JAMIA HAMDARD

(Deemed to be University)

Hamdard Nagar New Delhi - 110062

TENDER DOCUMENT

FOR

Establishing Double Storey Prefabricated LGSF Structure and its allied Miscellaneous works including Civil, Interiors, Electrical, etc.

at

School of Pharmaceutical Education & Research (SPER), Jamia Hamdard, New Delhi

NOTICE INVITINGTENDER

NIT NO.: JH/Civil/Porta(LGSF)/172/2024/01
Date: 22.01.2025

Jamia Hamdard invites sealed items rate Tenders in two bids system (Technical & Financial Bid) from the agencies registered with CPWD, MES, Railways, Deptt. Of Telecommunication, Universities, Higher Education Institution for the below mentioned work. The Tender documents and other details are available on the website:www.jamiahamdard.edu. Last date of submission of the Tender is 10.02.2025 upto3.00pm.

The bidders are also advised to visit site to satisfy themselves before submitting the bids. Bidders not fulfilling the eligibility criteria may be rejected.

NAME OF WORK:	**Establishing LGSF Prefabricated Structure for SPER**
ESTIMATED COST:	**Rs.1.50 Cr.**
EARNEST MONEY:	Rs. 3.00 Lakhs
TENDER COST:	Rs. 2,000.00 only (Non-Refundable)
TIME PERIOD:	180 Days
Date of Pre-Bid Meeting:	04.02.2025 at 11:00 A.M.

The Tender duly filled should be dropped in the Tender Box kept in Purchase Section, Admin. Block on or before 10.02.2025 up to 03.00 PM along with demand draft of Earnest money & Tender fee in sealed envelope clearly specifying the name of work. The D.D shall be in favour of “Jamia Hamdard” payable at New Delhi. The Tender shall be opened on the same day at 03.30 PM by the tender opening committee in the presence of available interested parties in the Office of Executive Engineer and the Financial bid of the eligible parties will be opened after due information to eligible parties.

In case, the required procedure is not followed, the tender can be rejected. Jamia Hamdard reserves the right to reject any or all tenders or split the tenders without assigning any reason whatsoever.

REGISTRAR

Copy to:

1. System Analyst, Computer Center to kindly upload the NIT with tender documents on the University’s website.
2. PA to Finance Officer for kind information
3. Executive Engineer for kind information
4. Concerned AE(Civil) for necessary action

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Mode of Submission of Tender:

The tender shall be submitted in **physical documents** in the **Tender Box at *Purchase Section, Administrative Block, Jamia Hamdard, New Delhi*** in two cover system in accordance with the procedure detailed herein below. Specified documents shall be sealed in envelopes of appropriate size each of which shall be sealed.

1) First Envelope marked **Cover 1** shall contain Tender Fee, Earnest Money Deposit along with Covering Letter along.

2) Envelope marked **Cover 2** shall be of adequate size and shall contain envelopes marked **Cover 1 & tender documents** duly filled and shall be properly sealed & signed. This envelope shall be endorsed on the outside face as under:

"Establishing Double Storey Prefabricated LGSF Structure and its allied Miscellaneous works including Civil, Interiors, Electrical, etc. for **School of Pharmaceutical Education& Research** (SPER)at Jamia Hamdard New Delhi-110062**."**

The envelope marked Cover 2 containing the tender documents as per instructions mentioned above shall be submitted in the office of Purchase Section, Administrative Block, Jamia Hamdard, New Delhi by 10.02.2025 upto 03:00 PM.

Envelope marked Cover 1 & Cover 2 containing Tender fee, Earnest Money Deposit along with Covering Letter tender document/Undertaking as in Annexure- I will be opened and if the Tender Fee & Earnest Money Deposit, tender document / Undertaking as in Annexure- I is not found as prescribed, the tender shall be rejected out rightly out rightly.

APPLICATION FROM BIDDER
(Forwarding letter)

From: M/s ----------

To,
The Executive Engineer
Jamia Hamdard
Hamdard Nagar
New Delhi –110062.

Subject: "Establishing Double Storey Prefabricated LGSF Structure and its allied Miscellaneous works including Civil, Interiors, Electrical, etc. for School of Pharmaceutical Education& Research (SPER)at Jamia Hamdard New Delhi-110062."

Dear Sir,
With reference to the tenders invited by you for the above work, I / We do hereby offer to perform, provide execute & complete the above work in conformity with the drawings, items & conditions and specifications for the amount as shