manner mentioned in Clause 20 above the Museum/Centre or the Engineer shall have power to give notice in writing to the successful e-tenderer requiring that the works be proceeded with reasonable speed and output must be commensurate with the CPM/PERT/BAR CHART. Such notice shall specify the act of default on the part of the successful e-tenderer. After such notice has been given the Successful e-tenderer shall not be at liberty to remove from the site of work or from any ground continuous thereto any plant or materials belonging to him which had been placed thereon for the purpose of the work, and the Museum/Centre shall have a lien upon all such plants and materials to subsist from the date of such notice being given, until the notice have been complied with. Provided always that such lien shall not under any circumstances subsist after the expiration of thirty-one days from the date of such notice being given, unless the

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

42. DETERMINATION OF CONTRACT BY THE MUSEUM/CENTRE

If the successful e-tenderer goes into liquidation, whether voluntary or compulsory or shall make an assignment or a composition for the benefit of the greater part, or shall enter into a Deed of Agreement with its creditors or if the Receiver of the Successful e-tenderer shall be unable, within fourteen days after notice to him requiring him to do so, to show to the reasonable satisfaction of the Museum/Centre that he is liable to carry out and fulfil the contract and if so required by the Museum/Centre to give reasonable security therefore or if the successful e-tenderer shall suffer execution to be issued or shall suffer any payment under this contract to be attached by or on behalf of any of the creditors or the Successful e-tenderer or shall assign, charge or encumber this charge or encumber this contract thereunder or shall neglect or shall fail to proceed to perform all or any of the act, matters or things by the contract, to be observed and performed by the successful e-tenderer for three clear days after written notice shall have been given the successful e-tenderer in manner, matter hereinafter mentioned, requiring the successful e-tenderer to observer perform the same or shall use improper material or workmanship in carrying on the works or shall in the opinion of the Engineer not exercised such due progress as stipulated in the enclosed CPM/PERT/BAR CHART forming part of this contract which would enable the works to be completed within the time agreed upon or shall abandon the contract, then, and in any of said cases, the Museum/Centre may notwithstanding any previous waiver, determine the contract by a notice in writing in which case the retention money (including the earnest money and the initial security deposit) and whether paid in one sum or deducted by instalment shall stand forfeited and be absolutely at the disposal of the Museum/Centre. The Successful e-tenderer shall have no claim or compensation for any loss sustained by him by reasons of his having purchased or procured any materials or entered into any engagements or made advances on account of or with a view to the execution of the work or the performance of the contract. The successful e-tenderer shall not be entitled to recover or be paid any sum for any work actually performed under the contract unless and until the Engineer will have certified in writing the performance of such work and the value of work payable in respect thereof and the successful e-tenderer shall only be entitled to be paid the value so certified. The certificate of the Engineer shall be based on measurements taken by him or under his supervision and with due notice to the Successful e-tenderer and on rates in the priced schedule or as subsequently communicated by the Engineer with the approval of the Museum/Centre, under this agreement except for arithmetical errors, shall be final and conclusive. The Successful e-tenderer must remove his plant, materials, scaffolding etc. from the site within 10 days (ten days) of the receipt of the notice from the Museum/Centre after which they will vest in the Museum/Centre who may, dispose them off as per Clause 41 by sale or auction on account of and at the risk of the successful e-tenderer who will have no claim for loss or compensation on this account.

43. TERMINATION OF CONTRACT BY SUCCESSFUL E-TENDERER

If payment of the amount payable by the Museum/Centre under the certificate of interim payment issued by the Engineer in accordance with clause 38 shall be in arrears and unpaid for sixty days after notice in writing requiring payment of the amount shall have been given by the Successful e-tenderer to the Museum/Centre in manner hereinafter mentioned or if works be stopped for six months under the order of the Museum/Centre for any reason not connected with any default on the part of the Successful e-tenderer or by any injunction or other order of any court of law made for any reasons not connected with any such default on the part of the successful e-tenderer then and in any of the said cases the successful e-tenderer shall be at liberty to terminate the contract by notice in writing to the Museum/Centre and he shall be entitled to recover from the Museum/Centre payment for all works executed and for useful materials (but not plants) purchased for the purpose of the contract and is brought to the site. In arriving at the amount of such payment, the net rates contained in the successful e-tenderer's e-tender shall be followed, or where the same may not apply, rates proportional to the prices therein contained. Rates for materials may be determined by the Engineer on actual vouchers produced by the successful e-tenderer and/or prevailing market rates at the discretion of the Engineer. The Successful e-tenderer shall not be entitled to recover or be paid any sum for any work actually performed under the contract, unless and until the Engineer has certified in writing the performance of such work and the value payable in respect thereof and the successful e-tenderer shall only be entitled, to be paid the value so certified. The certificate of the Engineer shall be based on measurements taken by him or under his supervision after due notice to the successful e-tenderer and shall be final and conclusive except for arithmetical errors The successful e-tenderer must remove his plant, materials, scaffolding etc. from the site within ten days or such time as may be extended by the Museum/Centre in writing, from the receipt of the notice from the Museum/Centre after which they will vest in the Museum/Centre who may dispose

them off as per Clause 42 by sale or auction on account of and at the risk of the successful e-tenderer who will have no claim for loss or compensation on this account.

44. ARBITRATION

(a) Except where otherwise provided in the contract all questions and disputes relating to the meaning of the specifications, design, drawing, and instructions hereinbefore mentioned and so to any question, claim right, matter or thing whatsoever, in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works, or the execution of the same whether arising during the progress of the work or after the completion or abandonment thereof but excluding disputes on material and workmanship as per Clause 17 & 18 which is binding on both parties, shall be referred to the sole arbitration of a person nominated by the Director General, National Council of Science Museums and if the former is unable or unwilling to act to the sole arbitration, of some other person appointed by the Director General, NCSM willing to act as such arbitrator. The submission shall be deemed to be submission to Arbitration under the meaning of the Arbitration & Reconciliation Act, 1996 or any statutory modification or re-enactment thereof for the time being in force. The award of arbitrator so appointed shall be final, conclusive and binding on all parties to this contract.

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

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

45. COMPENSATION

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

46. WORK ON HOLIDAYS

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

47. WORK SUPERVISOR AND FOREMAN

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

48. DISMISSAL OF WORKMEN ETC.

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

49. ASSIGNMENT OR SUBLETTING OR BRIBES

(a) This contract shall not be assigned or sublet without the written approval of the Museum/Centre. If the Successful e-tenderer shall assign or sublet this contract, or attempts to do so or become insolvent or commence insolvency proceedings or make any composition with his creditors or attempt to do so, or if any bribe, gratuity, gift, loan, pre-requisite award, reward or advantage pecuniary or otherwise, shall either directly or indirectly be given, promised or offered by the Successful e-tenderer, any of his servants or agents to any officer of the Museum/Centre or to person who shall become in any way directly or indirectly interested in the Contract, the Museum/Centre may thereupon by notice in writing rescind the contract and the retention money of the Successful e-tenderer shall thereupon stand forfeited and be absolutely at the disposal of the Museum/Centre, and the same consequences shall ensure as if the contract had been rescinded under Clause 42 thereof and (in addition) the Successful e-tenderer shall not be entitled to recover or to be paid for any work therefore actually performed under the contract.

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

50. OTHER PERSON ENGAGED BY MUSEUM/CENTRE

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

51. OTHER AGENCIES AND PROVISIONAL SUMS

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

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

52. LABOUR WAGES AND REGULATIONS

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

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

53. INSURANCE FOR DAMAGE TO PERSON AND PROPERTY

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

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

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

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

(e) The Museum/Centre shall be at liberty and is hereby empowered to deduct the amount of any damages, compensation cost, charges and/or expenses

(f) arising or ascertaining from or in respect of any such claim and/or damages as aforesaid from any sum, or sums due to, or become due to the Successful e-tenderer.

54. NOTICE

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

55. APPOINTMENT OF APPRENTICES AS PER APPRENTICES ACT

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

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

(i)	Brick Layer	: One apprentice for every 7 person engaged in this category
(ii)	Building Construction	: One apprentice for every 7 person engaged in this category
(iii)	Carpenter	: One apprentice for every 7 person engaged in this category
(iv)	Surveyor	: One apprentice for every 14 person engaged in this category

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

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

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

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

The Successful e-tenderer shall comply with the provision of Apprentices Act 1961 and Rules and Orders issued hereunder from time to time.
If the Successful e-tenderer fails to do so, his failure will be deemed to be a breach of contract and the Museum/Centre reserves the right to cancel the contract. The Successful e-tenderer also shall be liable to any pecuniary liability arising on account of any violation by him of the provisions of the Act.

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

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

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

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

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

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

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

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

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

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

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

65. BRICK WORK (for civil works only)

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

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

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

67. EARTHWORK

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

Annexure – 'A'

(Format for Declarations & Undertaking to be typed on bidder agency's letterhead and to be submitted in Part –I (TECHNICAL ENVELOPE) of the e-tender document)

DECLARATION -1

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

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

Place:

DECLARATION -2

I/We hereby declare that I/we have not quoted any extra condition along with the Part-II (FINANCIAL ENVELOPE) of the e-tender & my quoted rate is inclusive of applicable GST& LC

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

I/we also undertake that the EMD amount payable shall be either transferred online or the physical EMD instrument shall be deposited by me/us at the office of the Birla Industrial and Technological Museum inviting the e-tender before the bid opening date, otherwise Birla Industrial and Technological Museum may reject the bid and also take action to withdraw my/our enlistment or debar me/us from further participation in tenders of NCSM or its constituent units.

Date:
Place:

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

DETAILS TO BE FURNISHED FOR **SIMILAR COMPLETED WORKS** DURING LAST SEVEN YEARS ENDING PREVIOUS DAY OF THE LAST DATE OF SUBMISSION OF TENDERS

Sl. No.	Details	Work -1	Work -2	…….
1	**Project name & Location:**			
2	**Owner or client: (**Name and Address, contact Number of Officer to whom reference can be made)			
3	**Project description**: 1. Type of work: 2. Total Area/Length (in sq. mts/mts): 3. Information to illustrate the attention to detail construction quality (close up photographs):			
4	**Whether For Government/Semi Government/ Government undertaking/ Government autonomous bodies/Otherwise : Please Mention**			
5	**Tendered Project Cost:**			
6	**Actual Project Cost:**			
7	**Whether the agency has specific experience in following types of works. Please provide details of works carried out with clients' name, cost of work, completion period, testimonials etc.** a. RCC Road / building. b. Pathways with Paver block & kerb stone c. Plumbing work			
8	**Project duration (as per contract):** (in months)			
9	**Start date (dd/mm/yy):**			
10	**Actual date of Completion (dd/mm/yy):**			
11	**Actual duration (Months):**			
12	**Reasons for delay (if any):**			
13	**Any penalty/ Bonus:**			
14	**Any litigation/Arbitration/claim/Dispute pending (with details of claim and award if any):**			

Note:

1) Attested scanned copies of initial **Work Order and Completion certifica**te from client **must** be uploaded.

2) **The certificate shall mention Name of work, Work order value, duration, Client name & Address, Location of work, Stipulated start and completion date, Actual Start and Completion date, Reasons for Delay (if any), Nature of Work etc.**

3) **Attach Photographs of the projects.**

4) **Attach separate sheets, if required**

I/We certify that above information furnished by me/us is true and correct to the best of my information and knowledge.

N.B: Attested copies of credentials/testimonials must be uploaded on CPP portal.

(Signature of the Applicant & date)
with company seal/rubber stamp

INFORMATION ABOUT ONGOING SIMILAR WORKS:

Sl. No.	Details	**Work -1**	**Work -2**	**…….**
1	**Project name & Location**			
2	**Owner or client: (**Name and Address, contact Number of Officer to whom reference can be made):			
3	**Project details in brief**:			
4	Stipulated start date			
5	Actual Start date			
6	Time period			
7	Stipulated completion date			
8	Present Status of work in Percentage completion:			
9	Work Order Value (in lakhs)			
10	Work done value (RA bill) of work (in lakhs):			
11	Type/nature of works details			
12	Slow progress, if any and Reasons for Delay, if any:			

Note:

1) Original or attested scanned copies of initial work order from client to be uploaded.

2)The certificate shall mention Name of work, Work order value, duration, Client name & Address, Location of work, Stipulated start and completion date, Actual Start and Completion date, Reasons for Delay (if any), Nature of Work etc.

3)Attach Photographs of the projects.

4)Attach separate sheets, if required

I/We certify that above information furnished by me/us is true and correct to the best of my information and knowledge.

(Signature of the Applicant & date)
with company seal/rubber stamp

(Affidavit to be submitted by the Agency on a non-judicial stamp paper of value Rs. 100/- duly notarized, in the Portal as well as hard copy to the TIA)

AFFIDAVIT

Ref: Date :

I/We…….....……...,S/o.....……...……..…

Resident of …….…….....

Contractor / Partner or sole Proprietor (strikeout which is not applicable) of firm M/s…… do hereby solemnly affirms and declare that our Individual / Firm / Companies is not blacklisted by any State / Central Govt. Dept. Or any PSUs.

DEPONENT

Address: ….....

Place :

Date :

Special Terms and Condition:

To be noted by Contractors at the time of e-tendering.

1. **The work shall be awarded in the combination of : PART –I & PART- II**

   The percentage rates quoted by the contractors shall be considered as balance rate and will be applicable for the above combination.

2. Supply and procurement of steel, cement and other materials will be the responsibility of the Contractor.

3. Steel required for the construction shall be tested as and when asked by the engineer-in-charge from Govt. Affiliated Test House. The cost of testing will be borne by the contractor. The Contractor also has to submit Manufacturer's test certificate for every consignment of steel to be used for the construction purpose.

4. Cement supplied by the contractors shall be tested as per direction of the Engineer-in-charge. Manufacturer's Test Certificate for each lot of cement supplied at site shall also have to be submitted by the contractor to the Engg.-in -Charge. During concreting, the interval of taking test cube will be as per IS Codal provisions and as per direction of Engg-in-Charge. Cost of cube testing will be borne by the Contractor.

5. Material testing shall have to be carried out from testing Lab (NABL) as per direction of Engg-In –charge as per IS Code provision. Cost of testing will be borne by the Contractor.

6. All the papers of the purchase, challans, warranty, MTC etc will have to be submitted to the BITM as and when asked.

7. Water and Electricity required for the construction work shall be arranged by the Contractor at their own cost as well as the security arrangement for the safety of martials during the entire period of construction. The source of power supply and water supply if provided from the Centre will be on chargeable basis.

8. Tenderers are requested to inspect the site of work before quoting their rates.

9. Tenderers are requested to get clarification of drawings and specification, if required, from BITM office before quoting.

10. For all curved shapes, no separate payment shall be entertained and the rates shall be comprehensive for all conditions of building and its allied formwork and shall be paid according to the rates quoted.

11. For successful completion of the item of work of our Schedule/BOQ, if any other accessories, equipment, ancillary work etc. is required to be done or is involved, no extra payment will be made on account of this. The payment will be done as per the net rate of the item quoted.

12. No other type of any additional/extra claim for payment will be entertained for the design, shape, width, breadth, height, scaffolding, and staging in the work apart from that specified in the BOQ.

13. Tenderer/Bidder should inspect the type and nature of earth/soil condition at the site. No extra claim will be entertained for the item of earthwork or item of work involving earthwork or work underground or below Natural ground level by digging earth (soil, rubbish, garbage, heterogenic garbage, non-decomposing material etc.) at the site, if any.

14. All other conditions will be referred as per our General Conditions of Contract.

15. All the damages, if any done to any existing facility/structures, the same has to be made good and brought back to its original state by the successful tenderer. No payment will be allowed for it.

16. All the safety provision required in the work is to be taken by the successful contractor. Successful Contractor should provide all the necessary safety equipment/accessories like Helmet, Safety Shoes, and Safety Belt etc. to its workmen during execution of works as the requirement. Compliances of all the labour laws, Insurance for the workmen/labour and/or third party insurance etc. shall be the sole responsibility of the successful contractor.

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

18. The drawings attached are for tender purpose only and are subjected to change/modification as per design/site condition.

19. The bidders must submit analysis of rates of the major items of works in support of Justification of their quoted rates if asked for by the tender inviting authority before deciding on award of work.

~~20. The Contactor shall submit the design calculation along with drawings of the scaffolding system for erection of roof truss & fixing of roofing materials.~~

21. The Contractor shall submit the Bar chart/ Planning Schedule of the project before start the work.

22. The contractor shall protect and guard all electric, telephone or any other cables, pipe drains, or any other underground service lines during excavation and any damages done to such connections shall be made good at his own cost.

~~23. For some of the items for which quantities cannot be assessed now but are likely to be executed during construction, the rates are mentioned in the BoQ as R.O (Rate Only)~~

24. The contractor shall have to construct temporary site Office including temporary toilet, sewerage lines, septic tank and soak pit as required size including furniture like Table, Chair & small Steel almirah as required at his own cost for BITM Officials. The contractor may construct the temporary accommodation of his labour & store for materials at his own cost. All temporary structures to be constructed by the contractor at his own cost and to be dismantled within one (01) month from completion date of the work and would clean the entire plot.

25. The successful tender shall deploy full time experienced site engineer at least 01(one) B.E/ B. Tech. in Civil Engineering or 02 (Two) Diploma in Civil Engineering at Site during the entire tenure of the Contract. Necessary documents to be submitted in support of the above man power. The agency shall also engage an experienced Surveyor for Site layout of Driveways/ Science Park Pathways/ Exhibit Foundations and as and when required. No extra payment shall be made for the deployment. The cost of required manpower, for handling of exhibits safely, for installation in the foundations at Science Park.

26. The contractor shall be setting up of small testing laboratories at site:

i) Hydraulic compression testing machine, electrically operated calibrated up to an accuracy of ± 1%
ii) Cube Moulds 150mm x 150mm x 150mm size conforming to IS 516-1959.
iii) Slump Apparatus confirming to IS 7320.
iv) Test Sieve Set as per IS 460-1972
v) Thickness and length gauge as per IS-2386
vi) Graduated Cylinder of Glass 100, 250, 1000 ml---- 03 nos. Each
vii) Balance 1 Kg, 5 Kg, 15 Kg
viii) Electric Oven Thermostatically controlled up to 200-degree C
ix) Any other equipment required for testing of materials as per instruction of the E.I.

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TECHNICAL SPECIFICATIONS FOR EARTH WORK, CONCRETE WORK, BRICK WORK, PLASTER AND ALLIED WORKS IN SUB-STRUCTURE & SUPER-STRUCTURE.

I. GENERAL

Specifications, Scope of Work, Schedule of Rates and drawings for a particular Tender shall be read in conjunction with each other. In case of conflicts / contradictions amongst them, the clarification shall be obtained from the Engineer – in – Charge / Architect whose decision shall be final & binding. Following procedure shall be followed for the necessary clarification.

A. Item description shall prevail over specifications for item rate tenders when provisions therein are different from those in specifications.
Whenever any requirement is not covered in Item description but are covered in specifications, the specifications shall be followed in addition to the requirements of item description. No extra paymentshall be made to the Contractor for executing such item as per specification.

B. Whenever drawings call for requirements different from or additional to those in item description andspecification, the decision of the Engineer – in – Charge shall be obtained.
However, no extra payment shall be made to the Contractor for executing any work incorporating requirements additional to those in item description and specification but covered in applicable drawings or standards. Where ever references has been made to Indian Standard or any otherspecifications the same shall mean to refer to the latest specifications irrespective of any particular edition of such specifications being mentioned in the specifications below of Schedule of Quantities.

C. The cost of Cement, Reinforcement steel, structural Steel, Bricks, Coarse and Fine Aggregates, and other requisite materials and labour Charges and other incidental expenses to be needed for the Construction of Store, Site Office etc. to be borne by the Contractor.

II. WORKMANSHIP

Workmanship shall be to the satisfaction of the Engineer – in – Charge / Architect. The contractor shall follow the specifications, relevant Codes & Manufacturer's guidelines for achieving desired level of workmanship as per specification & good engineering practice.
Any executed work not conforming to the specification or not to the satisfaction of the Engineer – in – Charge / Architect shall be removed immediately from site and shall be substituted with proper material and or workmanship forthwith.

III. MEASUREMENT

Mode of measurement is generally specified in each specification. Whenever mode of measurement is not specified, IS: 1200 shall be applicable.

IV. MATERIALS

General

(a) All materials shall be best of their kind and shall conform to the latest Indian Standard.

(b) All materials shall be of approved quality as per samples and from origins approved by the Engineer– in-Charge / Architect. The Contractor shall get the materials approved by the Engineer – in – Charge / Architect before ordering & procurement. The Contractor shall furnish necessary certificates etc. as asked by the Engineer – in – Charge. Further to that he shall get the materials tested from approved testhouse if asked by the Engineer-in-Charge & submit the test certificate at his own cost for which no extra payment shall be made to him. The Engineer – in – Charge shall have the right to reject all or any of the materials intended to be used and such materials shall be immediately removed from the site by the Contractor at

his own cost without any claim for compensation etc. due to such rejection.

(c) A set of specimen samples of all approved materials shall be kept in bottle or wise at site, cost of whichto be borne by the Contractor.

(d) Test reports on each manufactured materials shall include a statement certifying that this material is of the same quality as that proposed for this project. Manufacturer's literature on proprietary materials shall indicate compliance with standards listed here in.

1. **Cement:** Cement shall comply with the latest specifications I.S.-269/ I.S. 1489. OPC will be used. Fully orpartly set cement shall be rejected. One bag of cement shall weigh 50 kgs. Cement shall be stored in pucca godown with raised floor and should be water tight. The bags shall be stored in stacks of not more than 10 bags with clearance around sufficient, to enable inspection and periodical counting. Cement shall be utilized only for the work for which it is allotted.

2. **M.S Reinforcement:**
   a) Shall be mild and plain round bars conforming to IS:432.
   b) Cold Twisted bars: Shall be conforming to IS:1786-1979.

   Stocking and storage: Steel reinforcement shall be stored in a way as to prevent distortion and corrosion. Bars of different classifications. Sizes and lengths shall be stored separately to facilitate issues in such sizes and lengths as to minimize wastage in cutting from standard lengths.
3. **Structural Steel**: Shall be mild steel rolled sections and plates conforming to the latest Indian Standards IS:226-1962
4. **Coarse aggregate**: Shall be the best quality crushed or broken hard stone from approved quarries approved by the Architects and shall conform to IS: 383-1970 it shall be blue in colour and approved by the Architects.

5. **Coarse sand**: shall be either river sand or pit-sand, clean, sharp, strong, angular and composed of hard siliceous materials. It shall be obtained from quarries approved by the Architects. Its grading shall be within the limits of Grading Zone III (Table 1). When the grading fails outside the percentage limits prescribed for the sieves other than 600 microns, 300 microns and 150 microns (I.S) sieves by not more than5 %. It shall be regarded as falling within the zone. This five percent can split up; for example, it could be one percent of each of three sieves and two percent on another, or four percent on one sieve and one percent on another.
   The maximum quantity of stilt shall be not exceeding 8 %.

6. **Fine Sand:** This shall be natural river sand. Its grading shall be within the limits of grading zone IV (table
   - 1). When the grading falls outside the percentage limits prescribed for the sieves other than 600 microns 300 micron and 150 microns (I.S.) sieves by not more than 5 % it shall be regarded as falling within the zone. The 5 %can be split up; for example, it could be one percent on each of three sieves and two percent on another or 4 % on one sieve sand one percent on another.
   The maximum quantity of stilt shall be not exceeding 8 %.

7. **Stone dust**: It shall be obtained from crushing hard stones and from and from quarries approved by the Architects. Its grading shall be within the limits of grading zone III (Table 1). When the grading fails outside the percentage limits prescribed for sieves other than 600 microns and 300 micron (IS) sieves by notmore than 5 % and on 150-micron sieve by not more than 20 %. It shall be regarded as falling within the zone. The five percent can be split up; for example, it could be one percent in each of the three sieves and two percent on another or four percent on one sieve and one percent on another. The maximum quantity of stilt shall not exceed 8 %
8. **Bricks**: Shall be local best quality approved by the Architect, well burnt, sound, hard, square and with sharp arises and shall give a ringing sound when struck with a mallet. The average water absorption shall not be more than 20 % by weight after 24 hours' immersion in water.

9. **Glazing** glass: Shall be patent flattened sheet of glass of approved make of the best quality of plain or ground glass, free from flaws, specks, bubbles.

10. **Tar felts**: Shall comply with IS: 1322-1970 of Hessian base type-3, Grade-I, or type-3 grade – II of approved well known make, unless otherwise specified.

11. **Paints** These shall be of standard manufacture approved by Architects conforming to the latest Indian Standards for various paints.

12. **Water**: Shall be clean and free from excessive salinity, impurities / ingredients and other harmful masters duly tested in an approved Laboratory declared suitable for construction purpose and as approved by Architects.

13. Admixtures:

General Requirements for Admixtures:

All concrete admixtures shall comply with the following Indian standards:

For integral cement water proofing compounds	IS:2645
For other admixtures for concrete	IS:9103

In case of non-availability of any IS code for testing and acceptability Criteria, relevant American, British or German Code shall be applicable.

No admixture shall impair the durability of the concrete nor combine with the ingredients to form harmful compounds nor increase the risk of corrosion of reinforcement. Use of admixture shall not reduce the dry density of concrete. Once the proportion of admixtures have been established, strict check shall be maintained not to alter the proportion of ingredients and water-cement ratio of the Design Mix during execution.

The chloride contains in admixtures shall not exceed 2% by mass of the admixture or 0.03% by mass of the cement.

Admixtures to be used in concrete when required or permitted shall conform to the appropriate specification given in the reference publication.

Admixtures used in work shall be of same composition as used in establishing the required concrete proportions.

14. Water Proofing Compounds:

The permeability of the specimen with the admixture shall be less than half of the permeability with a similar specimen without the use of these compounds. These compounds shall be used in such proportion as recommended by manufacturer but in no case it shall exceed 3% by weight of cement.

The initial setting time of the cement with the use of these compounds shall not be less than 30 minutes and final setting time shall not be more than 10 hours. Tests shall be carried out in accordance with IS:4031.

Compressive strength of the specimen at 3 days shall not be less than 160 Kg/cm2 nor 80% of the 3 days' compressive strength of mortar cubes prepared with same cement and sand only, whichever is higher. Similarly, compressive strength at 7 days shall not be less than 220 Kg/Cm2 nor less than 80 % of the 7 days' compressive strength prepared with the same cement and sand only, whichever is higher. The test to determinethe compressive strength shall conform to IS:4031.

15. Wood / Timber:

All timbers shall be of best quality well-seasoned and / or well treated for preservation and protection against decay etc. it shall be uniform in substance, straight in fibre, free from large or dead knots, sap, flaws, sun- cracks, shakes or blemishes of any kind. Any insect damage or splits across the grain shall not be permissible.

The colour of the timber shall be uniform throughout, firm and shining with silky luster when planed and shallnot emit dull sound when stuck.
Timber required to be used for form work shall be fairly dry before use. It should maintain its shape duringthe use and even when it comes into contact with moisture from the concrete.
Storage of wood/Timber shall be as per the requirements of IS:4082.

16. PVC Pipes
PVC Pipes shall conform to the requirements of IS:4985.

17. Poly-Sulphide Sealants:
All Poly-sulphide Sealants shall conform to IS:12118. Test conditions and requirements shall be as given inthe above referred BIS code.

18. Testing of materials and works: As and when required by the Architects the contractor shall arrange to test materials and / or portions or works at his own cost to prove their soundness and efficiency. If after tests any materials, work or portions of work are considered defective or unsound by the Architects the contractor shall remove the defective material from the site, pull down and re-execute the works at hisown cost to the satisfaction of the Architects. To prove, that the materials used are as specified the contractor shall furnish to Architects with original vouchers on demand.

SCOPE OF WORK

All works shall be carried out in proper manner according to the directions of the Engineer-in-charge and to his satisfaction. Unless and otherwise specified in this section or in the description of the item, the cost of all, stages of works mentioned hereunder shall be deemed to have been included in the rates of items provided in the schedule.

1. ANTI-TERMITE TREATMENT:

Prevention of the termite from reaching the super-structure of the building and its contents can be achieved by creating a chemical barrier between the ground, from where the termites come and other contents of the building which may from food for the termites. This is achieved by treating the soil beneath the building and around the foundation with a suitable insecticide.

Materials – Any one of the following chemicals (as specified in water emulsion shall be used.

	Concentration (%)
Dieldrin Emulsifiable concentrates (IS: 1054-1962)	0.5
Aldrin emulsifiable concentrates (IS: 1037-1958)	0.5
Heptachlor emulsifiable concentrates	0.5
Chlordane emulsifiable concentrates	0.5

Chemicals are available in concentrated form in the market and concentration is indicated on the sealed containers. Graduated containers shall be used for dilution of chemicals with water in the required proportion to achieve the desired percentage of concentration.
Chemicals shall be brought to site of work in sealed original containers. The material shall be bought in a time in adequate quantity to suffice for the whole or at least a fort-night's work.

Pre-Construction Chemical Treatment- his is process in which chemical treatment is applied to a buildingin the early stages of its construction. Hand operated pressure pump shall be used for uniform spraying of the chemical. To have proper check for uniform spraying of chemical, graduated containers shall be used.

Time Of Application – Soil treatment should start when foundation trenches and pits are ready to take mass concrete in foundations, laying of mass concrete should start when the chemicals emulsion has been absorbed by the soil and the surface is quite dry. Treatment should not be carried out when it is raining or soil is wet with rain or sub-soil water. The foregoing applies also in the case of treatment to the filled earth surface withinthe plinth before laying the sub-grade for the floor.
Disturbance – The treated soil barriers shall be disturbed after they are formed. If by chance, treated soil barriers are disturbed, immediate steps shall be taken to restore by continuity and completeness of the barrier system.

Treatment of Column Pits, Wall Trenches:

a) The bottom surface and the sides (up to a height of about 300mm) of the excavation made for column pits, wall trenches and basements shall be treated with the chemical at the rate of 5 liters per sq m. of the surface area.
b) After the column foundations come up the back fill in immediate contact, with the foundation structure shall be treated at the rate of 15 liters per sq m. of the vertical surface of the sub-structure for each side.If water is used for ramming the earth fill, the chemical treatment shall be carried out after the ramming operation is done by rod ding the earth at 150mm centers close to the wall surface and spraying the chemical with the above does. 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 surface of the columns and walls so that the earth contact with these surface is well treated with the chemical.
c) In the case of R.C.C. framed structures with columns, plinth beams, concrete mix is rich and dense (being 1:2:4 of richer), it is unnecessary to start the treatment from the bottom of column and plinth beams. The treatment shall start at the depth of 500mm below ground level. From this depth the back fill around the columns, beams, shall be treated @ 15 liters/sq m. of the vertical surface. The other details of treatment shall be as laid down in clause (b) above.

Treatment of Top surface of Plinth Filling:
The top surface of the filled earth within plinth walls shall be treated with chemical emulsion at the rate of 4 liters/sq m. of the surface before the sand/sub grade is laid. Holes up to 50 to 75mm deep at 150mm centers both ways shall be made with crow bars on the surface to facilitate saturation of the soil with chemical emulsion.

Treatment of Junction of Wall and Floor:
To achieve continuity of the vertical chemical barriers on inner wall surfaces from the ground level, small channel 30X30mm shall be made at all the junctions of wall and column with floor (before laying the sub- grade) and rod holes made in the channel upon ground level 150mm apart one chemical emulsion poured along the channel @15 liters/sq m. of the vertical wall or column surface so as to soak the soil right to bottom. The soil shall be tamped back into place after this operation.

Treatment of Soil along External Perimeter of Building:
After the building is complete provide holes in the soil with iron rods along the external perimeter of the building at intervals of about 150mm and depth 300mm and filling these holes with chemical emulsion at the rate of 5 liters/m. of perimeter of the external wall.

Treatment of Expansion Joints:
Anti-termite treatment shall be supplemented by treating through the expansion joint after the sub-grade has been laid @ 2 liters per linear meter or expansion joint.

Safety Precautions:
All chemical used for anti-termite treatment are poisonous and hazardous to health. These chemicals can have an adverse effect upon health when absorbed through the skin, in-haled as vapors or spray mists or swallowed.

Person using or handling these chemicals should be warned of these dangers and advised that absorption through skin is the most likely source of accidental poisoning. They should be cautioned to observe carefully the safety precautions given below. These chemicals are usually brought to site in the form of emulsifiable concentrator. The containers should be clearly labeled and should be stored carefully so that children and persons cannot get at them. They should be kept securely closed.
Particular care should be taken to prevent skin contact with concentrates. Prolonged exposure to dilute emulsions should also be avoided. Workers should wear clean clothing and should wash thoroughly with soap and water, especially before eating and smoking. In the event of severe contamination, clothing should be removed at once and the skin washed with soap and water. If chemical splash into the eyes they shall be flashed with plenty of soap and water and immediate medical attention should be sought.
The concentrates are oil solution and present a fire hazard owing to the use of petroleum solvents. Flames should not be allowed during mixing.
Care should be taken in the application of chemical to see that they are not allowed to contaminate wells or spring which serve as source of drinking water.

Measurements:
The measurements shall be made in sq m. on the basis of plinth area of the building at floor (GF) only for alloperations described above. Nothing extra shall be measured.

2. EARTH WORK:

2.1 Site Clearance:

The site shall be cleared of rubbish of all kinds, rocks, trees dirt and superfluous earth all buds, brush, wood, stumps of trees and saplings, grass and other rank vegetation etc. The serviceable material to be stacked at site in a manner as directed by the Architect/ Engineer-in-charge. All cavities or holes formed shall be filled with good earth well rammed and levelled neatly. Site clearance shall be done for an area measuring seven (7) metres all-round the proposed construction. The Contractor shall provide all labour and materials for site clearance at his own cost.

2.2 Profiles:

Shall be with pegs, bamboos, strings or burgees to show the correct formation before the start of the Work andmaintained till the completion of the work.

2.3 Bench mark and levels:

The contractor shall lay out one or more permanent bench marks in some central places before start of the Work, from which all important levels, exact bed levels for the excavation will be set. The Contractor shall provide all labour and material for setting levels and profiles at his own cost.

2.4 Levelling site:

The ground levels after site clearance shall be taken before the start of the Work and to be recorded in a level book duly signed by the Contractor and the Engineer – in – Charge /Architect. Similarly, final levels shall be taken and recorded in the level book signed by the Contractor and the Engineer – in – Charge /Architect. The quantities shall be computed by averages method. The cross-sections shall be taken at every 15M. apart inboth directions in a fairly level ground and in and undulating ground cross-sections shall be taken at closer distances to be decided by the Architect.
In case the earth work is to be paid for filling computed from the cross-sections, the quantity computed from such cross-sections shall be reduced by 1/13 for payment as excavation.
All useful materials such as gravel, stone, relics of antiquity, coins, fossils, etc. met with during excavation shall remain the property of the Employer and shall be handed over to the engineer on behalf of the Employer. All cutting shall be done from top to bottom, no under-mining shall be permitted. Cutting shall be done to precise levels and any cutting taken deeper shall be made good to the required levels without any extra cost. The final surface shall be neatly dressed.

2.5 Excavation in trenches:

The foundation trenches shall be excavated to the exact width of the lowest step of the foundation or footing as shown on drawing. The sides of the trenches shall be kept vertical and bottom horizontal both transversely and longitudinally as shown on the drawings. Steps shall be squarely benched out as shown on the drawings or as directed by the Engineer – in – Charge / Architect. The excavated earth shall be deposited at least three meter or 1/3rd depth away from the edge of excavation whichever is more. Working space on the outer periphery, if required shall be provided by the Contractor as per IS Code and shall be paid as per actual or as per IS. Code, whichever is less.

2.6 Excavation in rock:

The specification for earth work shall apply to excavation in rack in general. The cutting to rock shall either be by blasting or chiselling, wedging or any other method to the required width and depths as directed by the architects. The measurement of rack when made from stacks which shall be made with the spoils shall be reduced by 50% for voids for payments as excavation, the rack spoil shall remain the properly of the Employer. In case where blasting is resorted to the following specification shall be followed:

a) Storage and use of explosive. The storage, transport and use of explosives shall be covered by a licence as required by the current explosive rules laid down by the State and the Central Government. The contractor shall strictly abide by these rules.

No child under 16 year of age and no person who is in a state of intoxication shall be employed on the loading, unloading or transport of explosives, or be employed in, or allowed to enter the premises where explosive is stored.

b) Use of Explosives. Blasting shall only be carried out at certain specified times to be jointly agreed by a contract and the Engineer within the hours of day specified by the Licensing Authorities; and an area of 180 m radius from the firing point is to be specially flagged out, and all workmen excluded there from at least 10 minutes before the hour for firing, a warning bell being sounded for the purpose.

c) Explosives shall not be brought on to the works in quantities exceeding the requirement enough for the particular amount of firing to be done, and any surplus explosives left, when all the holes have been charged must be carefully removed at least 300m away from the firing. A properly appointed agent on behalf of the contractor shall per5sonally superintend the firing and not more than eight holes at a time shall be set off (fired successively and not simultaneously). Account shall be kept of the blast; if these do not tally with the number fired, the difference indicates misfires. In which case no persons shall be allowed to return to the site of the firing for at least half an hour after firing, when the misfire shall be carefully looked for by the authority's agent. In the event of misfire, a portion of the tamping may by slugged out with compressed air and water under pressure, but no kind of tool shall be used for this purpose. The hole shall thereafter be reprimed and fired. If a relieving hole is to be drilled it shall not be placed within 30 cm from the misfired hole. The relieving hole shall run parallel to the misfired hole. If a misfire is detected during working hours and it is necessary to leave it charged till firing time, a splodge of red paint must be put around the drill hole.

d) If misfire has been found to be due to defective fuse, detonators of explosives, special notice should be sent to the officer-in-charge of the works, and to persons in charge of the storage and expense magazine's so that steps may be taken to inspect the whole quantity or box from where the detective article was taken. No more of defective stocks is to be used without the permission of the officer-in- charge.

e) As each hole is drilled and loaded a small wooded plug (not more than 76 cm long) is to be driven in at the top, confining the fuse and also helping to indicate the position of the hole if it misfires. An adequate slot; must be cut on the side of the plug to hold the fuse and prevent it from damage when the plug is being tapped down. The top of the plug should be painted red.

f) Dynamite should be kept dry until used. If exposed to dampness the nitro-glycerine exudes become most dangerous. If shall not be exposed to direct rays of the sun, also it become highly dangerous if placed near fires, stoves, steam pipes of heated metal.

(i) A wooden tamping rod should be used to push the cartridge home. No metal rod or rammer shall be used in tamping or brought to the site of blasting work.
(ii) The charge should not be rammed nor pounded but pressed firmly into place.
(iii) Dry earth should be used for tamping. If water is used, great care should be taken to press the cartridge into contact with each other, a water coming in between two cartridges will prevent the explosion of the lower one, and lead to a hole being only partially blown out and remaining charged with the balance of the dynamite.

g) The dynamite is exploded by means of detonator pinched on to a fuse by means of special nippers,and put the primer or cartridge. Instruction accompanying each box should be carefully adhered to.

h) All fuses must be cut to the length required before being inserted into the holes.

i) Any slackness carelessness or the infringement of the rules will render all responsible parties liableto prosecution.

j) Account of Explosives. To prevent explosives being disposed off unlawfully orders must be strictlyenforced:

(i) The contractor shall personally be responsible for all explosives, and shall personally attend to the charging, tamping, and firings of all holes.
(ii) The supervisor in-charge shall maintain a register in which the explosive used each day will be entered regularly the same evening, and a copy of entry shall be forwarded to the Architects/Consultants and in addition a statement at the end of each month should be prepared and sent to the Architect / Consultants

k) All losses shortage of stock and thefts of explosives shall be reported without delay to the nearestpolice station.

2.7 Classification of soils:

If soils of any classification other than specified in the schedule of quantities is met with during excavation, nowork shall be done until the decision of the Engineer – in – Charge / Architect as to the classification of soil, level or the strata of different classification and their location is obtained in writing.

The materials to be excavated shall be classified as follows :

a) Soft, Loose soil:
Such as vegetative or organic soil, turf, gravel, sand, silt, loam, clay peat etc. which yields to the ordinary application of pick and shovel, or other ordinary digging implements.

b) Hard dense soil:
Such as stiff clay, gravel and cobble stone rock fragment usually rounded or semi rounded having maximum diameter between 80 to 300 mm which require the close application of picks or jumpers or scarifiers to loosen.

c) Soft Disintegrated rock:
Rock or boulders, which do not require blasting but can be queried or split with crow bars such as laterite and hard Conglomerate.

d) Hard rock:
Any rock or boulder which require blasting or chiselling. Where levels for different soil strata cannot be clearly marked and defined the Contractor shall stack different soil of various classificationseparately for measurement purposes and then disposing off as directed.

The measurement from stacks in case where excavation is of soil, mixed with moorum soft rock and where levels of various strata cannot be fixed, the total quantity shall be computed from the trench measurement and the hard rock measurements of stacks after reducing 50% soft rocks stack measurement reducing 1/7 and that of moorum stack measurement after

reducing by 1/13 shall be paid as excavation and deducted from the total quantity computed from trench measurement and the balance shall be paid as ordinary earth or soil excavation.

2.8 Earth filling:

Filling can be in the sides of foundation trenches, under floors and for site formation.

The earth to be used for filling shall be granular fill, free from salt peter, organic or other foreign matter. The space around the foundations in trenches and under floors shall be cleared of all debris, brick pieces or any other rubbish, surplus mortar falls etc. Filling shall be done in layers not exceeding 150 mm thickness. Each layer shall be well watered and rammed to the satisfaction of the Engineer – in – Charge / Architect. Final surface shall be neatly dressed.

The earth filling shall be computed from levels recorded before start of filling and after completion of fillings. The quantity so computed shall be paid with deduction of 1/13 as mentioned in para 2.4 above for open site formation and without any deduction of 1/13 filling under floors i.e. in confined situation.

2.9 Sand filling: Sand filling shall be done, measured and paid in the same manner as earth filling as described in the foregoing para.

2.10 Hard Core: Shall either be of stone ballast, gravel or stone rubble of size mentioned in the schedule of quantities and shall be free from dust and other impurities.

Hard core of stone ballast not exceeding 40 mm gauge shall be laid in required thickness dry rolled and consolidated with a power roller to the satisfaction of the architects unless otherwise specified in the schedule of quantities.

Hard core of rubble stone shall be laid, with stones of required height vertically, closely and hand packed with smaller pieces and /or stone ballast 40 mm gauge as directed by the Architects and consolidated dry with a ten-ton power roller unless otherwise specified in the schedule of quantities to the satisfaction of theArchitects / consultants.

2.11 Disposal of excavated spoil: Where in the schedule of quantities the disposal of excavated spoil is specified to be measured and paid for separately, the quantity of disposal of earth, rock etc., shall not exceed the quantity paid as excavation i.e. the element of bulkage is not to be reflected in the measurements for disposal but is to be accounted for in the rates quoted for disposal. All the materials such as earth, moorum soft/hard rock etc. are to be kept separately for classification and payment of disposal. The contractor shall maintain detailed charts showing the origin and place of disposal of spoil for calculation of lead for disposal.

No separate payment shall be made for re-excavation or loosening of excavated spoil for disposal and transportation due to its having become hard or consolidated due to passage of time, rains or any other cause whatsoever. The lead shall be measured by shortest route possible.

2.12 Compaction of Embankments and other areas of Fill:

All materials used in embankments and as filling elsewhere shall be compacted as soon as practicable after deposition. Site trials have to be carried out to determine the state of compaction attained.

The dry density / moisture content, field density and CBR tests shall be carried out using the appropriate methods described in latest IS Code, except that in the case of the CBR tests the test specimen shall be undisturbed samples obtained from the field. The method of obtaining the undistributed samples shall be approved by the Architect / Employer. The Architect / Employer may at his discretion also permit the CBR tests to be carried out in situ provided that the Contractor shall first submit his proposal in writing for the approval of the Architect / Employer.

In the event that the material used fails to attain the required CBR, the Contractor shall either increase his compactive effort or alternatively he may vary his source of material, so that he can demonstrate at the site trials that the required CBR can be obtained.

The Architect / Owner may at any time carry out comparative field density tests on material which he considers has been inadequately compacted. If the test results, when compared with the results of similar tests made on approved work in similar materials show the state of compaction to be inadequate and this is held to be due to failure of the Contractor to comply with the requirements of the Contract the Contractor shall carry out such further work as the Architects / Owner may decide is required to comply with the terms of Contract.If however the Contractor has fully complied with the requirement of the Contract the Architect / Employer will issue a Variation order to cover any necessary remedial works.

2.13 Compaction (Minimum Target Specification):

The moisture content of the in situ material during compaction shall be within +3% of the optimum moisture content determined. Adjust this to enable the required in- situ field densities of the fill material to be obtainedconsistently. Tests for each layer shall be done and approval shall be obtained by the S.O. prior to placing of the next layer.

Unless otherwise stated the in situ field densities of compacted materials shall not be less than 90% of themaximum dry density.

2.14 Shoring:

(i) For loose earth and when the depth of excavation exceeds 3.0M or as per the Architect / Engineer- in-charge, poling board (vertical members) of 50 to 75mm in thickness and 175 to 225mm in width preferably Sal-wood to be placed close together and to be driven about 300mm in ground below the bottom of the trench with intermediate Sal-ballah piling of dia. not less than 100mm at the rate 900 to 1000mm centre to centre to be placed in between the vertical surface of the trench and the poling boards and the double struts of Sal-ballah of not less than 100mm in dia. between two walling (horizontal members) of 250mm in width and 75mm in thickness held horizontally between them.

(ii) For medium clay and when the depth of excavation exceeds 2.0 M but exceeds 3.0M single struts will be provided and Sal-ballah piling may not be placed. Other requirements are to be satisfied as above (i) or as per the direction of the Architect / Engineer-in-charge.

(iii) For stiff clay of dry clay and when excavation is within 2.0M, vertical poling boards will be placed at the rate 600 to 1000mm apart with or without walling pieces; but single or double strutting will be provided. Other requirements are to be satisfied as per (i) or as per the direction of the Engineer-in-charge.

3.0 CONCRETE WORK

3.1 Lime Mortar: shall be composed of one part of hydraulic lime 2 parts of sand. The materials shall be stacked in alternate layers 15 and 30 cm thickness respectively, a top layer of 75 mm thickness of sand being allowed after at least 4 layers of time have been laid. The stock shall be watered thoroughly and allowed and allowed to stand for 24 hours. The mortar shall be ground in at least 200 turns by wet process. The mortar shall be kept moist and protected from sun rain and dust. Mortar more than 7 days old shall not be used and shall be rejected.

Wet process: The ingredient shall be thoroughly mixed and then shall be ground in a bullock Ghani or power driven mortar mill. Water shall be added during grinding as required, care being taken to add sufficient water to enable the mixture to have consistency of stiff paste. The mortar has to be ground for not less than 200 revolutions of the mill or Ghani. Where Ghani is not fitted with a suitable attachment for counting the revolutions the mortar shall be ground for at least two hours. The mortar shall be raked up continuously during the process of grinding particularly in the angles of the mill or Ghani.

3.2 Lime Concrete: Shall consist of one cum of wet mortar of the mix specified and prepared as above mixed with 2.5 cum of 40 mm and down gauge brick ballast suitably graded as desired by the Architects. The ingredients shall be accurately gauged and

thoroughly mixed on a platform by being turned over at least twice wet. Water being added gradually note more than necessary. The concrete shall then be gently deposited in horizontal layers not exceeding 30 cm thickness and thoroughly consolidated with square wooden rammers weighing 5 to 6 kg. After consolidation, the work shall be watered twice a day for a wee. No ramming after ingredients have started setting shall be allowed the next day.

The measurements shall be exact length, breadth and depth ordered by the Architects or as shown or figured on the drawing and after the concrete is consolidated.

3.3 Cement Concrete: For foundation shall be mixed in proportions and with ingredients as specified in the schedule of quantities. The concrete shall be mixed in a mechanical mixer. No more concrete shall be mixed than can be consumed within half an hour. It shall be deposited gently in the trenchesin horizontal layers not more than 30 cm. thick & rammed and consolidated with steel rammers of 5 to 6 kg. weight. After laying and consolidation is completed watering twice a day for a week from the next day shall be done, measurements shall be done as for the lime concrete.

Damp Proof Course:

This shall be laid to specified thickness over walls for the full thickness of the super-structure walls. The surface shall be levelled and prepared before laying the cement concrete. Edges of damp proof course shall be straight, even and vertical. Side shuttering shall consist of wooden form and shall be strong and properly fixed so that it does not get disturbed during compaction and the mortar does not leak through. The concrete mix shall be of workable consistency and shall be tamped thoroughly to make a dense mass. When the sides are removed, the surface should come out smooth without any honey-combing. The damp proof course shall be laid continuous and the surface shall be double chequered. Damp proof course shall be cured for at least seven days; after which it shall be allowed to dry. Waterproofing materials of approved quality shall be added to concrete mixture in proportions as per manufacturer's specifications. Polymer based paint may be used under damp proof course as per direction of the Engineer-in-charge / Architect.

3.4 Cinder Concrete fills: Shall be cement concrete maximum 60 Lbs. per cft. made from well burnt furnace residue conforming to B.S. 1165 : 1947. Clinkers shall be from unburnt coal, sulphur or lime for roofs cinder concrete fill (proportion 1: 10 cement cinder) shall be laid in specified thickness to proper falls, slopes and grades and finished smooth to receive targets to the satisfaction of Architects. Cinder cash shall not be used.

4 REINFORCED CEMENT CONCRETE WORK:

4.1 **General**: Reinforced cement concrete work may be cast-in-site or precast as directed. Reinforced cement concrete work shall comprise of the following which may be paid separately or collectively asper description of the item of work a) Form work b) Reinforcement c) concrete d) Plastering or other finishing on concrete surface.

4.1.1 **Scope**: This specification coves reinforced cement concrete work both cast-in-situ or precast and related work in sections, form work and reinforcement, special requirements for shell and folded plateconstruction, architecturally exposed concrete are also included.

4.1.2 **Reference Publication**: The specifications, standards and codes are made part of this specification. Publication referred to herein shall be the latest editions including all applicable official amendments and revisions. In case of discrepancy, between this specification and those referred to herein, this specification shall govern.

4.1.2.1 MATERIALS

Cement

IS 269	Ordinary and low heat Portland cement
IS 455	Portland slag cement
IS 8041	Rapid hardening Portland cement
IS 1489	Portland Pozzolana cement
IS 8112	High strength ordinary Portland cement
IS 8043	Hydrophobic Portland cement
IS 6909	Super sulphated cement

Testing of cement

IS 4031	Physical tests of Hydraulic cement
IS 650	Standard sand for testing of cement

Aggregates

IS 383	Coarse and fine aggregates from natural sources for concrete
IS 2386	Method of test for aggregates for concretePart I to VIII

Concrete

IS 1199	Methods of sampling and analysis ofConcrete
IS 516	Methods of test for strength of concrete
IS 1881 (part VI)	Analysis of hardened concrete

Water

IS 3025	Method of sampling and test for water usedIn industry

Steel

IS 432	Mild steel and medium tensile steel bars and hard drawn steelwire for concrete reinforcement
IS 1139	Hot rolled mild steel, medium tensile steel and high yield strength steel deformed bars for concrete reinforcement
IS 1786	Cold twisted steel bars for concrete reinforcement
IS 1566	Hard drawn steel wire fabric for concrete reinforcement

Admixtures

IS 2645	Integral cement waterproofing compound
IS 9103	Admixtures for concrete

Codes of Practice

IS 456	Code of practice for plain and reinforced concrete
IS3696 Part I & II	Safety code for scaffolds and ladders
IS 1200	Method of measurement of building and civil engineering works
IS 7861	Code of practice for extreme weather concrete
ASTN-94	Ready mixed concrete

Definitions

i. Nominal Mix Concrete: Concrete in which the determinations of proportion of cement, aggregates and water to attain the required strength is made without any prior concrete mix design, byadopting nominal mix proportion shall be called “Nominal Mix Concrete”.

ii. Design Mix Concrete: Concrete in which the determination of cement, aggregates and water to attain the required strength is made by designing the concrete mix shall be called "Design MixConcrete".

iii. Embedded items: All bolts, inserts, sleeves, conduit, fixture and other material placed so as to become anchored in cast-in-place or precast concrete, as indicated and specified elsewhere in the contract documents

iv. Testing Laboratory: A testing laboratory by the contractor or any specified testing agency to perform testing services required in this section not otherwise assigned, and to perform any other such services requested by the Employer's Representative. All records and work shall be available for Employer's Representative.

v Concrete Admixtures. Special purpose manufactured materials added to concrete mixes by specific dispensing equipment furnished to the concrete Producer by the admixture manufacture.

vi. Free Water Cement Ratio. The total water in a concrete mix consists of water absorbed by aggregates to bring into saturated surface dry condition, and the free water available for thehydration of cement and for the workability of fresh concrete. The free water cement is the ratio by weight of free water to cement in the mix.

4.2 MATERIAL

4.2.1 General: All manufactured materials shall be new and shall conform to the following requirementsunless waived in writing by Employer/Architect

4.2.2 Approval of materials

Test reports on each manufactured material shall include a statement certifying that this material is of the same quality as that proposed for this project. Manufacturer's literature on proprietary materials shall indicate compliance with standards listed herein.

4.2.3 Cements

a) Each of the following types of cement shall conform of the appropriate specifications asindicated in the reference publications

Ordinary Portland cement	IS 269
Portland slab cement	IS 455
Portland Pozzolona cement	IS 1489
Rapid hardening Portland cement	IS 8041
High strength ordinary Portland cement	IS 8112
Super sulphated cement	IS 6909
Hydrophobic cement	IS 8043

b) These different cements shall not be used interchangeable in the same element or portion of thework.

c) Unless otherwise permitted or required cement shall be ordinary Portland cement.

d) Cement shall be further classified according to the compressive strength of cement of the age of7 days as given in table 4.1

Table 4.1

Cement type	Compressive strength of cement at the age of 168 + 2 Hrs
A	Not less than 22 N/mm2
B	Not less than 26 N/mm2
C	Not less than 30 N/mm2
D	Not less than 33 N/mm2

e) Supply. The cement shall be packed in bags of (gunny, multiply paper or cloth) alternatively it may also be supplied at site in silos installed for the purpose of supply

4.2.4 Aggregates

a) Aggregates shall be locally best available and shall conform to the following standards unless otherwise approved by Architects. IS 383 Specification for coarse and fine aggregates from natural sources for concrete.

b) Fine and coarse aggregate shall be regarded as separate ingredients. Each size of coarse aggregates as well as the combination of sizes when two or more are used. Shall conform to thegrading requirements of the applicable standard.

4.2.5 Water : Water used for mixing and curing shall conform to requirements as specified in IS 456

4.2.6 Admixture: Admixture to be used in concrete when required or permitted shall conform to the appropriate specification given in the reference publication.

4.2.6.1. **Admixture** used in work shall be of same composition as used in establishing the required concrete proportions.

4.2.7 Storage of materials:

Coarse aggregates: Aggregates stockpiles shall be arranged and used in manner to avoid excessive segregation and to prevent contamination with other sizes of like aggregat3es. It shall be stacked separately according to nominal sizes of coarse aggregates in stacks of height not exceeding 1.5meters. Frozen or partially frozen aggregates shall not be used.

Cement: Cement shall be stored in weather tight buildings, bins, or silos which will exclude moisture and contaminants. Storage of cement of site shall be at contractor's expense and risk. In the event of any damage occurring to cement due to faulty storage in contractors shed or on account of negligence on his part. Such damages shall be the liability of the contractors.

In case cement is stored and stacked in bags, storing shall be done in weather tight and properly ventilated structures to prevent absorption of moisture. The bags shall be stacked at least 10 to 20 cm. clear above the floor a space of 60 cm. around should be kept between the exterior walls and the stacks. Cement bags should be placed close together in the stack to reduce circulation of air as much as possible. Cement bags shall not be stacked more than 10 bags high to avoid lumping under pressure if the stack is more than 7 bags high arrange the bags in header and stretcher fashion, that is alternatively length wise and cross wise so as to tie them together and lessen the danger of tapping over. For extra safety during the monsoon or when it is expected to store the cement for an unusually long period, enclose the stack completely in 700-gauge polythene sheet or any other suitable water proof material. The flap will close on the top of the stack. Care should be taken that the polythene sheet is not damaged any time during use. When removing bags from storage some bags should be removed from two or three fiers back rather than all from one fier. If the rows are thus stepped back, there is less chance of over turning them. When removing cement bags for use apply the "first in, first out", rule that is, and take the oldest cement out first. Each consignment of

cement shall be stacked separately therein to permit easy access for inspection and facilitate removal.

Fine aggregate: fine aggregates shall preferably be stacked in regular stacks on a hard surface or platform so as to prevent contamination with clay, dust, vegetation and other foreign matter. Fine aggregates stacks should be allowed to drain until it has reached relatively uniform moisture content before it is used.

Admixture: Admixture manufactured in liquid form should be stored in water tight drums or tanks protected from freezing. Agitation of these materials during use should be as recommended by Manufacturers.

4.3 Concrete grades and quality

4.3.1 Grades: The concrete shall be in grades designated as per Table 4.2

4.3.1.1 The characteristic strength is defined as the strength of material below which not more than 5 percent of the test results are expected to fall.

Table 4.2 - Grades of Concrete

Grade Designation	Specification Characteristic (Compressive strength at 28 days in N/mm^2)
M-10	10
M-15	15
M-20	20
M-25	25
M-30	30

4.2.2 Workability of Concrete :

The concrete mix proportions chosen shall be such that the concrete is having adequate workability for placingof the concrete and can be properly compacted. The definition of the ranges of workability of concrete as measured by either the slump or V-B Test (IS-1199), and the ranges to be generally adopted for different kinds of work unless specified otherwise are given in Table 4.3 below :

Table – 4.3

Placing Condition	Degree of Workability	Values of Workability
Concreting of Shallow Sections with vibration	Very Low	Slump : 0-10 mm V.B.:12 Sec.
Concreting of lightly reinforced sections with vibration	Low	Slump : 10 – 30 mm V.B.: 6-12 Sec.
Concrete of lightly Reinforced sections without vibration or heavily Reinforced Sections with Vibration.	Medium	Slump : 30- 60 mm VB : 3 – 6 Sec
Concreting of heavily reinforced sections without vibration	High	Slump : 60 – 180 mm V.B.: 0-3 Sec.

4.2.3 Durability:

Unless otherwise specified to ensure durability the concrete shall be proportioned with limitations of minimumcement contents and maximum water cement ratios as given in Table 4.4 below for different conditions of exposure as specified below :

Table – 4.4

Exposure	Minimum cement content in Kg/ CuM of fresh Concrete	Maximum free water cement ratio
Mild	250	0.65
Moderate	290	0.55
Severe	360	0.45
Potentially destructive freezing and thawing severe weathering or subject to chemicals (Use air entrainment as per requirement of latest ACI 307).	290	0.53

4.2.3.1 Requirement of concrete exposed to Sulphate attack.

The requirements shall be as given in Appendix A , Table 20 of latest IS : 466.

4.2.4 Proportioning

The mix proportions shall be selected to ensure that the workability of the fresh concrete is suitable for the conditions of handling and placing, so that after compaction it surrounds all reinforcements and completely fills the form work. When concrete is hardened, it shall have the required strength durability and surfacefinish.

4.2.4.1 The determination of the proportions of cement aggregates and water to attain the required strengthshall be made as follows :

(a) By designing the concrete mix, such shall be called Design Mix Concrete.

(b) By adopting normal concrete mix, such concrete shall be called Nominal Mix Concrete.

4.2.4.2 Design Mix Concrete

This mix shall be designed to produce the grade of concrete having the required workability characteristic strength not less than the appropriate values given in Table 4.2 . The requirements of minimum cement contents, maximum water cement ratios, entrainment etc. specified from the point of view of achieving durability are also to be adequately considered.

4.2.4.3 Target mean strength of concrete :

The mix design for different grades of concrete shall be done for the following mean strength :

Grade of Concrete	Target mean cubes strength at 28 days N/mm^2
M-10	14.0
M-15	20.8
M-20	27.5
M-25	33.7
M-30	39.0

4.2.4.4 Nominal Mix Concrete

Nominal mix concrete may be used for concretes of Grades M – 10 , M- 15 and M-20. the proportions ofmaterials for nominal mix concrete shall be in accordance with Table 4.5.

Table – 4.5

Grade of Concrete	Total quantity of dry aggregates by mass per 50 Kg of cement to be taken as the sum of the individual masses of fine & course aggregates.	Proportion of fine aggregates to course aggregates (by mass)	Maximum water cement ration by weight
(1)	(2)	(3)	(4)
M-10	480	Generally, 1:2 butsubject to an upper limit of 1:1.5 & a Lower limit of 1:2 .5	0.68
M-15	350	-do-	0.64
M-20	250	-do-	0.60

Notes:

i) The proportions of the fine to coarse aggregates should be adjusted from upper limit to lower limit progressively as the grading of the fine aggregate become finer and the maximum size of coarse aggregate becomes larger. Graded coarse aggregates shall be used for example, for an average grading of fine aggregates (i.e. Zone II of Table 4 of IS-383), the proportions shall be 1:1.5 and 1:2.5 for maximum size of aggregate 10mm, 20 mm and 40 mm respectively.

ii) Normal mix concrete is also to meet the requirements of durability. Hence the maximum water cement ratios as given in Table 4.5 are to be adequately modified as per Table- 4.4 as per the exposure situation.

iii) The mix proportions as given in Table-4.5 are given in component weights. When expressly permitted, the following volumetric mixes may also be used for the respective grades of concrete.

Grades of Concrete	Volumetric Proportion Cement :Coarse Sand : Stone Aggregates	Maximum Water Cement Ratio
M-10	1:3:6	0.56
M-15	1:2:4	0.54
M-20	1:1.5:3	0.46

4.2.5 Sampling and Strength test of concrete:

4.2.5.1 General :

Samples from fresh concrete shall be taken as per IS : 1199 and cubes shall be made, cured andtested at 28 days in accordance with IS : 516.

4.2.5.2 In order to get relatively quicker idea of the quality of concrete, optional tests on beams for modulus of rupture at 72 $\pm$ 2 hours or at 7 days, or compressive strength tests days may be carried outin addition to 28 days' compressive strength tests. For this purpose, the values given in Table 4.6 may be taken for general guidance in the case of concrete mix with ordinary Portland cement. In all cases, the 28 days' compressive strength specified in Table 4.2 shall alone be the criteria for acceptance or rejection of the concrete.

Table – 4.6
OPTIONAL TEST REQUIREMENTS OF CONCRETE

Grade of Concrete	**Compressive strength on 15 cm Cubes Minimum at 7 days**	**Modulus of Rupture by Beam Test, Minimum at 72 + 2 hours**	**Modulus of Rupture by Beam Test, Minimum at 7 days**
(1)	**(2)** in **N/mm^2**	**(3)** in **N/mm^2**	**(4)** in **N/mm^2**
M-10	7.0	1.2	1.7
M-15	10.0	1.5	2.1
M-20	13.5	1.7	2.4
M-25	17.0	1.9	2.7
M-30	20.0	2.1	3.0
M-35	23.5	2.3	3.2
M-40	27.0	2.5	3.4

4.2.6 Frequency of Sampling:

4.2.6.1 Sampling Procedure : A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested, that is the sampling should be spread over the entire period of concreting and cover all mixing units.

4.2.6.2 Frequency : As per IS specifications.

4.2.7 Test Specimen : There Test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for various purposes such as to determine the strength of concrete at 7 days or at the time of striking the form work, or to determine the duration of curing or to check the testing error. Additional cubes may also be required for testing cubes cured by accelerated methods as described in IS-516.

4.2.8 Test Strength of Sample : The test strength of the sample shall be the average of the strength of three specimens. The individual variation should not be more than $\pm$15 percent of the average.

4.2.9 Standard Deviation :

4.2.9.1 Standard Deviation based on Test Results.

(a) Number of test results - The total number of test results required to constitute an acceptable record for calculation of standard deviation shall be not less than 30. Attempts should be made to obtain the 30 test results, as early as possible, when a mix is used for the first time.

(b) Standard deviation to be brought up to date - The calculation of the standard deviation shall be brought up to date after every change of mix design and at least once a month.

4.2.9.2 Determination of Standard Deviation :

a. Concrete of each Grade shall be analysed separately to determine its standard deviation.

b. The standard deviation of concrete of a given Grade shall be calculated using the following formula from the results of individual tests of concrete of that Grade obtained as specified in4.2.8.

$$\text{Estimated Standard Deviation} = \sqrt{\frac{\sum \Delta^2}{n-1}}$$

Where, Δ = deviation of the individual test strength from the average strength of a samples, andn=number of sample test results.

n = the number of sample test results.

c. When significant changes are made in the production of concrete batches (for example changesin the materials used, mix design, equipment or technical control), the standard deviation value shall be separately calculated for such batches of concrete.

4.3.9.3 Assumed Standard Deviation- Where sufficient test result for a particular grade of concrete are not available, the value of standard deviation given in Table 4.7 may be assumed

Table – 4.7
ASSUMED STANDARD DEVIATION

Grade of Concrete	Assumed Standard Deviation N/mm^2
M-10	2.3
M-15	3.5
M-20	4.6
M-25	5.3
M-30	6.0
M-35	6.3
M-40	6.6

However, when adequate past records for a similar grade exist and justify to the designer a value of standarddeviation different from that shown in Table 4.7, it shall be permissible to use that value.

4.3.10 Acceptance Criteria

4.3.10.1 The concrete shall be deemed to comply with the strength requirements if :

(a) Every sample has a test strength not less than the characteristic value :

or

(b) The strength of one or more sample though less than the characteristic value, is in each case notless than greater of :

(i) The characteristic strength minus 1.35 times the standard deviation; and

(ii) 0.80 time the characteristic strength; and the average strength of all the sample is notless than characteristic strength Plus

$$\left(\frac{1.65}{\sqrt{\text{No of Samples}}} \right) \text{ times standard deviation.}$$

If the average Compressive Strength of the cubes is less than the specified but not less than 85% of the specified of the strength the concrete may be accepted at reduced rates at the discretion of the Engineer – in – charge.

If the average Compressive strength is less than 50% of the specified strength the Engineer – in – charge shall reject & get dismantled the defective portion of the work, represented by the sample along with structurally connected work as considered necessary at the risk & cost of the Contractor.

In both the above case, the Engineer – in – charge if he so decides may order for additional tests like core tests, ultrasonic tests, rebound Hammer test etc. to be carried out. All the changes in the connection with these additional tests shall be borne by the Contractor.

If the results of these tests are satisfactory, the Owner may accept the work at reduced rate.

4.3.10.2 The concrete shall be deemed not to comply with strength requirements if;

(a) The strength of any sample is less than the greater of :

(i) The characteristic strength minus 1.35 times the standard deviation; and

(ii) 0.80 times the characteristic strength : or

(b) The average strength of all the samples is less than the characteristic strength plus

$$\left(\frac{1.65}{\sqrt{\text{No of Samples}}} \right) \text{ times standard deviation.}$$

4.3.10.3 Concrete which does not meet the strength requirements as specified in 4.3.10.1 but has a strength greater than required by 4.3.10.2 may at the discretion of the designer, be accepted as being structurally adequate without testing.

4.3.10.4 Concrete of each grade shall be assessed separately.

4.3.10.5 Concrete shall be assessed daily for compliance. The contractor shall keep a record at site of all such tests identifying them with the portion of the work to which they relate. This record will be checked by the Architects, from time to time. The said record shall give the following details and shall be initialed by the Architects.

(a) Reference to specific structural member receiving the batch of concrete from which the cubes were cast.

(b) Mark on cubes.

(c.) Mix of concrete.

(d) Date and time of casting.

(e) Water cement ratio by weight and slump.

(f) Crushing strength as obtained at the end of 7 days for 3 cubes out of a set of 6 cubes and at the end of28 days for the remaining 3 cubes.

(g) Laboratory in which tested and reference to test certificates.

(h) The quantity of concrete incorporated in work that is represented by the quantity of concrete of the setof the cubes.

(i) Any other information required by the Architect / Engineer – in – charge.

4.4 Form work :

4.4.1 General :

4.4.1.1 Forms shall be used, wherever necessary to confine the concrete and shape it to the required dimension Forms shall have sufficient strength to withstand the pressure resulting from placement andvibration of the concrete, and shall have sufficient rigidity to maintain specified tolerances.

4.4.1.2 Earth cuts shall not be used as forms for vertical surfaces unless required or permitted.

4.4.1.3 Shop drawings for form work including the location of shoring and reshoring shall be submitted forapproval by the Architect.

4.4.2 Materials :

The selection of materials suitable for form work shall be based on economy. Consistent with safety and quality required in the finished work. Form work shall be of timber, plywood, steel, fibre glass, reinforced plastics or any other material as approved by the Architect whose decision in this respect shall be final. Props and shores shall be of steel, timber posts, ballies or any other material as approved by Architect.

4.4.3 Design and installation of formwork :
The design and engineering of the formwork, as well as its construction, shall be the responsibility of theContractor.

4.4.3.1 The formwork shall be designed for the loads, lateral pressure, and allowable stresses. Design of Recommended Practice for concrete formwork (ACI-347) and for design considerations, wind loads, allowable stresses and other applicable requirements of the controlling local building code. The design shall besubmitted to the Owner / Architect for necessary approval & the Contractor shall erect the form work only after getting the approval from the Owner / Architect.

4.4.3.2 Forms shall be sufficiently tight to prevent loss of mortar from the concrete, Chamfer strips shall be placed in corners of forms to produce bevelled edges on permanently exposed. Surface interior corners on such surfaces and the edges of formed joints will not require bevelling unless required by the contract documents.

4.4.3.3 Where necessary to maintain the specified tolerances, the formwork shall be chambered to compensate for anticipated deflections in the formwork prior to hardening of the concrete.

4.4.3.4 Position means of adjustment (wedges or jacks) of shores and struts shall be provided and all settlement shall be taken up during concrete placing operation. Forms shall be securely braced against lateral deflections.

4.4.3.5 Temporary openings shall be provided at the base of column forms and wall forms and at other points where necessary to facilitate cleaning and observation immediately before concrete is placed.

4.4.3.6 Form ties shall be constructed so that the ends, or end fasteners can be removed without causing appreciable spalling at the faces of the concrete. After the ends or and fasteners of forms ties have been removed, the embedded portion of the ties shall terminate not less than 2 diameters or twice the minimum dimension of the tie from the formed faces of concrete to be permanently exposed to view except that in no case shall this distance be less than 18/20 mm. When the formed face of the concrete is not to be permanently exposed to view, form ties may be cut off flush with the formed surfaces.

4.4.3.7 At construction joints, contact surface of the form sheathing for flush surfaces exposed to view shall overlap the hardened concrete in the previous placement by not more than 25 mm. The forms shall be held against the hardened concrete to prevent offsets or loss or mortar at the construction joint and to maintain a true surface.
4.4.3.8 Wood forms for wall openings shall be constructed to facilitate loosening, if necessary, to counteract swellforms.
Wedges used for final adjustment of forms prior to concrete placement shall be fastened in position after thefinal check.
4.4.3.9 At construction joints, contact surface of the form sheathing for flush surfaces exposed to view shall overlap the hardened concrete in the previous placement by not more than 25 mm. The forms shall be held against the hardened concrete to prevent offsets or loss or mortar at the construction joint and to maintain a true surface.

4.4.3.10 Wood forms for wall openings shall be constructed to facilitate loosening, if necessary, to counteractswelling of the forms.

4.4.3.11 Wedges used for final adjustment of forms prior to concrete placement shall be fastened in positionafter the final check.
4.4.3.12 Form work shall be so anchored to shores or other supporting surfaces or members that upward orlateral movement of any part of the formwork system during concrete placement will be prevented.

4.4.3.13 Runways for moving equipment shall be provided with struts or legs and shall be supported directlyon the formwork or structural member without resting on the reinforcement steel.

4.4.4 Tolerances

4.4.4.1 Unless otherwise specified by the Architect/Engineer-in-charge, formwork shall be constructed so thatthe concrete surfaces will conform to the tolerance limits in Table 4.8.

4.4.4.2 The Contractor shall establish to maintain the undisturbed condition until final completion and acceptanproject Sufficient points and bench marks to be used for reference purposes to check tolerances.

4.4.4.3 Regardless of the tolerances listed in Table 4.8 no portion of the building shall extend beyond thelegal boundary of the project.

Table - 4.8

Tolerance for formed surfaces (applicable only for concrete dimensions not applicable for positioning ofvertical reinforcing steel, dowels or embedded items).

(i) Variation from plumb:

(a) In the lines and surfaces of columns, piers, walls and in sharp edges formed at meeting of two surfaces 6mm per 3.0 M, but not more than 25mm.

(b) For exposed corner columns and other conspicuous lines -

In any 6M height	6 mm
Maximum for entire height	12 mm

(ii) Variation from the level or from the grades indicated on the drawings (after allowing forspecified camber).

(a) In slab soffits, ceilings beam soffits, and in horizontal sharp edges formed at meeting of two surfaces,(measured before removal of supporting shores)

In 3 M	6 mm
In any bay or in any 6 M length	10 mm
Maximum for entire length	20 mm

(b) For exposed lintels, sills parapets, horizontal grooves and other conspicuous lines.

In any bay or in 6 M length	6 mm
Maximum for entire length	12 mm

(iii) Variation of the linear building lines from established position in plan and related position ofcolumns, wall and partitions.

In any 6 M of length	12 mm
Maximum for entire length	25 mm

(iv) Variation of the sizes and locations of sleeves, openings in walls and floors. - 6 mm

(v) Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs andwalls.

Minus	6 mm
Plus	12 mm

(vi) Footings :

(a) Variation in dimension in plan

Minus	12 mm
Plus	50 mm

(b) Misplacement or eccentricity 2% of footing width in the direction of misplacement but not morethan 50 mm.

(c.) Reduction in thickness Minus -50% of specified thickness subject to a maximum of 50 mm.

(vii) Variation in steps

(a) In a flight of Stair

Rise	3 mm
Tread	5 mm

(b) In consecutive Steps

Rise	1.5 mm
Tread	5 mm

4.4.5 Preparation of form surfaces

4.4.5.1 All surfaces of forms and embedded materials shall be cleaned of any accumulated mortar of groutfrom previous concreting and of other foreign material before concrete is placed in them.

4.4.5.2 Unless otherwise specified or approved, surfaces of form shall be treated as follows :

(a) Before placing of either the reinforcing steel / or the concrete, the surfaces of the forms shall be covered with an approved coating material that will effectively prevent absorption of moisture and prevent bond with the concrete, and will not stain the concrete surfaces. A field applied from release agent or sealer of approved type or a factory applied non absorptive liner may be used.

(b) Excess form coating material shall not be allowed to stand in puddles in the forms nor shall such coating be allowed to come in contact with hardened concrete against which fresh concrete is to be placed.

4.4.6 Removal of formwork

4.4.6.1 When repair of surface defects or finishing is required at an early age, forms shall be removed as the concrete has hardened sufficient by to resist damages from removal operation.

4.4.6.2 Top forms on sloping surfaces of concrete shall be removed as soon as the concrete has attained sufficient stiffness to prevent sagging. Any needed repairs or treatment required on such sloping surfaces shall be performed at once and be followed by the specified curing.

4.4.6.3 Wood forms for wall openings shall be loosened as soon as this can be accomplished without damageto the concrete.

4.4.6.4 In normal circumstances and where ordinary Portland cement is used, forms may generally beremoved after expiry of the following
period:

A	Walls, columns and vertical faces ofall structural members	24 to 48 hours as may be decided by the Engineer – inCharge
B	Slabs (Props left under)	3 days
C	Beam soffits (props left under)	7 days
D	Removal of Props under slabs:	
	…spanning upto 4.5 M	7 days
	…spanning over 4.5 M	14 days

4.4.6.5 The number of props left under, their sizes and disposition shall be such as to be able to safely carrythe full dead load of the slab, beams or arch as the case may be together with any live load likely to occur during curing or further construction.

4.4.7 Re-shoring:

4.4.7.1 When re-shoring is permitted or required, the operations shall be planned in advance and shall besubject to approval. While re-shoring is under way, no live load shall be permitted on the new construction.

4.4.7.2 In no case during re-shoring shall concrete in beam slab, column or any other structural member besubjected to combined dead and construction loads in excess of the loads permitted by the Architect / Engineer
– in - charge for the developed concrete strength at the time of re-shoring. Re-shores shall be brightened tocarry their required loads without overstressing the construction.

4.4.7.3 Floors supporting shores under newly placed concrete shall have their original supporting shores left in place or shall be re-shored. The re-shoring system shall have capacity sufficient to resist the anticipated loads and in all cases shall have a capacity equal to at least one half of the capacity of the shoring system above. The re-shores shall be located directly under a shore position above unless other locations are permitted.
Before the lifting operation is started the top of concrete in the shuttering shall be leveled and cleared by removingdeposit of concrete
by pointed metal brushes.
From the lower platform any honey combs and bad spots shall be repaired as soon as the concrete comes outof the forms. All the block outs and embedded materials shall be exposed before concrete hardens.

4.4.8 Scaffolding:

The scaffolding must be strong and right stiffened with necessary cross braces and always decked and boarded on the sills with close boarded veiling and swings to prevent any injury to persons or materials. The Contractorshall have to allow other traders to make reasonable use of his scaffolding as and when directed by the Engineer-in-charge.
If for the interest of the work Contractors have to erect scaffolding in other's properties including the local bodies or municipalities or corporations, the arrangement for the same including the cost of licensing fees etc shall have to borne by the Contractor and the Employer / Architect should be kept free from any liability on this account.

4.5 Reinforcement :

4.5.1 Steel reinforcement shall be either mild steel of tested quality conforming to IS:432 or cold worked steelhigh strength deformed bars as per IS:1786 in strength grade Fe 415 or hot rolled high yield strength steel deformed bars with minimum yield strength of 425 N/mm^2 as per IS:1139 as specified in the drawings. Fabric reinforcement in topping slab or precast concrete units shall be of hard drawn mild steel wire mesh I.R.C weld mesh or other equivalent as approved. Bars shall be free from mill scale, excessive rust, oil or paint.

4.5.2 The Contractor shall submit manufacturer's Test Certificate with every lot of supply of reinforcement steel. In a period of every 3 (three) months the Contractor shall collect samples of reinforcement steel in presence of the representative of the Employer and send to any Government recognized laboratory for testing as per relevant IS Code.

4.5.3 The weight per metre of bars shall be calculated on the basis of the steel weighs - 7.85 gm/cc.

4.5.4 The Contractor shall submit bar bending schedule for the approval of the Architect prior to commencement of fabrication. These will indicate the accurate dimensions and bending of bars as required in the structural drawings. Fabrication shall be accurately done to the dimensions, spacing and minimum cover asshown on structural drawings.

4.5.5 All steel shall be rigidly held in place with 18 gauge annealed steel wire. Cement mortar (1 : 2) cubes,
M.S. chairs and spacer bars shall be used in order to ensure accurate positioning of reinforcement.

4.5.6 All joints in mild steel reinforcement up to and including 16 mm dia shall be overlapped. The length of overlap for tension and compression joints shall be in accordance with the IS Code. Joints in mild steel reinforcement above 16 mm diameter may be welded if permitted by the Architects in writing. All joints in deformed bars shall be overlapped strictly in accordance with the IS Code.

4.5.7 Welding of Reinforcement
Reinforcement in structures shall not be welded except where permitted in the Contract. All welding procedures shall be subject to the prior approval of the Architect / Employer in writing.

4.5.8 Cover to Reinforcement :

Care shall be taken to maintain the correct cover to reinforcement. The minimum covers to be provided shallbe in accordance with the provisions specified in the structural drawings.

4.6 Joints and Embedded items.
4.6.1 Construction joints :
Construction joints shall be made only where shown on the drawings or approved by the Architects. Such joints shall be kept to the minimum and shall not be located in valleys. The joints shall be at places where the shear force is the minimum and shall be at right angles to the direction of main reinforcement. In case of columns and walls the joint shall be horizontal and 8 to 15 cms below the bottom of the beam or slab comingin to the column or wall head or below the anchor reinforcement of beam and slab coming into the column andwall and the portion of the column or wall between the stopping of level and the top of the slab shall be concreted with the beam or slab.

i) Vertical Joints : At the end of any day's work or run of concrete the concrete should be finished off against temporary shutter stop which should be vertical and securely fixed this stop should removed as early as weather permits.
ii) Horizontal Joints : Horizontal joints should be washed down two hours after casting in the manner described above for vertical joints.

If the concrete has been allowed to harden excessively, surface shall be chipped over its whole surface todepth of at least 10mm and thereafter thoroughly washed. Before fresh concrete is added on the other side of a construction joint, the surface of the old concrete will be thoroughly wetted then covered with a thin layer of cement mortar 1 : 2 by volume.

All construction joint in all concrete floors and wall of basement, water tanks or any other structure in contact with water or earth, shall be provided with approved PVC water stops coated on both sides with hot asphalt or approved metallic strips. The longitudinal joints in water stops shall be preferably hot welded or overlapped at least 200mm.

4.6.2 Expansion Joint :
Expansion joint shall be provided where required as shown in the drawing or as directed by the Architect. The filler to be used shall be of approved material.

4.6.3 Inserts :
Inserts of any kind like fan hooks, sleeves pipes, bolts and nuts, anchor bolts etc. are to be accurately placedin the concrete (and/or brick work) and concreted over, as and where required and directed. The word insert will mean article like anchors, anchor beams, sleeves, pipes, bolts, nuts etc. and the weight of which does not exceed 100 Kgs/piece.
The contractor shall provide necessary wooden plugs sleeves, etc. for his own works, for which no extra payment shall be made. He will provide if so directed any inserts, wooden plugs, sleeves etc. for other contractors for which he shall be paid but in case where the other contractors provide the inserts, he will take proper measures at his own expense not to disturb their work while concreting.
The required detail for the fan hooks is given in the Architect's drawing.
Conduit and Plumbing pipes: All Electric Conduits and Sanitary Pipes, Water supply pipes and Down pipes that lie within Concrete Slabs, Beams and Columns shall be laid correctly in place as per drawings and Architect's approval shall be obtained before the Casting of Concrete. No cutting of the Structural Concrete will be permitted. All care shall be taken to ensure that conduit pipes are not damaged.

4.7 Production of concrete
4.7.1 General :
To avoid confusion and error in batching, consideration should be given to use the smallest practical numberof different concrete mixes on any site or in any one plant.

4.7.1.1 A competent person shall supervise all stages of production of concrete. Preparation of test specimensand site test shall be properly supervised. Above persons placement for particular operation shall be approved by the Owner.

4.7.1.2 The Engineer-in-Charge shall be afforded all reasonable opportunity and facility to inspect the materials and manufacture of concrete and to take any samples or to make any tests. All such inspection, sampling and testing shall be carried out with the minimum of interference with the process of manufactureand delivery.

4.7.2 Ready Mixed Concrete
Except as otherwise provided, ready mixed concrete shall be batched, mixed and transported in accordancewith "Specifications for Ready – Mixed Concrete" .

4.7.3 Site Mixed Concrete

4.7.3.1 Batching
(a) In proportioning concrete, the quantity of both cement and aggregate should be determined by mass. Where the mass is determined on the basis of mass of cement per bag, a reasonable number of bags should be

weighed periodically to check the net mass. Where the cement is weighed on the site and not in bags it should be weighed separately from the aggregates. Water should be either measured by volume in calibrated tanks or weighed. Any solid admixture that may be added, may be measured by mass, liquid and paste admixture by volume or mass. Batching plant where used should conform to IS:4925. All measuring equipments should be maintained in a clean serviceable condition, and their accuracy periodically checked.

(b) Except where it can be shown to the satisfaction of the Engineer – in – Charge that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate should be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions when required. The different sizes being stacked in separate stock piles. The materials should be stock – piled for several hours preferably a day before use. The grading of coarse and fine aggregate should be checked as frequently as possible, the frequency for a given job being determined by the Engineer – in – Charge to ensure that the specified grading is maintained.

(c) Volume batching with weight control : Where batching by volume with weight control specified by the Architect all measurements of sand, coarse aggregate and water shall be by the volume and of cement by the bag controlled by regular periodical weighing. In order to ensure correct proportioning following precautions shall be taken :

i) The Contractor shall maintain at site a number of platforms, balances similar to the balances used for weighing luggage at railways platforms, capable of weighing upto 200 Kg. to the nearest 500 grams. The balance shall be used for weighing cement bags and occasional boxes of sand and coarse aggregate as specified below:

ii) The contractor shall provide the mixer operator with two standard measures one of 5 litre and one of 1 litre capacity for measuring the water to be added to the mix.

iii) The quantity of water to be added to the mix shall be approved by the Architect / Engineer – in – Charge and may be adjusted by them as frequently as necessary in order to allow for the moisture content of fine and coarse aggregate and workability desired. On no account shall the Contractor allow more water to be added to the mix than that specified, a mix containing such excess water may be rejected by the Architect / Engineer – in - Charge and not allowed for use in the works.

iv) Sand and coarse aggregate shall be measured by volume. The sizes of measuring boxes or the depth to which they are filled or both shall be adjusted to obtain the correct weight of each material specified by the Architect for that mix.

v) Every fifth or tenth measuring box of sand or of coarse aggregate shall be weighed on the balance to ensure that filling of boxes is being uniformly done. Adjustments shall be made from time to time in the amount of each box filled to take into account variation in moisture content and bulking of sand in accordance with IS-2386 (Part III).

vi) More frequent weighing of boxes, particularly of sand if found to very considerably in moisture content and bulking, may be required by the Architect and shall be done by the Contractor without additional cost.

(d) It is important to maintain the water-cement ratio constant at its correct value. To this end, determination of moisture contents in both fine and coarse aggregates shall be made as frequently as possible, the frequency for a given job being determined by the Engineer-in-Charge according to the weather conditions. The amount of the added water shall be adjusted to compensate for any observed variations in the moisture contents. For the determination of moisture content in the aggregates IS : 2386 (Part III) may be referred to. To allow for the variation in mass of aggregate due to variation in their moisture content, suitable adjustments in the masses of

aggregates shall be made. In the absence of exact data, only in the case of nominal mixes, the amount of surface water may be estimated from the values given in Table 4.9.

Table 4.9 : Surface water carried by aggregate.

Aggregate	Approximate Quantity of Surface Water	
	Percent by Mass	$1/m^2$
Very wet sand	7.5	120
Moderately wet sand	5.0	80
Moist sand	2.5	49
*Moist Gravel or Crushed Rock	1.25 – 2.5	20 - 40
*Coarse the aggregate, less the water it will carry.		

(e) No substitutions in materials used on the work or alterations in the established proportions, except as permitted for accounting bulkage of fine aggregate and moisture contents in the fine and coarse aggregates shall be made without additional tests to show that the quality and strength of concrete are satisfactory.

4.7.4 Mixing :

Concrete shall be mixed in a mechanical mixer. The mixer should comply with IS : 1791. The mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in colour and consistency. If there is segregation after unloading from the mixer, the concrete should be remixed.

Note : 1. For guidance, the mixing time may be 1.5 to 2 minutes, for hydrophobic cement may be taken as 2.5 to 3 minutes.

Note : 2. In exceptional circumstances such as mechanical breakdown of mixer, work in remote areas or when the quantity of concrete work is very small, hand mixing may be permitted subject to adding 10 percent extra cement. When hand mixing is permitted, it shall be carried out on a water-tight platform and care shall be taken to ensure that mixing is continued until the concrete is uniform in colour and consistency.

4.7.4.1 Workability of the concrete should be controlled by direct measurement of water content. Workability should be checked at frequent intervals (IS:1199).

4.7.4.2 Work in extreme weather conditions : During hot or cold weather, the concreting should be done as per the procedure set out in IS:7861 (Part – I) or IS: 7861 (Part – II).

4.8 Transport and Lacing of Concrete

4.8.1 General

The method of transporting and placing concrete shall be to the approval of the Architect / Employer.
The temperature of concrete at the time of placing shall not exceed 32 degrees Celsius and the Contractor shall submit for the Architect / Employer's approval details of the measures he proposes to take to ensure that this temperature will not be exceeded.
All areas in which concrete is to be placed shall be clean and free from standing water immediately before placing of the concrete, except for concrete placed under water.
Concrete shall not be placed in any part of the structure until the Architect / Employer's approval has been given. If concreting is not started within 24 hours of approval being given, approval shall again be obtained from the Architect / Employer.

Concrete shall be compacted in its final position within 30 minutes of discharge from the mixer, in case of ready mix concrete, unless carried in continuously operating purpose made agitators when the time shall be within 2.5 hours of the introduction of cement of the mix and within 30 minutes of discharge from the agitator. The placing and compaction of concrete shall be done in such a way as not to cause disturbance to the framework or reinforcement. Where sections of the works are carried out in lifts, the reinforcement projecting above the lift being cast shall be adequately supported so as to prevent movement of the bars during the casting and setting of the concrete.
No concrete shall be placed in flowing water.

4.8.2 Placing of concrete:

Preparation before placing.
Hardened concrete and foreign materials should be removed from the inner surfaces of the conveying equipment.
From work shall have been completed, water shall have been removed, reinforcement shall have been secured in place, expansion joint material, anchors and other embedded items shall have been positioned, and the entire preparation shall have been approved.
Semi-porous sub-grades shall be sprinkled sufficiently to eliminate suction and porous sub grades shall be sealed in an approved manner.

4.8.3 Conveying :

Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.
Conveying equipment shall be approved and shall be of size and design such that detectable setting of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or work day. Conveying equipment and operation shall conform to the following additional requirements :
(a) Truck mixers, agitators and agitating units and their manner of operation shall conform to the applicable requirements of "Specifications for Ready Mixed Concrete"
(b) Belt conveyors shall be horizontal or at a slope which will not cause excessive segregation or loss of ingredients. Concrete shall be protected against undue drying or rise in temperature. An approved arrangements shall be used at the discharge end to prevent apparent segregation. Mortar shall not be allowed to adhere to the return length of the belt. Long runs shall be discharged into a hopper or through a baffle.
(c) Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 6 meters long and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.

(d) Pumping or pneumatic conveying equipment shall be of a suitable kind with adequate pumping capacity. Pneumatic placement shall be controlled so that segregation is not apparent in the discharged concrete. The loss of slump in pumping or pneumatic conveying equipment shall no exceed 50 mm.
(e) Concrete shall not be conveyed through pile made of aluminum or aluminum alloy.

4.8.4 Depositing

General :

Concrete shall be deposited continuously, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, Construction Joints shall be located as shown in the structural drawings or as approved. Placing shall be carried on at such a rate that concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened or has been contaminated by foreign materials shall not be deposited. Temporary spreaders in forms shall be removed when the concrete

placing has reached an elevation tendering their service unnecessary. They may remain embedded in the concrete only if made of metal or concrete and if prior approval has been obtained.

Placing :
Placing of concrete in supported elements shall not be started until the concrete previously placed in columns and walls is no longer plastic and has been in place at least two hours.

Segregation :

Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to re-handling or following. Concrete shall not be subjected to any procedure which will cause segregation.

Consolidation :
All concrete shall be consolidated by vibration, spading rodding or forking so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of forms, eliminating all air or stone pockets which may cause honey combing, pitting or planes of weakness. Internal vibrators shall have a minimum frequency of 8000 vibrations per minute and sufficient amplitude to consolidate the concrete effectively. They shall be operated by competent workers. Use of vibrator to transport concrete within forms shall not be allowed. vibrators shall be inserted and withdrawn in at points approximately 450 mm apart. At each insertion, the duration shall be sufficient to consolidate the concrete but not sufficient to cause segregation, generally from 5 to 15 seconds. A spare vibrator shall be kept on the job site during all concrete placing operations. Where the concrete is to have an as cast, finish, a full surface of mortar shall be brought against the form by the vibration process, supplemented if necessary by spading to work the coarse aggregate back from the formed surface.

Compaction of Concrete
All concrete shall be compacted to produce a dense homogeneous mass. Unless otherwise agreed by the Architect / Employer, it shall be compacted with the vibrators.
Vibration shall not be applied by way of the reinforcement. Where vibrators of the immersion type are used, contact with reinforcement, formwork and all inserts shall be avoided as far as its practicable.
Concrete shall not be subjected to vibrations between 4 and 24 hours after compaction.
Vibration shall not be used as a means of distributing concrete into position.

4.8.5 Protection.

Unless adequate protection is provided and approval is obtained, concrete shall not be place during rain.
Rainwater shall not be allowed to increase the mixing water nor to damage the surface finish.
Special precautions are to be taken during rainy reason so that freshly placed concrete can be adequately covered and protected by keeping sufficient number of tarpaulins.

4.8.6 Bonding :
When specified, the surface of joints shall be prepared in accordance with one of the methods specified in the section on Joints and embedded items.
The hardened concrete of construction joints and of joints between footings and walls or columns, between walls or columns and beams or floor they support, joints in unexposed walls and all others not mentioned below shall be dampened (but not saturated) immediately prior to placing of fresh concrete.
The hardened concrete of joints in exposed work, joints in the middle of beams, girders, joints, and slabs, and joints in work designed to contain liquids shall be dampened (but not saturated) and then thoroughly covered with a coat of cement grout of similar proportions to the mortar in the concrete. The grout shall be as thick as possible on vertical surfaces and at least 12mm thick on horizontal surfaces. The fresh concrete shall be placed before the grout has attained its initial set.
Joint receiving an adhesive shall have been prepared and adhesive applied in accordance with the manufacturer's recommendations prior to placing of fresh concrete.

Surfaces of joints which have been treated with a chemical retarder shall have been prepared in accordance with the manufacturer's recommendations prior to placing of fresh concrete.

4.8.7 Concreting under water :
When required or permitted, concrete shall be deposited under water by an approved method in such a way that the fresh concrete enters them as of previously placed concrete from within causing water to be displaced with minimum disturbance at the surface of the concrete.

4.9 Curing and Protection

4.9.1 General :
Immediately after placement, concrete shall be protected from premature drying, excessively hot or cold temperatures, and mechanical, injury, and shall be maintained with minimum moisture loss at a relatively constant temperature for the period necessary for hydration of cement and hardening of the concrete. The materials and methods of curing shall be subject to approval. About 24 hours after laying of concrete, the surface shall be cured by flooding with water of minimum 25mm depth or by conveying with wet absorbent materials. The curing shall be done for a minimum period of 7 days. Over the foundation concrete the masonry work may be started after 48 hours of its laying, but the curing of cement concrete shall be continued along with masonry work for a minimum period of 7 days.
In case of cement concrete used as sub-grade for flooring, the flooring work may be commenced within 48 hours of the laying of the sub-grade. In case it is not possible to do so due to exigencies of work the sub-grade shall be roughened with steel wire brush without disturbing the concrete, wetted with neat cement slurry at the rate of 1.75 kgs of cement per SqM applied to the base before laying floor. The curing to be continued along with the top layer of flooring for a minimum period of 7 days.

4.9.2 Preservation of moisture :
4.9.2.1 For concrete surfaces not in contact with forms, one of the following procedures shall be applied immediately after completion of placement and finishing.

a) Ponding or continuous sprinkling.

b) Applications of absorptive mats or fabric kept continuously wet.

c) Application of sand kept continuously wet.

d) Continuous application of steam (not exceeding 650 C) or mist spray.

e) Application of waterproof sheet materials, conforming to specifications for waterproof sheet materials for curing concrete (ASTMC 171)
f) Application of other moisture retaining covering as approved.

g) Application of a curing compound conforming to specifications for liquid member-forming compounds for curing concrete (ASTM C 309).

The compound shall be applied in accordance with the recommendations of the manufacturer immediately after any water seen which may develop after finishing has disappeared from the concrete surface. It shall not be used on any surface against which additional concrete or other material is to be bonded unless it is proven that the curing compound will not prevent bond, or unless positive measures are taken to remove it completely from areas to receive bonded application.

4.9.3 Moisture loss from surfaces placed against wooden forms or metal forms exposed to heating by the sun shall be minimized by keeping the forms we until they can be safely removed. After form removal the concrete shall be cured until the end of the time prescribed in section 4.9.4 any of the section by one of the methods of section 4.9.2.1.

4.9.4 Curing in accordance with 4.9.2.1 or 4.9.3 shall be continued for at least 7 days in case of all concrete except high early strength concrete for which the period shall be at least 3 days. Alternatively, if tests are made of cylinders kept adjacent to the structure and cured by the same methods, moisture retention measures may be terminated when the average compressive strength has reached 70 percent of the specified strength. If one of the curing procedures of sections 4.9.2.1 (a) through (d) is used initially, it may be replaced by one of the other procedure of section 4.9.2.1 any time after the concrete is 1 day old provided the concrete is not permitted to become surface dry during transition.

4.9.5 Temperature wind and humidity .

Cold weather :

When the mean daily outdoor temperature is less than 5^0 C, the temperature of the concrete shall be maintained between 10^0 C and 21^0 C for the required curing period of Section 4.9.4. When necessary arrangements for heating, covering insulating or housing the concrete work shall be made in advance of placement and shall be adequate to maintain the required temperature without injury due to concentration of heat. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.

Hot weather : When necessary, provision of wind breaks, shading for spring, sprinkling, ponding or wet covering with a light coloured material shall be made in advance of placement and such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow.

Rate of temperature change – Changes in temperature of the air immediately adjacent to the concrete during and immediately following the curing period shall be kept as uniform as possible and shall not exceed 3^0 C in any 1 hour or 28^0 C in any 24 hours' period.

4.9.6 Protection from mechanical injury – During the curing period the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock and excessive vibration. All finished construction equipment, materials, or methods, by application of curing procedures, and by rain or running water. Self-Supporting structures shall not be loaded in such a way as to overstress the concrete.

4.10 Finishing of formed surfaces - Unless otherwise specified after removal of forms the surfaces of concrete shall be given one or more of the finishes specified below in locations designated by the contract.

4.10.1 Cement plaster finish - The concrete surface shall be properly roughened immediately after the shuttering is removed taking care to remove any laitance completely without disturbing the concrete. The roughening shall be done by hacking. Before the surface is plastered, it shall be cleaned and wetted so as to give good bond between concrete and plaster. After preparation the exposed formed surface or RCC work shall be plastered with cement mortar 1:3 / 1:4 (1 cement : 3 fine sand / 4 fine sand) or as directed by the Engineer – in - Charge of thickness not less than 6 mm to give a smooth and even surface true to time and form.

4.11 Pre – Cast Concrete

4.11.1 Pre cast Nominal mix concrete.

A General

All pre-cast concrete shall be cast over vibrating tables or by using form vibrators. The concrete mix shall conform in all respect to the IS specifications.

Exposed pre-cast surfaces shall be finished as called for on the drawings or as directed by the Architects. All surfaces coming in contact with in situ concrete shall be wire brushed and hosed down until the aggregate is free from cement slurry. Castellation shall be provided wherever called for. Leaving grouting holes, grooves, inserts projections reinforcement, lifting hooks etc to conform to the erection procedure. All edges and delicate projection likely to be damaged during erection shall be provided by means of wooden cover fillets, until placed in position.

B Pre – cast jail blocks louvers, shelves etc – All Pre-cast jail blocks shall be exactly of the size and pattern shown on the drawings and shall be made face up in the following manner. All units shall be integrally cast, steel formwork shall be used for making jails.

Provided in the formwork as shown in the drawings. Stiff plastic concrete
1: 1.5:3 shall be used with coarse aggregate 12 mm and down Grade.

The pre – cast units shall not be removed from the forms for three days. Pre – cast work shall be cured under cover and shall be kept under water for fifteen days before placing in position. Samples of each part shall be approved by the Architects before proceeding with the work. Units may require wetted before bedding. The concrete base shall be wetted and coated with slurry and minimum of mixing water shall be used in the bedding mortar which shall be Portland cement and sand 1: 3.

4.12 Measurements

4.12.1 Reinforce cement concrete work (Cast – in – Situ).

The consolidated cubical contents of concrete shall be measured in cubic meters nearer to two places of decimal. Concrete laid in excess of sections shown in the drawings or as determined by the Engineer – in – Charge shall not be measured.
The work shall be measured separately under the different categories provided in Schedule of Quantities.

4.12.2 Pre – Cast Work

Same as per R.C.C. in situ work.
RCC pre- cast work shall be measured separately under the different categories specified in the Schedule of Quantities and shall include all modules, finished faces, reinforcement (where provided hoisting and setting in position.)
Pre-cast Jali bocks louvers, shelves etc.
These shall be measured in square meters for their gross dimensional area. The length and breadth shall be measured correct to a cm. The thickness shall not be less than specified.

5. BRICK WORK (Ordinary Brick Work by using Conventional / Modular Bricks).

5.1 The bricks shall conform to the IS specifications.
(a) Mortar : The mortar for brick work shall be as specified.
(b) Construction Details

5.2 Soaking – All bricks shall be immersed in water for two hours before being put into work so that they will be saturated and will not absorb water from the mortar.

5.3 Bats – No bats or cut bricks shall be used in the work unless absolutely necessary around irregular openings or for adjusting the dimensions of different courses and for closer in which case, full bricks shall be laid at corners, the bats being placed in the middle of courses.

5.4 Laying – The bricks shall be laid in mortar to line, level and shapes shown on the plans slightly pressed and thoroughly bedded in mortar and all joints shall be properly flushed and packed with mortar so that they will be completely filled with mortar and no hollows left anywhere. Bricks shall be handled carefully so as not to damage their edge. They should not also be thrown from any heights to the ground and should be put down

gently. All courses shall be laid truly horizontal and all vertical joints made truly vertical. Vertical joints in one course and the next below shall not come over one another and shall not normally be nearer than quarter of a brick length. For battered faces bedding shall be at right angles to the face, plugs, frames etc. if any, shall be built in places shown in the plants while laying the courses only and not latter by removal of bricks already laid.

5.5 Bond – Unless otherwise specified, brick work shall be done in English Bond.

5.6 Joints – Joints shall not exceed 10 mm in thickness and this thickness shall be uniform throughout. The Joints shall be raked out not less than 15 mm deep when the mortar is green so as to provide proper key for the plaster or pointing to be done, where plastering and pointing is not required to be done, the joints shall be struck flush and finished at the time of laying. The face of brickwork shall be cleaned on the same day on which brickwork is laid and all mortar dropping removed promptly.

5.7 Uniform Raising : Brick work shall be carried up regularly in all cases where the nature of work will admit, not leaving any part 60 cm. Lower than another. But where building at different levels is necessary, the breaks shall be stepped so as to give later uniform level and effectual bond. Horizontal courses should be to line and level and even and face plumb or to batter as shown on the plan. The rate of laying masonry may be up to a height of 80 cm.if lime mortar is used.

5.8 Scaffolding: Single Scaffolding shall be used. Holes shall be made good by bricks to match the face work, when scaffolding is removed.

5.9 Curing : All brick work shall be kept well watered for 14 days after laying.

5.10 Architectural exposed brick work:
Where exposed brick work is specified , the usual specifications for 'Brick Work' as mentioned above will be applicable for 'Exposed brick' , but in addition specially selected brick shall be used for facing, ensuring regular and clean faces of uniform colour. No bricks which are broken, chipped, wrinkled or which have irregular edges or corners, shall be used. Depending on the quality of bricks and if instructed by the Architects, the exposed face of every brick shall be rubbed before laying without any extra charge. Wooden fillets 10 mm thick and 10 mm wide shall be placed at the edge of joints so that no mortar comes on the surface of the bricks and a regular thickness of joints is maintained. The surface shall be rubbed down with brushes or bricks if necessary, and thoroughly washed. No mortar shall be allowed to stick to the surface, which shall be left clean with all joints even and true to straight line. Double scaffolding shall be used in exposed brick work.

5.11 Reinforcement in Half Brick Thick Walls
Half brick thick and brick on edge walls shall be provided with reinforcement consisting of 2 Nos. of 6mm M.S. bars or Hoop iron 25 x 1.6 mm or Chicken Wire Mesh embedded in mortar 15 mm thick at every fourth course and shall be anchored at ends. The cost of M.S. bars or Hoop iron or Chicken Wire Mesh shall be included in the rate for partition walls unless otherwise stated in the Schedule of Quantities.

5.12 Measurements:
(a) Half brick, cavity walls and brick on edge walls shall be measured in SqM. unless otherwise stated in the schedule of quantities.
(b) One or more brick thick wall shall be measured in CuM. The thickness of brick walls in and or more brick thickness shall be measured in multiples of half bricks.

5.13 Brick Drip Course:
It shall be laid above the junction of roof with the wall to shield the cracks at their junction. The upper course of the projecting brick shall be chamfered or rounded off with 7.6 cms. Radius. A transverse drip or throating about 1.3 cm deep shall be cut on the underside of the projecting bricks.

The drip course shall project 11.4 cms. From the face of the wall thereby completely covering the gola and projection beyond it.

Measurement: The drip course shall be measured in running meters correct to a cm and no deduction shall be made from the wall masonry for the bearing portion of drip course.

6. PLASTER WORK

6.1 Workmanship.

6.1.1 Preparation of Background Surface.

The surface shall be cleaned of all dust, loose mortar, droppings, traces of algae, efflorescence and other foreign matter by water or by brushing. Smooth surfaces shall be roughened by wire brushing or hacking for non-hard and hard surfaces respectively. Projections on the surfaces shall be trimmed whenever necessary to get even surfaces. In case of brick / stone masonry work, raking of joints shall be carried out whenever necessary. The masonry shall be allowed to dry out for sufficient period before carrying out the plasterwork. The masonry shall not be soaked but only damped evenly thereafter before applying plaster.

In case of concrete work, projecting blurs of mortars formed due to the gaps of joints in shuttering shall be removed. Such surface shall be scrubbed clean with wire brushes. The surface shall be pock marked with a pointed tool at spacing of not more than 50mm centers, the pocks being made not less than 3mm deep to ensure a proper key for the plaster. The surface shall be washed off and cleaned of all oil, and well wetted before the plaster is applied.

6.1.2 Sequence of Operations.

For External Plaster, the plastering operations shall be started from the top floor and carried downwards. For Internal Plaster, the plastering may be started whenever the building frame, roofing, and brick work are ready.

The surfaces to be plastered shall first be prepared as described in above 'Preparation of background surface' in clause 6.1.1.

The first under layer shall then be applied to ceilings. After the ceiling plaster is complete and scaffolding for the same removed, plastering on wall shall be started.

After a suitable time, interval as detailed in various types of plaster, depending upon the type of mortar, the secondary layer if required shall be applied. After a further suitable time interval as detailed under various types of plaster, the finishing coat shall be applied first to ceiling and then to walls.

Plaster of cornices, decorative features, etc. shall be completed before the finishing coat is applied. Unless otherwise specified corners and edges shall be rounded off to a radius of 25mm, such rounding off shall be completed along with the finishing coat to prevent any joint marks showing out later.

6.1.3 Scaffolding and Staging.

Double Scaffolding shall be provided for Plaster work having two sets of vertical supports. Before applying plaster to wall faces the joints shall be hacked by hooks. Use of 'Basuli' being prohibited.

6.1.4 Damage Rectification.

Any cracks, damages, any part of work which sounds hollow when tapped or found damaged or defective otherwise shall be cut out in rectangular shape and redone as directed by the Engineer in Charge.

6.1.5 Measurements: As per IS code of practice.

6.2 Plain Cement Plaster.

6.2.1 Preparation if Mortar.

The Mortar of specified mix shall be used as per Schedule of Quantities.

6.2.2 Application of Plaster.

(a) One Layer Plaster.

To ensure even thickness and a true surface, plaster about 150mm x 150mm.shall be first applied horizontally and vertically at not more than 2.0 M intervals over the entire surface to serve as gauges. The surface of these gauged areas shall truly in the plane of the finished plaster surface. The mortar shall be brought to true surface by working with a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float to obtain a smooth texture. Excessive towelling or overworking the float shall be avoided. All corners, arises, edges, angles and junctions shall be truly vertical / horizontal and shall be carefully finished. Rounding or chamferingof corners, arises, junctions shall be carried out with proper templates to the size required.

In suspending the work, the plaster shall be left cut clean to line, both horizontally and vertically. When recommencing the plastering the edge of the old work shall be scrapped, clean and wetted before the adjoining area. Plastering work shall be closed on the border of the wall and nearer than 150mm to any corners or arises and shall not be closed on the body of the features such as plaster bands, cornices nor at the corners or arises.

(b) Two Layer Plaster Work.

First or Under Layer

The first or under layer of the specified thickness shall be applied as described in Clause No.6.2.2. Before the first coat hardens, surface of it shall be beaten up by edges of wooden tapers and close dents shall be made on the surface. The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days depending upon weather conditions. The surface shall not be allowed to dry during this period.

Second of finishing layer

The second layer shall be complete to the specified thickness in the same manner as for first layer.

6.2.3 Curing

Curing shall be started 24 hours after finishing the plaster. The plaster shall be kept wet for a period of 7 days. During this period the plaster shall be suitably protected from all damages at the contractor's expense by such means as approved by the Engineer – in – Charge. The date of execution of plastering shall be marked on the plastering to ensure the proper duration of curing.

6.3 Sand Face Plaster

Preparation of Mortar

The mortar of specified mix shall be used as per the specifications of schedule of quantities.

Application of Plaster

Sand face plaster shall consist of 13 mm thick (1 cement : 4 coarse sand by volume) under layer and 7 mm thick (1 cement : 2 coarse sand by volume) top layer. Application of plaster shall be as described in 'Two Coat Plaster Work' in Clause No.6.2.2(b)

The surface of the sand face plaster shall be finished rough with sponge or as directed by the Engineer – in – Charge.

Curing

Curing shall be described in Clause 6.2.3.

Top Coat : The top coat shall be applied after the under coat has sufficiently set but not dried, and in any case within 48 hours and finished smooth.

The finished surface of the second coat shall be roughened with cork sheet trowels and finished finally with a soft cloth pad to get uniform granular surface.

Measurements : Shall be the same as per IS:1200.

7. ROOF WATERPROOFING

The chemical impregnation process to be applied on the horizontal as well as the vertical surface along the parapet wall up to a height of 300 mm (minimum). The surface must be clean and free from water, dust, dirt to the maximum possible extent. Since the product functions impregnating through the pores of the substance, it is important to allow it to make a free flow favorable condition.

Testing : After 24 hours of completion the job stand pool water 2" depth to be retained on the roof to check any leakage point is found.

Measurement : Shall be taken from the finished work. The length and the breadth shall be measured to a cm.

Guarantee : The Contractor through the specialized agency of sub-contractor shall give a guarantee against any leakage for a period of ten years. Any leakage or defects during this period shall be made good by the Contractor at his own cost in a manner to be decided by the Architect.

8. RAIN WATER PIPES:

The rain water pipes shall be of the materials and of the sizes as specified. All rain water pipes shall have suitable grating as directed at the inlet opening at roof and shall be fitted and fixed in proper position with necessary offsets, clamps, shoe, Y-junctions and other accessories as required and as directed by the Engineer-in-charge / Architect. The pipes are to be fixed to walls in cement mortar (1:4) with necessary clamps, nails, suitable teak wood blocks being fixed on walls to receive the nails. Y-junction shall be used at the top of the pipe and the vertical leg thereof shall be provided with a cowl. All joints are to be properly packed. In case the hole is made much larger than the size of the pipe, cement concrete (1:2:4) shall be used to fill the annular space. The pipes with fittings etc. are to be painted with 2 coats of paints as approved by the Engineer-in-charge / Architect.

9. REHABILITATION OF CONCRETE:

For rehabilitation of concrete structures, the following essential steps are to be followed:

a) To remove the loose concrete / plaster until hard and sound surface is exposed.
b) To remove all rusts by wire brush or sand blasting.
c) To apply two coats of cement based polymer modified anti-corrosive protecting coating (approved quality, brand) to exposed reinforcement (manufacturer's specifications to be strictly followed).
d) If diameter of the reinforcement bars is reduced by more than 25%, additional bar equivalent to 50% area of the existing bar to be added by lapping / welding as per direction.
e) Either (i) The exposed hard concrete surface is to be saturated with clean water and the bond coat of cement slurry duly admixed with water resistant bonding agent.
   Or (ii) For concrete beam / column if found necessary by the Engineer-in-charge / Architect the surface may be treated by epoxy based reactive agent for jointing fresh concrete with old surface.
   Note: In both the cases manufacturer's specification is to be strictly followed.
f) For slab / chhaja / weatherboard: To fill up the removed part of concrete / plaster with fresh concrete / plaster admixed with the water resistant bonding agent as per manufacturer's specifications within the

time the bond coat remains fresh and tacky. The admixed material shall have to be applied within 30 minutes of preparation or as per direction.
For beams / columns: To fill up the removed part of concrete with fresh concrete with water proofing plasticizing admixture as per manufacturer's specifications.
To cure the concrete surface for at least 3 days.

TECHNICAL SPECIFICATIONS FOR FINISHING ITEMS (CIVIL)

I. GENERAL

Specifications, Scope of Work, Schedule of Rates and drawings for a particular Tender shall be read in conjunction with each other. In case of conflicts / contradictions amongst them, the clarification shall be obtained from the Engineer – in – Charge / Architect whose decision shall be final & binding. Following procedure shall be followed for the necessary clarification.

A. Item description shall prevail over specifications for item rate tenders when provisions therein are different from those in specifications.
Whenever any requirement is not covered in Item description but are covered in specifications, the specifications shall be followed in addition to the requirements of item description. No extra payment shall be made to the Contractor for executing such item as per specification.

B. Whenever drawings call for requirements different from or additional to those in item description and specification, the decision of the Engineer – in – Charge shall be obtained.
However, no extra payment shall be made to the Contractor for executing any work incorporating requirements additional to those in item description and specification but covered in applicable drawings or standards. Where ever references has been made to Indian Standard or any other specifications the same shall mean to refer to the latest specifications irrespective of any particular edition of such specifications being mentioned in the specifications below of Schedule of Quantities.

C. The cost of Cement, Reinforcement steel, structural Steel, Bricks, Coarse and Fine Aggregates, and other requisite materials and labour Charges and other incidental expenses to be needed for the Construction of Store, Site Office etc. to be borne by the Contractor.

II. WORKMANSHIP

Workmanship shall be to the satisfaction of the Engineer – in – Charge / Architect. The contractor shall follow the specifications, relevant Codes & Manufacturer's guidelines for achieving desired level of workmanship as per specification & good engineering practice.
Any executed work not conforming to the specification or not to the satisfaction of the Engineer – in – Charge / Architect shall be rectified by the Contractor as directed by the Engineer – in – Charge / Architect. No extra payment shall be made to the Contractor for such rectification.

III. MEASUREMENT

Mode of measurement is generally specified in each specification. Whenever mode of measurement is not specified, IS: 1200 shall be applicable.

IV. MATERIALS

General

(a) All materials shall be best of their kind and shall conform to the latest Indian Standard.

(b) All materials shall be of approved quality as per samples and from origins approved by the Engineer– in-Charge / Architect. The Contractor shall get the materials approved by the Engineer – in – Charge / Architect before ordering & procurement. The Contractor shall furnish necessary certificates etc. as asked

by the Engineer – in – Charge. Further to that he shall get the materials tested from approved test house if asked by the Engineer-in-Charge & submit the test certificate at his own cost for whichno extra payment shall be made to him.

The Engineer – in – Charge shall have the right to reject all or any of the materials intended to be used and such materials shall be immediately removed from the site by the Contractor at his own costwithout any claim for compensation etc. due to such rejection.

(c) A set of specimen samples of all approved materials shall be kept in bottle or wise at site, cost of which to be borne by the Contractor.

(d) Test reports on each manufactured material shall include a statement certifying that this material is of the same quality as that proposed for this project. Manufacturer's literature on proprietary materials shall indicate compliance with standards listed here in.

1. Wood / Timber:

All timbers shall be of best quality well-seasoned and / or well treated for preservation and protection against decay etc. it shall be uniform in substance, straight in fibre, free from large or dead knots, sap, flaws,sun-cracks, shakes or blemishes of any kind. Any insect damage or splits across the grain shall not be permissible. The colour of the timber shall be uniform throughout, firm and shining with silky luster when planed and shall not emit dull sound when stuck.

Storage of wood/Timber shall be as per the requirements of IS:4082.

Timber required to be used for form work shall be fairly dry before use. It should maintain its shape duringthe use and even when it comes intocontact with moisture from the concrete. Storage of wood/Timber shall be as per the requirements of IS:4082.

2. Glass:

Glass used for glazing shall be of the specified type, colour, visibility and sound and shall be free from cracks, flaws, spic bubbles and blemishes and shall not weigh less than 7.4Kg per SqM unless otherwise specified. If glass of required thickness is not available in the market the Contractor shall have to use next higher thickness available without any extra payment.

3. Aluminium sections:

Specifications of different components will be of INDAL / BECO or any approved ISI marked Aluminiumextruded sections.

V. SCOPE OF WORK

All works shall be carried out in proper manner according to the directions of the Engineer-in-charge and to his satisfaction. Unless and otherwise specified in this section or in the description of the item, the cost of all,stages of works mentioned hereunder shall be deemed to have been included in the rates of items provided in the schedule.

1 WOODEN DOORS AND WINDOWS:

All door / window frames must have plaster rabbit of 12mm x 12mm and the rabbit for receiving shutter atleast 15mm deep. Wood work shall not be painted, oiled or otherwise treated before it has been approved bythe Engineer-in-charge / Architect. All portions of timber abutting against or embedded in masonry or concrete shall be painted with boiling coal tar / solignum oil or as specified in the schedule of quantities before placing in position. In case of door frames without sills, the vertical members shall be buried in floor to40mm deep.

Unless otherwise specified the clamps shall be fixed to outer side of the frame with screws. For the purpose of receiving clamps a recess of at least 12mm deep of suitable size shall be cut in to the frame. After fixing the frame true to plumb with the clamps, the exposed face of the clamps shall be covered by a thin wooden covering fixed with screws. The side of the door / window frames which remain in contact with masonry / concrete shall invariably be painted with a protective coat of paint.

2 BLOCK BOARD SHUTTERS:

Block board flush shutter shall conform to IS:2202. The shutter shall be 35mm thick and shall be made ofsolid core block board. 'T' type Teak wood beading of minimum 12mm thickness fixed to the perimeter of the shutter. The shutter shall be faced on both sides with following finished as specified and shall be factory made.

A. 3mm thick commercial type plywood conforming to IS:303, BS:476 part-7.
B. Approved quality 1mm thick teakwood veneering conforming to IS:303, BS:476, part-7 .
C. 1 mm thick approved quality lamination of approved shade.

3 PANEL DOOR SHUTTERS:

Panel door shutter shall be 35mm/38 mm thick and shall consist of wooden styles, rails,12mm thick Particle board/Marine grade ply in fill panels. The infill panels shall be fixed with adhesive and moulded wood beadings (minimum 12.5mm X 12.5mm size) as per drawings and schedule of quantities.

Glazed wooden door shutter shall be 35mm/38 mm thick and shall consist of wooden styles and rails; 4 mm to 6mm thick plain / float glass panes shall be fixed in the styles and rails wooden beading having mitred joints. A thin layer of putty shall be applied between glass panes and the beading.

4. PRESSED STEEL DOOR / WINDOW / VENTILATOR FRAME:

Pressed steel door/window/ventilator frame shall conform to IS:4351. The frame shall be of specified sectional size, dimension and profile. The frames shall be made of 16 SWG pressed steel bent to shape using. Bending machine, and mitered with square edges. The frames shall be provided with spacers by welding 50mm x 5mm flats to the portion of the frame in contact with jambs @ 600mm vertical spacing.

The frame shall be fixed to the masonry by means of 300mm x 25mm x 6mm hold fast welded to the spacersand grouted with M-15 grade Concrete in minimum 350mm x 100mm x 100mm sized hole in the masonry.

In case of concrete, the frame shall be fixed by 96mm long, 12mm dia metallic counter sunk type dash fasteners through the frame and spacers.

Provisions for hinges, locking arrangement and other hardware shall be provided in the frames by machine cutting required size cutout on the frame body and welding/screwing to 3mm thick MS pad plates already welded over the cutout from behind.

The frame surface shall be thoroughly cleaned of rust, mill scale, dirt, oil etc. and then finished with painting(by priming with
red oxide zinc chromate primer conforming to IS:2074 and painting conforming to IS:1477 part (II) or byapproved shade
electrostatic powder coating (25 micron).

5. ALUMINIUM DOORS / WIMDOWS / VENTILATORS:

Aluminium glazed doors/window/ventilators shall be of specified sectional size, dimension and profile as per drawing.

All Aluminium sections shall be extruded sections of "INDAL" Aluminium alloy as per IS:733 and IS:1285. Aluminium sections shall be anodized as per IS:7088 or electrostatic alloy powder coated to min.25 microns as specified.

Accessories for Sliding Windows: EPDM Gasket, Adhesive, Screw, Cleat Angle & Glass.

Accessories for Casement Windows: EPDM Gasket – T & U type,, Adhesive, Screw, Stainless steel / Aluminium Functional Hinges & Glass.

Accessories for Fixed Glazing: EPDM Gasket & Glass.

Accessories for Doors: EPDM Gasket, Wool Pile, Handle, Lock, Heavy Duty Floor Spring or Butt Hinges & Glass/ Board.

6. FITTINGS:

Fittings shall be of iron, aluminium or as specified in the schedule of quantities. These shall be well made, reasonably smooth and free from edges, corners, flaws and other defects. Screw holes shall be

counter sunkto suit the head of specified wood screws. All hinge pins shall be of steel and other riveted heads shall be well formed. Iron fittings shall be finished bright or black or copper oxidized. Brass fittings shall be finished bright (brass) oxidized or chromium plated and the aluminium fittings shall be bright or anodized or as specified. All fittings shall be got approved by the Engineer-in-charge / Architect.

7. FIBRE REINFORCED POLYMER (FRP) DOOR SHUTTER / FRAME:

The Polymer shall be either thermoplastic or thermo set resin, such as Polyester, ISO polyester, Vinyl ester, Epoxy or Phenolic base. The fibre moulded skins may be of glass or other synthetic (Carbon or Aramid) or natural (jute or coir) or other reinforced materials.

The sandwich core to import monolithic composite structures approved by the competent authority.

Testing: As per IS:4020 door testing criteria.

Frame without Core: Frames shall have intermittent stiffness for rigidity and will have provision of hingefixing, including anchor.

Frame with Core: Such Composite frames will be filled with inner Core in addition to all the featuresmentioned for frame without Core.

8. METAL DOORS , WINDOWS & VENTILATORS:

Steel windows, ventilators shall in general conform to IS:1081 / IS:1038 and IS:7452.

Rolled steel sections for the fabrication of steel windows, ventilators shall conform to IS: 7452. Glass panels for glazing purpose shall be 5.5 mm thick transparent sheet glass conforming to IS:2835 as per schedule of quantities.

The profile and type of windows, ventilators (glazed, partly glazed / louvered, side hung / top hung / fixed shutter, composite) shall be as per approved drawings.

The frames shall be constructed of sections cut to size and mitred. Corners shall be welded to form a fused welded joint. Process of welding shall be flash butt welding. The welded joints shall be grinded to square andflat edges.

Where larger units are to be formed by coupling individual units, the mullions, transoms shall be bedded in mastic to ensure weather tightness. Mastic shall be applied liberally to the channels of the outside frame sections before assembly, and the two units being coupled shall be drawn together tight with clamps, the mastic being squeezed out and cut off nearly when the units shall be screwed together tight.

Where fixed glazing units are placed over open able units a push fit weather bar shall be provided.

Before glazing, all opening parts shall be checked for their operational smoothness. The frame shall be completely cleaned and bedding putty shall be placed in the rebate before glazing. Glass then shall be cushioned into the bedding and shall be fronted with front putty in a manner so as to enable the painting tobe done up to the sight line. The back putty oozing out over the glazing rebate shall be cut off square and smoothed down.

For panels exceeding 600 x 300 mm in size, glass shall be secured by special glazing clips inserted in holes already provided in the steel sections, before applying the front putty.

For glazing of very large areas, rust proof steel beading with mitred corners shall be provided with screws @ 100 mm from each corner and @ 200 mm apart from each other. Putty shall be provided to the face of the bead in contact with glass, in addition to back putty.

Side hung shutters shall be connected to the frame by means of friction hinges.

In case of fixing with masonry, holes for fixing the lugs/hold fasts shall be cut at required locations. In case of concrete or stone, the frame shall be fixed by means of dash fasteners. In case of masonry, the lugs shall be grouted in the holes with cement concrete, M-15 Grade when fixing to steel work, mastic shall be applied to the sill of the opening and the unit shall be placed on it with the jambs and head buttered with mastic andthe unit shall be fixed with special fixing dips or with nuts and bolts.

All the steel surface shall be thoroughly cleaned free of rust, mill scale, oil etc. by sand and shot blasting and then painted with approved quality red oxide zinc chromate primer.

12mm MS square safety bar (welded to fixed frame horizontally @ 100mm c/c) shall be provided whereverspecified as per drawing

Handles and peg stays:

Each side hung shutter be provided with suitable protruding hinges and peg stay arms 300 mm long and shall have holes to keep the shutter open in three different positions up to 90^0 (The peg and the arm for thepeg stay will be riveted). The handles shall be mounted on a handle plate and the plate shall be welded to the opening frame. The handle shall have a two-point nose which will engage with suitable tapered strikingplate provided on the fixed frame to keep the shutter open in a slightly open position as well as in a fixed position.

Top & bottom hung ventilators:

Top & bottom hung ventilators shall be provided with two plain hinges with 300 mm peg stay arm, which willkeep the shutter open in three different positions and will act as a stopper too.

Beading:

The contractor shall provide windows with threaded holes nor fixing steel aluminium beading with screws,required for fixing glass of thickness specified.

Sample Unit:

A typical approved sample of the glazing unit shall be kept in the site office of the Architect till the satisfactorycompletion of the work. The decision of the Architect weather a unit compares well with the approved samples shall be binding and final on the contractor.

Schedule of Hardware:

(a) Steel Windows (each shutter):

150 mm handle	… 1 No.
300 mm peg stay	… 1 No.
Projected of friction hinges of size	… 2 Nos.

(b) Top or bottom hung ventilators:

300 mm peg stay arm	… 1 No.
Projected or friction hinges of size	… 2 Nos.

(c.) Steel doors :

A	Brass mortice lock 6 lever with a pair of chromium plated handles	… 1 no.
B	300 tower bolt (per leaf)	… 1 No.
C	Friction hinges of size per leaf	… 3 Nos.

Measurements

Width and height shall be measured from outside to outside of frame correct to a cm. The measurementsshall be in square meters as net fixed at site.

9. STEEL GLAZED OR MS SHEET FLUSH DOORS:

The frame shall be of standard extruded sections and built by welding as for glazing units. The open ableshutter shall be finished flush on both sides with 18 gauge M.S. sheet or provided with glass panes of thickness specified in the Schedule of Quantities fixed with metal beading of required shape section with cadmium plated screws for fully shutters.

Fixing

The glazing unit doors, windows and ventilators shall not be built into the walls but shall be fixed in the prepared openings with lugs in masonry walls or with screws and jute expansion plugs in holes carefully drilled in RCC work. Mastic compound shall be provided all-round the frame of the glazing unit at the junction of the function of the frame and opening to make the junction water tight.

Composite glazing units shall be supplied with necessary coupling transoms or mullion with machine screws and mastic compound and shall be coupled with box mullions. The mullions shall be embedded in mastic to make the joint water tight.

10. COLLAPSIBLE STEEL GATES:

General

These shall be of approved manufacture and shall be fabricated from mild steel sections.

Collapsible Gates:

These shall be double or single collapsible gates depending upon the size of the opening. These shall consist of vertical channels 20 x 10 x 2 mm at 10 cm. Centers braced with flat iron iron diagonals 20 x 5 mm and top and bottom rails of T – iron 40 x 40 x 6 mm with 38 mm. dia steel pulleys or ball bearings in every 4th double channels, unless otherwise specified. Where collapsible gate is not provided within the opening andis fixed along the outer surface T – iron at the top may be replaced by flat iron 40 x 10 mm . The collapsible gate shall be provided with necessary bolts and nuts, locking arrangement, stoppers and handles. Any special fittings like springs, catches and locks shall be provided as described in the nomenclature of item in the Schedule of Quantities.

Fixing:

T-iron shall be fixed to floor and lintel by means of anchor bolts at 45 cm. Centers alternatively in two flanges of T- iron embedded in cement concrete of floor and lintel. The bottom runner shall be embedded in floor and proper groove formed along the runner for the purpose. The collapsible shutter on the sides be fixed by fixing the end double channels with T- iron rails and also by hold fasts bolted to the end double channel and fixed in masonry of the side on the other side.

In case the collapsible shutter does not reach lintel, beam or slab. A T- section suitably designed be fixed at top embedded in masonry and provided with necessary clamps and roller arrangement at top.

Measurements:

The gate shall be measured in square metre. The breadth and height shall be measurement correct to a cm. The height shall be measured as the length of the double channels and breadth from outside to outside ofthe end fixed double channels of in open position of the gate.

11. ROLLING SHUTTERS:

Rolling shutters Shall be of approved manufacture suitable for fixing in the position ordered i.e. outside, inside on or below lintel or between jambs. Shutter up to 12 SqM in area shall be manually operated of Push-Up type while bigger size shall be of Reduction Gear type Mechanical Operated by Handles.

Laths shall be of 18-gauge best quality mild steel interlocking at 75 mm rolling centre, machine rolled and straightened with an effective bridge depth of 16 mm. Side guides and bottom rail shall be built up mild rolled section. The spring assembly shall be supported on strong mild steel or malleable cast iron brackets shaped to fit the lintel. The rolling springs shall be from tested unbreakable high tensile steel wire or strip of adequatestrength to balance the shutter in all position. The shutter shall be complete with door suspension shafts, locking the shutter in all position. The shutter shall complete with door suspension shafts, locking arrangements pulling hooks, handles and other accessories.

Measurements:

The rolling shutter shall be measured net as fixed at site including portions going in the guides and in the hood up to shafts in square meter width and height shall be measured correct to a cm.

12. FLOOR FINISHING:

General:

Cement concrete flooring shall in general conform to IS:2571. Cement concrete flooring shall consist of a subbase (laid on the compacted earth or sand fill in case of ground floor only) a base course laid on the sub – base and then finishing layer of floor finishing. In case of ground floor, the filled and compacted bed on whichthe sub – base is to be laid, shall be as per structural drawings and specifications.

The bed for flooring shall be prepared either level or sloped as per drawings and as instructed by Engineer – in – Charge / Architect.

Sub – Base:

The sub-base which shall be laid on the prepared bed shall be of specified thickness and as per structural drawings and specifications.

The sub – base shall be of gravel/broken bricks/stone aggregate/sand/cement concrete as per drawings and Schedule of Quantities. In case of upper floors, the structural RCC slab shall be treated as sub – base.

Base Course:

Base course shall be 25mm thick M-15 Grade concrete and shall generally conform to civil structural specification.

The floor space on which base course is to be laid shall be divided into square / rectangular or as per designed panels to prevent cracks in the floor finish. No dimension of the panels shall exceed 2M and length of the panel shall not exceed 1.5 times its breadth. Base course shall be laid on alternate panels. The borders of the panels shall have mitred joints at the corners of the room and intermediate joints shall be in straight line with panel joints.

The panels shall be bound by glass / PVC / stainless steel strips etc. as specified in Schedule of Quantities. These shall be fixed in position with their top at proper level, giving slope wherever required.

The flooring shall butt against masonry of wall which shall not be plastered. When the base course is to be laid on hardened base, the sub – base shall be roughened by steel wire brushing and cleaned. Before laying the base course, neat cement slurry @ 2.75 kg of cement per SqM of area shall be brushed into the prepared sub base surface.

Cement concrete shall be placed in position and beaten with trowel and finished smooth. Beating shall ceaseas soon as surface is found covered with cream of mortar. Necessary slope shall be provided.

Floor Finishing:

Finishing of the surface shall follow immediately after the completion of base course. The base course shall be free of excessive moisture before starting the floor finishing. Use of dry cement, cement sand mixture sprinkled on the surface to stiffen the concrete or absorb excessive moisture shall not permitted.

While the concrete is still green, cement @ 2.75 kg per SqM of floor area shall be mixed with water to form a thick slurry and spread over the surface. It shall be pressed twice by means of iron floats, once when the slurry is applied and second time when the cement starts setting.

The junction of floor with wall plaster, cladding, skirting shall be rounded off uniformly up to a radius of 25mm unless otherwise mentioned.

Curing:

Each finished portion of floor, on completion shall be kept wet with ponding for a minimum period of 7 days.

13. CEMENT CONCRETE GRANOLITHIC FLOORINGGeneral:

Cement concrete granolithic shall consist of a sub – base, a base course and finishing layer of floor finish. Workmanship shall in general be same as for cement flooring, unless otherwise mentioned.

Workmanship:

Workmanship shall in general conform to IS:5491.

Sub – Base:

The sub – base which shall be laid on the prepared bed shall be of specified thickness and as per structural drawings and specifications.

The sub – base shall be of boulders/gravel/broken bricks/sand/cement concrete as per drawings. In case of upper floors, the structural RCC slab shall be treated as sub – base.

Base Course (Under Layer):

Base course shall be M-15 grade Concrete and shall generally conform to Civil Structural specification.

The floor space on which base course is to be laid shall be divided into square/rectangular or as per designed panels to prevent cracks in the floor finish. No dimension of the panels shall exceed 2M and length of the panel shall not exceed 1.5 times its breadth. Base course shall be laid on alternate panels. The borders of the panels shall have mitred joints at the corners of the room and intermediate joints shall be in straight line with panel joints.

The panels shall be bound by glass / PVC / Stainless steel strips etc. as specified in Schedule of Quantities. These shall be fixed in position with their top at proper level, giving slope wherever required.

The flooring shall butt against masonry of wall which shall not be plastered.

When the base course is to be laid on hardened base, the sub – base shall be roughened by steel wire brushing and cleaned. Before laying the base course, neat cement slurry @ 2.75 kg of cement per SqM of area shall be brushed into the prepared sub – base surface.

Cement concrete shall be placed in position and beaten with trowel and finished smooth. Beating shall ceaseas soon as surface is found covered with cream of mortar. Necessary slope shall be provided.

Thickness of base course shall be as follows doe different thickness of floorings:

A	40 mm thick flooring	25 mm thick
B	50 mm thick flooring	35 mm thick

Wearing Top Layer:

The top layer shall be laid over first layer within 15 minutes of laying the first layer. The cement and aggregates for the top layer shall be mixed dry. After mixing, sufficient quantity of washed sand and water shall be added to make the mix plastic but not flowing. The top and bottom layer shall firmly grip together.

Floor Finishing:

Finishing of the surface shall follow immediately after the completion of base course. The base course shall be free of excessive moisture before starting the floor finishing. Use of dry cement, cement sand

mixture sprinkled on the surface to stiffen the concrete or absorb excessive moisture shall not be permitted.

While the concrete is still green, cement @ 2.75 kg per Sq.M. of floor area shall be mixed with water to forma thick slurry and spread over the surface. It shall be pressed twice by means of iron floats, once when the slurry is applied and second time when the cement starts setting.

The junction of floor with wall plaster, cladding, skirting shall be rounded off uniformly up to a radius of 25 mm unless otherwise mentioned.

Curing:

Each finished portion of floor, on completion shall be kept wet with ponding for a minimum period of 7 days.

14. HEAVY DUTY FLOORING:

General:

Heavy duty flooring shall consist of a sub – base, a base course and a finishing layer of floor finish.

Sub – Base:

The sub – base which shall be laid on the prepared bed shall be of specified thickness and as per structural drawings and specifications.

The sub – base shall be of boulders / Gravel / Broken bricks / sand cement concrete as per drawings. Incase of upper floors, the structural RCC slab shall be treated as sub – base.

Base Course:

Base course shall consist of one layer of 35 mm thick cement concrete (1 cement : 1.5 Coarse sand : 3.5 stone aggregates of 10 mm to 6 mm size by volume) laid on sub – base in panels.

Floor Finish:

Finishing layer shall be of cement, hardener and stone aggregate mix of 15 mm thickness laid over the base course. Unless otherwise mentioned, one part of approved quality hardener and four parts of cement by weight shall be mixed dry. This dry mixture shall be mixed with stone grit of 6 mm and down size in the ratio of 1 hardener and cement mixture : 2 stone grit by volume. Just enough water shall then be added to the mix.

The mixture so obtained shall then be laid on the base course within 2 to 4 hours of latter's laying. It shall be firmly pressed into bottom concrete so as to have a good bond with it. After the starting of initial setting, the surface shall be finished smooth and true with steel floats.

15. PRECAST HYDRAULICALLY PRESSED CEMENT TILES:

Cement mortar shall be in accordance with civil structural specification and following Schedule:

A	For Flooring	20 mm thick, cement mortar (1 cement : 6 coarsesand by volume)
B	For Skirting / Dado /Riser	12 mm thick, cement mortar (1 cement : 3 coarsesand by volume)

Workmanship:

Workmanship shall in general conform to IS: 1443. The base on which tiles are to be laid shall be cleaned of all dust, dirt and properly wetted by applying neat cement slurry @ 2.75 kg. of cement per SqM of area without allowing water pools. Cement mortar of specified thickness shall then be spread over the base for two rows of tiles and 3-5 metres in length. The mortar shall be laid in slope as per requirements and thickness of mortar shall not be less than 10 mm at any place. The top of the mortar

shall be kept rough so that cement slurry can be absorbed. Laying shall be from centre and proceed outwards in two directions at 90°. Cut tiles of uniform sizes shall be laid along periphery, if necessary. Neat cement slurry @ 4.4 kg. Of cement per SqM shall be spread over the mortar bed for laying 20 tiles at a time. The tiles shall then be fixed in this grout one after the other, each tile being gently tapped and properly bedded in line and level. Thejoints shall not exceed 1.5 mm in width. After the day's work, the excess cement slurry on top and the joints shall be cleaned with broom stick and washed before the slurry sets hard. Next day, the joints shall be filled with the cement grout to match the shade of the tile.

Tiles along the periphery shall be continued by average 12 mm under the wall plaster. Skirting or dado.

For skirting / dado / risers on the brick masonry wall, the joints shall be raked out to a depth of at least 15 mm while the masonry is being laid. In case of concrete work, the surface shall be hauled and roughened with wire brushes. The wall surface shall be uniformly and evenly covered with backing of cement mortar 1:3 (1 cement : 3 coarse sand by volume) of specified thickness. Before hardening of the cushioning mortar, back of each tile shall be covered with a neat layer of cement slurry @ 4.4 kg of cement per SqM and edges with white cement with or without pigment to match the shade of tiles and the tiles then shall be pressed on the backing and tapped.

The tiles shall be corrected to proper planes with joints truly vertical in required pattern and butt jointed. The fixing shall be done from bottom upward. The top of skirting and dado shall be truly horizontal.

Curing:

The flooring shall be cured for 7 days by keeping it wet with ponding. Heavy traffic on the flooring shall be permitted only after 14 days.

Grinding and Polishing:

Grinding shall be commenced after 14 days when the tiles and the joints are properly set. Grinding shall be done by machines except for skirting and small areas. First grinding shall be done with carborundum stones of 48 to 60 grade grit fitted in the machine. Water shall be properly used during grinding. When the chips show up and the floor has been uniformly rubbed, it shall be cleaned with water baring all pin – holes. It shall then be covered with a thin coat of grey / white cement mixed with pigments to match with colour of the flooring. This grout shall be kept moist for a week. Thereafter the second grinding shall be started with carborundum stone of 120 grit. Grinding and curing shall follow again. Final grinding shall be with carborundum of Grade 220 to 350 grit using water in abundance. The floor shall be washed clean with water;oxalic acid powder shall then be dusted at 35 gms. /SqM. On the surface rubbed with machine fitted hessian bobs or rubbed hard with woollen rags. The floor shall then be washed clean and dried with a soft cloth or linen. If any tile is disturbed or damaged, it shall be refitted or replaced and properly jointed and polished.

16. CEMENT PLASTER SKIRTING:

Materials:

Cement plaster skirting shall be laid with cement mortar (1 cement : 3 coarse sand by volume) and shall beof specified thickness (6 mm / 12 m / 18 mm) as per Item description.

Workmanship:

The surface on which the skirting is to be applied shall be prepared and skirting of specified thickness shallbe laid. The junction between flooring and wall shall be rounded off to a radius of 25 mm if not otherwise mentioned.

While the mortar is still green, cement @ 2.75 kg per square metre shall be mixed with water to form a thick slurry and applied over the mortar. It shall be pressed twice by means of iron floats, once when the slurry is applied and second time when the cement starts setting.

17. CAST - IN - SITU TERRAZZO FINISH:

Base Course (Under layer)

Base course for cast – in – situ terrazzo flooring shall be 25 mm thick cement concrete (1 cement : 2 coarse sand : 4 stone aggregate, 10 mm nominal size by volume).

In case of vertical surfaces, the base course shall be 13 mm thick cement mortar (1 cement : 3 coarse sand by volume)

Aggregates for Terrazzo Topping:

The aggregate to be used in topping shall be marble chips pf plain White / Pink Makrana / Baroda green etc. all Grade – 1 As specified which shall be of 10 mm nominal size. Marble powder to be used in terrazzo topping shall pass through IS Sieve Terrazzo. Marble chips shall be hard, sound, dense and homogenous in texture with crystalline and coarse grains. It shall be uniform in colour and free from stains, cracks, decay and weathering. All proportions of materials used should be as directed by the Engineer – in – Charge / as specified.

Pigments:

Pigments to be used in terrazzo shall be of permanent colour and shall conform to IS:2114 , Table – 1.

Workmanship:

Workmanship shall in general conform to IS: 2114. Terrazzo flooring shall be of specified thickness and shall be laid in two layers and in panels. Under layer or base course shall be of cement concrete laid over sub base and top layer shall be of terrazzo floor finish. Details of panels shall as per drawings. The thickness of terrazzo finish shall be 15 mm.

Top layer shall consist of mix of white cement, marble powder, marble chips, water and pigments. Cement and marble powder mix powder mix proportion shall be 3:1 by weight. Cement, marble powder mix shall be mixed with marble chips in the proportion of 4:7 by volume. Quality and shade of chips and powder shall be as specified with a view to avoid variation in colour. Sufficient quantity of white cement shall be added in the cement mix to obtain the desired shade. Mixing shall be done in a trough or tub and complete quantities of white cement and pigment for a particular unit of job shall be dry mixed with aggregates. Water shall be added in small quantities to this dry mix to get a proper consistency. The mix shall be plastic but not so wetas to flow. The mix shall be used within 30 minutes of its preparation.

The base course / under layer shall be divided in panels with dividing strips (glass / PVC / Stainless steel strips) up to the finished surface levels. The sub-base shall be cleaned of all dust, dirt or any loose material.It shall then be wetted with water, mopped and smeared with neat cement slurry.

Terrazzo topping shall be laid while the under layer is still plastic but has hardened enough which is normally achieved between 18 – 24 hours after laying the under layer. A cement slurry @ 2.75 kg of cement per SqM of area pigmented with the same colour as the topping be brushed on the surface immediately before laying the topping. The terrazzo mix shall be laid to a uniform thickness and be compacted thoroughly by tamping or rolling and trowelled and brought true to required lavel by a straight edge and steel floats so that the maximum amount of marble chips come up and spreaded uniformly over the surface and no part of the surface is left without the chips.

Curing:

The surface shall be left dry for air curing for a period of 12 – 18 hours. Thereafter water shall be allowed to stand overnight in pools for a period of minimum four days.

Grinding and Finishing:

Grinding and polishing shall be done with machines and shall start after 7 days of laying. First grinding shall be done with carborundum stone of 60 grit size. The surface shall than be washed clean and grout of cementand / or colouring matter in same mix and proportion as the topping in order to fill any pin holes that appear. It shall then be allowed to dry for 24 hours and wet cured. The second grinding shall be done with carborundum stone of grit size. The surface shall then be prepared as after first grinding.

The third grinding shall be done with carborundum stone of 120 to 150 grit size. The surface shall then be prepared again as after first grinding.

The fourth grinding shall be done with carborundum stone of 320 to 400 grit size. The surface shall then be washed clean and rubbed hard with felt and slightly moistened oxalic acid powder @ 35 gms per square metre of less surface. After the finishing works are over, the surface shall be washed with dilute oxalic add solution and dried. Floor polishing machine fitted with felt on hessian bobs shall then be run over it until the floor shines.

In case of polishing, wax polish shall be applied on the surface with the help of soft linen over a clean anddry surface. Then the polishing machine fitted with bobs shall be run over it. Clean saw dust shall be spread over the floor surface and polishing machine again operated to remove excess wax.

Cast – in – situ Terrazzo in skirting, dado and risers shall be of specified thickness and of same shade asthat of the flooring.

Under layer for terrazzo on vertical surfaces shall be of stiff cement mortar 1:3 (1 cement : 3 coarse sand by volume) finished rough so as to give a good bond to the topping. Terrazzo topping shall be average 12 mm thick and under layer shall be 13 mm thick. Terrazzo topping shall be laid on the under layer. Other details shall be same as for flooring excepting grinding which shall be manual and panels dividers are required.

18. PRECAST HYDRAULICALLY PRESSED TERRAZZO TILES:

Cement Mortar:

Cement mortar shall be in accordance with civil structural specification and following schedule.

A	For Flooring	20 mm thick, cement mortar (1 cement : 4 coarsesand by volume)
B	For Skirting / Dado /Riser	12 mm thick, cement mortar (1 cement : 3 coarsesand by volume)

Workmanship:

Workmanship shall in general conform to IS: 1443. the base on which tiles are to be laid shall be cleaned of all dust, dirt and properly wetted by applying neat cement slurry @ 2.75 kg of cement per Sq.M. of area

without allowing water pools. Cement mortar of specified thickness shall then be spread over the base for two rows of tiles and 3-5 metres in length. The mortar shall be laid in slope as per requirements and thickness of mortar shall not be less than 10 mm at any place. The top of the mortar shall be kept rough so that cement slurry can be absorbed. laying shall be from centre and proceed outwards in two directions at 90^{o}. Cut tiles of uniform sizes shall be laid along periphery, if necessary. Neat cement slurry @ 4.4 kg of cement per Sq.M. shall be spread over the mortar bed for laying 20 tiles at a time. The tiles then be fixed in this grout one after the other, each tile being gently tapped and properly bedded in line and level. The joints shall not exceed 1.5mm in width. After ths day's work, the excess cement slurry on top and the joints shall becleaned with broom stick and washed before the slurry sets hard. Next day, the joints shall be filled with the cement grout to match the shade of the tile.

Tiles along the periphery shall be continued by average 12 mm under the wall plaster, skirting or dado.

For skirting / dado / risers on the bricks masonry wall, the joints shall be raked out to a depth of at least 15 mm while the masonry is being laid. In case of concrete work, the surface shall be hauled and roughened with wire brushes. The wall surface shall be uniformly and evenly covered with backing of cement mortar 1:3 (1 cement : 3 coarse sand by volume) of specified thickness. Before hardening of the cushioning mortar,back of each tile shall be covered with a neat layer slurry @ 4.4 kg of cement per SqM and edges with white cement with or without pigment to match the shade of tiles and the tiles then shall be pressed on the backing and tapped.

The tiles shall be corrected to proper planes with joints truly vertical in required pattern and butt jointed. The fixing shall be done from bottom upward. The top of skirting and dado shall be truly horizontal.

Curing:

The flooring shall be cured for 7 days by keeping it wet with ponding. Heavy traffic on the flooring shall be permitted only after 14 days.

Grinding and Polishing:

Grinding shall be commenced after 14 days when the tiles and the joints are properly set. Grinding shall be done by machines except for skirting and small areas. First grinding shall be done with carborundum stones of 48 to 60 grade grit fitted in the machine. Water shall be properly used during grinding. When the chips show up and the floor has been uniformly rubbed, it shall be cleaned with water baring all pin – holes. It shall then be covered with a thin coat of grey / white cement mixed with pigments to match with colour of the flooring. This grout shall be kept moist for a week. Thereafter the second grinding shall be started with carborundum stone of 120 grit. Grinding and curing shall follow again. Final grinding shall be with carborundum of Grade 220 to 350 grit using water in abundance. The floor shall be washed clean with water,oxalic acid powder shall then be dusted at 35 gms/SqM on the surface rubbed with machine fitted hessian bobs or rubbed hard with woolen rags. The floor shall then be washed clean and dried with a soft cloth or linen. If any tile is disturbed or damaged, it shall be refitted or replaced and properly jointed and polished.

19. TILE WORK:

Tiles:

Glazed (vitreous and ceramic tiles shall conform to IS:777 and shall be of specified shade, size and of approved manufacturer. Ceramic tiles shall be matt finished and non-slip type.

The size shall be as per follows:

a. White / Coloured glazed vitreous
   tiles200 mm x 100 mm x 6 mm
   200 mm x 150 mm x 6 mm
   200 mm x 300 mm x 6 mm
   300 mm x 300 mm x 8 mm (± 5%)

b. Ceramic Tiles
   300 mm x 300 mm x 8 mm (± 5%)
   200 mm x 100 mm x 6 mm

Pigments:

Pigments to be admixed with mortar or for grouting the joints shall conform to IS:2114. Cement mortar shall be in accordance with civil structural specification and following Schedule.

A	For flooring	20 mm thick, cement mortar (1 cement : 6coarse sand by volume)
B	For Skirting / dado / riser	12 mm thick, cement mortar (1 cement : 3coarse sand by volume)

Workmanship:

The tiles shall be laid over a coating of specified adhesive (as per approved manufacturer's specification) laidon base floor / wall plaster. The joints of the tiles shall be flush pointed with cement and pigment conforming to IS:2114, matching the shade of colours.

Curing:

The flooring shall be cured for 7 days by keeping it wet with ponding. Heavy traffic on the flooring shall be permitted only after 14 days.

20. KOTA STONE FLOORING:

Dressing of Slabs:

Each slab shall be machine cut to the required size and shape and fine chisel dressed at all edges to full depth and machine rubbed to a smooth surface finish. All angles and edges of the slabs shall be true square and free from chippings giving a plane and smooth surface.

Preparation of Surface:

Cement mortar of specified thickness and mix and shall be laid over the base after making it rough, cleaning thoroughly and applying neat cement slurry @ 2.75 kg of cement per SqM of area to receive the mortar.

The mortar shall be laid for fixing one slab at a time. Cement mortar shall be 15 mm thick (1 cement : 4 coarse sand by volume) for flooring and 12 mm thick (1 cement : 3 coarse sand by volume) for skirting / dado
/ riser.

Laying:

The slab shall be washed clean before laying. It shall be laid over cement mortar bedding on top, pressed, tapped gently to bring it in level. It shall be then lifted and laid aside. Top surface of the mortar then shall be corrected by adding fresh mortar at hollows and depressions. The mortar then shall be allowed to hardenand cement slurry of honey like consistency @ 4.4 kg of cement per SqM shall be spread over the mortar. The edges of the slabs shall be buttered with white cement with or without pigment grout to match the shade of the slabs. The slabs shall then be gently placed in position and tapped with wooden mallets till it isproperly bedded in level. The joints shall be as possible. Surplus cement on the surface of the slab shall be removed. The slabs in flooring shall continue for not less than 10 mm under the plaster / skirting. The finished surface shall be true to levels and slope as instructed by the Engineer – in – Charge / Architect.

The slabs shall be laid in patterns as per drawings and size shall not be less than 310 mm x 310 mm which shall be uniform. Cut size may be used along periphery as required.

Curing:

The floor shall be cured for a minimum period of 7 days by wetting.

Polishing and Finishing:

Unevenness at the meeting edges of slabs shall be removed by fine chiseling. Polishing etc. shall be done in accordance with clause No.5.4. except the cement slurry shall not be applied on the surface before each polishing.

21. MARBLE STONE FLOORING

Marble slabs:

The Marble slabs shall be 20 mm thick and Grade – 1 Makrana White or Makrana plain Pink or Abu Green or Baroda Green as specified. The marble from which the slabs are made shall be of selected quality, hard, sound, dense, homogenous in texture, free from cracks, decay, weathering and flakes. The sample of Marblestone slabs shall be got approved from the Engineer – in – Charge / Architect.

The slabs shall be machine cut to the requisite dimensions.

Pigments:

Pigments to be admixed with mortar or for grouting the joints shall conform to IS:2114.

Cement Mortar:

Cement mortar shall be in accordance with civil structural specification and following schedule

A	For flooring	20 mm thick, cement mortar (1 cement : 6coarse sand by volume)
B	For Skirting / dado / riser	12 mm thick, cement mortar (1 cement : 3coarse sand by volume)

Workmanship:

Same as Kota stone except that cement mortar shall be 20 mm thick (1 cement : 6 coarse sand by volume) for flooring.

Curing:

The floor shall be cured for a minimum period of 7 days by wetting.

Polishing and Finishing:

Unevenness at the meeting edges of slabs shall be removed by fine chiseling. Polishing etc. shall be done in accordance with Clause No.5.4. except that cement slurry shall not be applied on the surface before each polishing.

22. WHITE WASHING, COLOUR WASHING:

Materials:

Lime of CLASS-C (Fat lime) shall be used for White Washing / Colour Washing.

Preparation of surface:

All surfaces for white washing, colour washing, painting shall be thoroughly brushed free from mortar droppings and foreign matter and prepared to satisfaction of the Engineer-in-charge / Architect before application of treatment.

Before white washing all the nails etc have to be removed from the walls and all nail or other holes, small depressions or damages in plaster of wall surface shall be filled or repaired to the original condition with lime paste.

Old surfaces spoiled by smoke and greasy shoots shall be sprinkled with surki and water and to be rubbed with brick bats or steel wire brushes or steel scrappers. The surface shall then be broomed to remove all dust and shall be washed with clean water.

Preparation of White Wash:

The White Washing is to be done with 5 parts of stone lime and one part of shell lime with necessary gum (2 Kgs per CuM of lime) using indigo as necessary and to be mixed as per standard practice.

Procedure and preparation of the surface shall be same as in white washing.

Application of White Wash & Colour Wash:

The operation for each coat shall consist of four consecutive strokes of the brush, one horizontally from right to left and the next from left to right and the third from bottom to upward and the from top to downward beforethe previous stroke dries. Each coat shall be allowed to dry before the next coat applied. No portion of the surface shall be left out initially to be patched up later on. The brush shall be dipped in white wash or colour wash, pressed lightly against the wall of the container and then applied by lightly pressing against thesurface with full swing of hand.

The white wash on ceiling should be done prior to that on walls.

Protective Measures:

Surfaces of doors, windows, floors, articles of furniture, beams etc and such other parts of the building not to be white or colour washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white or colour wash splashes, if any.

23. DRY DISTEMPERING:

Dry distempering of approved brand and manufacturer shall be used. The shade shall be got approved from the Engineer-in-charge / Architect before application. The Dry distemper shall be stirred slowly in clean waterusing 6 decilitres of water per kg of distemper or as specified by the manufacturer. Warm water shall preferably use. It shall be allowed to stand for 30 minutes. The mixture shall be well stirred before and during use to maintain an even consistency. Distemper shall not be mixed in larger quantity than is actually required for one day's work.

All surfaces for distempering shall be thoroughly brushed free from mortar droppings and foreign matter and prepared to satisfaction of the Engineer-in-charge / Architect before application of treatment. Pitting in plastershall be made good with plaster of paris mixed with dry distemper of the colour to be used. The surface shall be rubbed down again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat is applied. A priming coat of whiting (ground white chalk) shall be applied and no white washing coat shall be used as a priming coat of distemper.

24. PAINTING:

All surfaces for painting shall be properly sand papered and cleaned and where necessary good quality puttyshall be used to hide all holes, cracks, open joints etc. The rate for painting includes such work. Paint shallbe applied with approved brushes and surfaces shall be sand papered after every coat. All work when completed shall present a smooth, clean solid and uniform surface, to the satisfaction of the Engineer-in-charge.

(**a) Primer :** All surfaces for painting, if they are new, should have a coat of priming before application ofthe paint. Old surfaces where existing paints have been completely worn out owing to long use should owing to long use should also receive a coat of priming before application of fresh painting.

(i) Wood Primer : Wood primer of approved brand and manufacture is to be applied on the wooden surface which would be free from moisture and loose particles.

(ii) Steel Primer: For steel surface red oxide primer, zinc chromate primer of approved brand and manufacture and as per direction of the Engineer- in-Charge is to be applied on the surface. The surface should be made free of grease,rust, moisture and loose particles.

(iii) Acrylic Primer Coat (solvent based Primer) : Acrylic primer coat is to be used as base coat on wall finish of cement, lime or lime cement plaster surface before application of any wall coating e.g. distemper, oil based paints, synthetic enamel, acrylic emulsion etc. on them. Priming coatshall be preferably applied by brushing and not by spraying. Hurried priming shall be avoided

particularly on absorbent surface New plaster patches in old work before applying distemper Paris etc. should also be treated with acrylic primer. The surface shall then be allowed to dry for at least
48 hours. It shall then be sand papered to give a smooth and even surface. Any unevenness shall be made good by applying putty, made of plaster of Paris mixed with water on the entire surface including filling up the undulation and the sand papering the same after it is dry. The cement primer shall be applied with a brush on the clean dry and smooth surface Horizontal strokes shall be given first, vertical strokes shall be applied immediately afterwards. The entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours before oil bound distemper or paint is applied.

(b) Synthetic Enamel Paint : Synthetic enamel paint of approved brand and manufacture and of the require shade shall be used for the top coat and an undercoat of shade to match the coat as recommended by the manufacturer shall be used. Undercoat of the specified paints of shade suited to the shade of the top coat shall be applied and allowed to dry overnight. It shall be rubbed next day with thefine grade of wet abrasive paper to ensure a smooth and eve surface free from brush marks and all loose particles dusted off. Top coats of specified paint of the desired shade shall be applied after the undercoat is thoroughly dry. Additional finishing coats shall be applied if found necessary to ensure properly uniform glossy surface.

(c) Aluminium Paint : Aluminium paint of approved brand and manufacture shall be used. The paint comes compact dual containers with the paste and the medium separately. The two shall be mixedtogether to proper consistency before use. Each coat shall be allowed to dry for 24 hours and lightly rubbeddown with fine grade sand paper and dusted before the next coat is applied. The finished surface shall present an even and uniform appearance. As aluminium paint is likely to settle in the container, care shall be taken to frequently stir paint during use. Also the paint shall be applied and laid off quickly, as surface is otherwise not easily finished.

(d) Interior Acrylic Emulsion Paint : Acrylic emulsion paint are not suitable for application on external surface and surface which are liable to heavy condensation and are be used generally on internalsurface. For plastered surfaces a cement priming coat is required before application of acrylic emulsion.Acrylic emulsion paint of approved brand and manufacture and of the required shade shall be used. Thepaint will be applied in the usual manner with brush or roller .The paint dries by evaporation of the watercontent and as soon as the water has evaporated the film gets hard and the next coat can be applied.The time for drying various from one hour on absorbent surfaces to 2 to 3 hours on non-absorbentsurfaces. The thinning of emulsion Is to be done with water and not with turpentine. Thinning withwater will be particularly required for the undercoat t which is applied on the absorbent surface.

The quantity of thinner to be added shall be as per manufacturer's instructions. The surface on finishing shallpresent a flat, velvety, smooth finish. If necessary, more coats will be applied till the surface present a uniform appearance.

Precautions : **(i)** Old brushes if they are to be used with emulsion paints should be completelydried of turpentine or oil paints by washing in warm soap water. Brushes should be quickly washed in water, immediately after use and kept immersed in water during break periods to prevent the paint from hardening on the brush.

(ii) In the preparation of walls f or Acrylic emulsion painting, an oil base putty shall be used in filling cracks, holes etc.

(iii) Splashes in floor etc. shall be cleaned out without delay as they will be difficult remove after hardening.

(iv) Washing of surface treated emulsion paints shall not be done within 3 to 4 weeks of application.

(e) Varnishing: Varnish for the undercoat shall be a flatting varnish of the same manufacture as the top

coats. New wood work to be varnished shall be finished smooth with a carpenter's plane. Knots shall be cutto a slight depth. Cracks and holes shall be cleaned of dust. The knots, cracks etc. shall then be filled in with woodputty. The varnish shall be applied liberally with a full brush and spread evenly with short lightstrokes to avoid frothing. If the work is vertical the varnish shall be crossed and re-crossed and then laid off, the later being finished on the upstroke so that varnish, as it sets, flows down and eliminates brush marks. The above process will constitute one coat. If the surface is horizontal, varnish shall be worked in everydirection with light quick strokes and finished in one definite direction so that it will set without showingbrush marks. Rubbing down and fatting the surface shall be done after each coat except the final coat withfine sand paper. The work shall be allowed to dry away from draughts and damp air .The finished surface shall then present a uniform appearance and fine glossy surface free from streaks, blister etc. Any varnish left over in the small container shall not be poured back into the stock tin, as it will render the latter unfitfor use Special fine haired varnishing brush shall be used and not ordinary paint brushes. Brushes shall be well worm and perfectly clean.

(f) Oiling with Raw linseed Oil : Raw linseed oil shall be lightly viscous but clear and of a yellowish colour with light brown tinge. Its specific gravity at a temperature of 30 ºC shall be between 0.293 and 0. 298.The oil shall be mellow and sweet to the taste with very little smell. The oil shall be of sufficiently matured quality. Oil turbid or thick, with acid and bitter taste and rancid odour and which remains sticky fora considerable time shall be rejected. The oil shall be of approved brand and manufacture. The wood work shall be cleaned of al l smoke and water and completely dried. The oil shall be applied freely with brushes (not rags) and spread evenly and smooth until no more oil is absorbed. Each subsequent coat shall be applied after the previous coat is thoroughly dried and in any case not before 24 hours of application of the first coat. Work after completion shall not be patchy and sticky to the touch and shall present a uniform appearance.

(g) Wax polishing : Wax polishing shall be done with material of approved brand and manufacture. Preparation of surface will be same as for varnishing. The polish shall be applied evenly with aclean oft pad of cotton cloth is such a way that the surface is completely and fully covered. The surface is then rubbed continuously for half an hour. When the surface is quite dry, a second coat shall be appliedin the same manner and rubbed continuously for one hour or until the surface is dry. The final coat shall then be applied and rubbed for two hours (more if necessary) until the surface has assumed a uniform gloss and is dry, showing no sign of stickiness. The final polish depends largely on the amount of rubbing which should be continuous and with uniform pressure with frequently changes in the direction.

(h) French polishing : Pure shellac varying from pale orange to lemon yellow colour, free from resin or dirt shall be dissolved in methylated spirit at the rate of 150 gm. Of shellac to a litre of spirit. Suitable pigment shall be added to get required shade The surface shall be cleaned. All unevenness shall be rubbed down smooth with sand paper and well dusted. Knots if visible shall be covered with a preparation of red lead and glue size laid on while hot. Holes and indentations on the surface shall be stopped with glaziers putty. The surface shall then be given a coat of wood filler made by mixing whiting (ground chalk) in methylated spirit at the rate of 1.4 kg. of whiting per litre of spirit. The surface shall againbe rubbed down perfectly smooth with glass paper and wiped clean. A pad of woollen cloth covered by a fine cloth shall be used to apply the polish. The pad shall be moistened with the polish and rubbed hard on the wood in a series of overlapping circles applying the mixture sparingly but uniformly over the entire area of an even evil surface. A trace of linseed oil on the face of the pad facilities this operation. Thesurface shall be allowed to dry and the remaining coats applied in the same way. To finish off, the pad shall be covered with a fresh piece of clean fine cotton cloth, slightly damped with methylated spirit and rubbed lightly and quickly with circular motions. The finished surface shall have a uniform texture and high gloss.

LIST OF APPROVED MAKE / AGENCIES :-

The Engineer reserves the right to select any of the brands indicated in the list of approved makes. The Tenderer shall quote his rates on the basis of the price of best quality and grade of product of the brand / make stipulated in the item of works as described in the BOQ and specifications as well as in the list of approved make. The Contractor cannot claim anything extra if the owner changes the make but within the list of approved make.

(A) LIST OF APPROVED MAKES FOR CIVIL WORKS ITEMS:-

S.No.	Description of Item	Makes for Items
1	Cement	ACC, DCM Shriram, Ultratech, Nuvoco (Lafarge), Dalmia, Ambuja.
2	White cement	Birla white, JK White
3	Structural & TMT/ TOR steel	TATA/SAIL/Essar Steel/RINL/JSW/ Electro steel
4	RMC	ACC, DCM Shriram, Ultratech, Nuvoco (Lafarge), Dalmia, Ambuja.
5	uPVC Doors	Rajshree, Sintex
6	Aluminum door / window / grill	Jindal Aluminum Ltd., Hindalco Industries, Indal Aluminum Industry
7	Aluminum Accessories	Classic Aluminum Industry Pvt Ltd, Argent Industries, NU-LITE INDUSTRIES (INDIA)
8	uPVC Window & Accessories	Fenesta, LG Hausys, Lingel, Window Magic
9	Stainless steel sections	SAIL, TATA, Jindal
10	STAINLESS STEEL FITTINGS, Accessories & Hardware	Ebco, Hettich, Godrej, Dorset, Inox ,Ozone
11	Mortice Latch & Lock	Godrej, Dorset, Ozone
12	Hydraulic Door Closer	Godrej, Everite, Doorking, Dorset, Ozone, Hettich
13	Floor Spring	Godrej, Everite, Doorking, Dorset, Ozone, Hettich
14	Stainless steel railing	DSD, Techno links, Silver Designs, Manjit
15	Stainless steel screws for fabrication & fixing of doors & windows	Kundan, Puja, Atul
16	Stainless steel bolts, screws, washers and nuts	Kundan, Puja, Atul
17	Glass	AIS, MODI, ST.GOBAIN
18	Structural Glazing	AIS, MODI, ST.GOBAIN
19	Adhesive SR/SH Grade	FEVICOL, VAMICOL
20	Screws	GKW, Nettle Fold
21	Dash Fastner	Fischer, Hilti

22	Flush Doors	Duro, Greenply Industries, Merino, Century
23	Primer (Cement, wood, metal)	Asian, Berger, Nerolac, Dulux
24	Paints (OBD, dry distemper, acrylic emulsion, synthetic enamel)	Asian, Berger, Nerolac, Dulux
25	Paints (OBD, dry distemper, acrylic emulsion, Polish, synthetic enamel, exterior grade paint)	Asian, Berger, Nerolac, Dulux, Super snowcem paint
26	Heat reflective paints/ coatings	Thermatek, COOLROOFTM, DR. FIXIT, RAINCOAT COOL, Asian, Dulux, British paints
27	External-Internal cement based putty	Birla white, JK White, NCL-Altec
28	Texture paint	Heritage, Uni-tile, NCL-Altec, Spectrum
29	External Decorative plaster	Birla White, Morbi, Unistone
30	Acrylic based integral water proofing compound	ROFFE, CICO Technologies Limited, Chryso India, Fosrac Construction Chemicals, BASF, PIDILITE, Fairmate, SIKA.
31	Water proofing compound to be mixed in cement (Admixture)	ROFFE, CICO Technologies Limited, Chryso India, Fosrac Construction Chemicals, BASF, PIDILITE, Fairmate, SIKA. Master Crete M-81 of Choksey Chemicals /Dr. Sealkit Sealcrete (Asian Chemicals)/RHEOMIX 131of BASF
32	Ceramic / glazed Tiles	Johnson, Kajaria, Somany, Nitco
33	Vitrified tiles	Somany/ Orient/Nitco /Varmora/VITA/ Marbito, Johnson, Kajaria
34	Tile Adhesive chemical (Fix-A-Tile),Sealant	Dr. Fixit, CICO Technologies Limited, Choksey/Sika/PIdIlite/Rouf
35	Laminated wooden flooring	Unitex, Armstrong, Vista
36	PVC Flooring	Armstong, L.G. Hausys, Gerflor
37	Precast Paver Blocks	Nitco, Hindustan, Unitile, vyara
38	E.P.D.M.Gasket	Roop, Anand
39	Door seal—Woolpile,Weather strip	Anand, Raddiplex
40	Mineral Fibre False Ceiling	ARMSTRONG, Daiken Ceilings, UGC Boral, Gyproc
41	Gypsum Board	Gyproc, elephant brand, USG Boral
42	Bitumen	Indian Oil Corporation, Shalimar Tar Products

43	Marine Ply wood/BWP Plywood / BLOCK BRD / Decorative Plywood	Duro, Merino India, Green ply Industries ltd., Century
44	PLAIN / PRELAMINATED Particle Board	Duro, Merino India, Green ply Industries ltd., Century, GVK Novopan
45	MDF (Medium density fibre board)	Century Ply, Green ply Industries ltd., Mangalam Timber, Actiontesa
46	LAMINATES	Greenlam India, Formica, Merino India, Decolam
47	Veneer	Decowood, Century, Durian
48	Galvanum Sheet (Puff Panel)	Interarch, Tata Blue scope, Dyna Roof, Everest Industries
49	Polycarbonate sheet	Lath Fibre, Dyna Roof, DPI Daylighting, Sabic
50	High density fiber board accoustical wall panelling	Anutone, Ecophone, Dexune, Armstrong, U.S.G Boral
51	Stretchable acoustical fabric wall panelling	Anutone, Ecophone, Dexune, Armstrong, U.S.G Boral
52	Perforated gypsum board wall panelling	Gyproc, U.S.G Boral
53	Metallic wall panelling	Armstrong, Gyproc, U.S.G Boral, Anutone, Dexune, Hi-Steel
54	Solid grade compact high pressure laminate Rest room cubicles	Merino, Trespa, Sturdo (Greenlam)
55	Alumium Louvers	Jindal Aluminum Ltd., Hindalco Industries, Indal Aluminum Industry
56	Aluminium Composite Panel with framework	Alu décor, Anutone, Alstone, Eurobond
57	Aluminium Screen Panel Cladding	Hunter Douglas, GKD
58	Accoustical Door	Anutone, Dexune
59	Roller/ Vertical Blinds	Vista, Mac, Packman, Dream décor
60	HPL sheet cladding	Merino, green lam, Durian
61	Composite Marble	Kalinga, Jhonson-Marbonite,
62	Acrylic Carpet	Transasia, Jupiter
63	Fibre Cement Board false ceiling	Gyproc, Visaka Industries LTD, Everest
64	Cement bonded Particle board	NCL Group
65	Metallic tile false ceiling	Armstrong, Gyproc, U.S.G Boral, Anutone, Dexune, Hi-Steel
66	PVC Frame & door shutter	Rajshri, Polyline, Duroplast, Pollywood
67	Sun control film	3M, Garware

68	Structural Retrofitting	Hilti, 3M
69	APP Membrane	ROFFE, CICO Technologies Limited, Chryso India, Fosrac Construction Chemicals, BASF, PIDILITE, Fairmate, SIKA.
70	Expansion Joint	Deevin, Emseal, asp (Architecture, speciality product), Dr. Fixit
71	Passive Fire protection	Hilti
72	Polyeurothene coating	ROFFE, CICO Technologies Limited, Chryso India, Fosrac Construction Chemicals, BASF, PIDILITE, Fairmate, SIKA, Master Crete M-81 of Choksey Chemicals /Dr. Sealkit Sealcrete (Asian Chemicals)/RHEOMIX 131of BASF
73	AAC Bricks	B R Metallics (Unit-AAC Block), Dlite Blocks Pvt. Ltd., ECO GREEN Products Pvt. Ltd., Ecorex Buildtech Pvt. Ltd., FastBuild Blocks Pvt. Ltd., Fusion Building Materials Pvt. Ltd., JVS COMATSCO INDUSTRIES PVT LTD, Kansal Building Solutions Pvt. Ltd.
74	Fire Rated Door	Navair, Meta flex, Gandhi Automations Pvt Ltd , Romat, Kutty Door
75	Solid acrylic laminate	Corian, Merino, Green lam
76	Chequerred terrazo tile	Nitco, Unistone, jhonson
77	Glass mosaic tile	Mridul, Bisazza, Little Glass crystal mosaic, world of mosaic
78	Turf paver block	Unistone, ultra, ovilite, victoria, lakshmi
79	Precast concrete tile	unitile, nitco, jhonson
80	Heat reflective tile	thermatek, Orient Bell Limited, H&R Johnson (India)
81	Tile grouting Compound	Somany, Kajaria, Dr Fixit
82	Floor hardner	Ironite, Ferrok, Hardomate, Fosroc
83	GRC Jaali/Fenestration	Unistone, Dalal tiles, G.K. Precast
84	Colour GI sheet	TATA/SAIL/JINDAL/HINDAL

(B) LIST OF APPROVED MAKES FOR PHE SERVICES

SR. NO.	DESCRIPTION OF MATERIAL	PROPOSED BRANDS/ MAKES/ MANUFACTURERS
1.	SANITARY FIXTURES	EURONICS /KOHLER /HINDWARE/ JAQUAR
2.	C.P. FITTINGS & BATHROOM ACCESSORIES	EURONICS /KOHLER /HINDWARE/ JAQUAR
3.	STAINLESS STEEL SINK	NEELKANTH/ JAYNA/NIRALI
4.	INFRA-RED BASED ELECTRONIC FLUSHING SYSTEM FOR URINAL/ WASHROOM	EURONICS /KOHLER /HINDWARE/ JAQUAR
5.	HAND DRIER	EURONICS/ UTECH
6.	ELECTRICAL WATER GEYSER	AO SMITH/ RACOLD/ MORPHY RICHARDS
7.	UPVC PIPE & FITTING	SUPREME/ PRINCE/ FINOLEX
8.	CPVC PIPE & FITTINGS	ASTRAL /AJAY/ ASHIRVAD
9.	G.I. PIPES	TATA/ JINDAL HISAR/ APL APOLLO
10.	G.I. FITTINGS	UNIK/ ZOLOTO 'M'/ DRP 'M'
11.	R.C.C. PIPE	JAIN SPUN PIPE/ PRAGATI/ DAYA SPUN PIPE
12.	C.P. GRATING	EURONICS /CAMRY/ CHILLY/ NEER
13.	C.I. MANHOLE COVER (IS: 1726-1991)	NECO/ RIF/ SKF
14.	C.I. GRATING	NECO/EQUIVALENT
15.	GULLY TRAPS	PERFECT /R.K. /ANAND
16.	BALL VALVE	CIM/ ZOLOTO/ SKS
17.	BUTTERFLY VALVES/SLUICE VALVE	ADVANCE/ L&T / SKS
18.	NON RETURN VALVE GUN METAL	CIM/ ZOLOTO/ SKS
19.	NON RETURN VALVE C.I. (DUAL PLATE TYPE)	ADVANCE/ SKS/ ZOLOTO
20.	AIR VENT VALVE	CIM/ ZOLOTO/ SKS
21.	PIPE SUPPORTS, HANGERS	EASYFLEX/ INTELLO TECH/ CAMRY
22.	FLANGES	TABLE 'H'/ CLASS 150
23.	THERMAL INSULATION	ARMACELL/ A-FLEX/ VEDOFLEX
24.	ANTI CORROSIVE BITUMASTIC PAINT	ASIAN/ BERGER/ NEROLAC
25.	EPOXY PAINT	ASIAN/ BERGER/ NEROLAC
26.	WC PAN CONNECTOR	GEBERIT/ MC ALPINE (UK)/ VIEGA
27.	PRESSURE REDUCING VALVE	GIACOMINI / RBM (ITALY)/SKS
28.	HDPE PIPES AND FITTINGS	JAIN IRRIGATION/ GEORG FISCHER/ ORIPLAST
29.	HANDICAP TOILET PRODUCTS	EURONICS /KOHLER /HINDWARE/ JAQUAR
30.	FOOT RUNGS	KGM OR EQUIVALENT
31.	ELECTRIC MOTORS	SIEMENS/ CROMPTON/ ABB
32.	SUBMERSIBLE SUMP PUMPS	GRUNDFOS/ XYLEM/ KSB/ WILO
33.	WATER SUPPLY PUMPS	GRUNDFOS/ XYLEM/ WILO/ MATHER & PLATT
34.	FRP FILTER AND SOFTENER	THERMAX/ ION EXCHANGE/ PENTAIR/ GOPANI
35.	DOSING PUMP	ASIA LMI/ TOSCHON/ PROMINENT / GRUNDFOS
36.	FLUSHING CISTERN	HINDWARE/ JAQUAR VIEGA/ GEBERIT
37.	GREASE TRAP	KESSEL/ ACO
38.	MOTORIZED VALVE WITH ASSEMBLED CONTROL PANEL	ADVANCE/ HONEYWELL / SKS
39.	PRESSURE VESSEL	ANERGY/ VAREM/ ZELMET
40.	LEVEL INDICATOR/ LEVEL CONTROLLER	ADVANCED AUTOMATION/ TECHNIKA/ MINILEC
41.	FASTNERS	HILTI/ FISCHER/ CANON
42.	WELDING ROD	VICTOR/ ADVANI/ ESAB INDIA

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39.	PRESSURE VESSEL	ANERGY/ VAREM/ ZELMET
40.	LEVEL INDICATOR/ LEVEL CONTROLLER	ADVANCED AUTOMATION/ TECHNIKA/ MINILEC
41.	FASTNERS	HILTI/ FISCHER/ CANON
42.	WELDING ROD	VICTOR/ ADVANI/ ESAB INDIA

(C) LIST OF APPROVED MAKES FOR ELECTRICAL WORKS ITEMS:-

S.No.	Description of Item	Makes for Items
1	Conduit PVC	Berlia, AKG, Precision, Schnieder, polycab equivalent as approved by deptt.
2	Wires Multi strand FR	Finolex, RR Kabel, Nicco, equivalent as approved by deptt.
3	D.B.	ABB, Schnieder, Legrand, Hager
4	Conduit Metallic	AKG or equivalent as approved by deptt.
5	MCB	Schnieder, Legrand, Hagar
6	MCCB	C &S, Schnieder, L&T, Schnieder, or equivalent as approved by deptt.
7	Underground cable	RPG, CCI, Polycab, Finolex
8	Blanking Plate	Same as accessories
9	Cable termination	Wago, Jainson, Dowells, Elcon
10	Glands	dowells, comet
11	Indicating Laps	L & T
12	Tel wire & cat 6	RR Kabel, Dalton, AT&T
13	Voltmeter	Melo, Milbourn, Rishab, Neptune, L&T, HPL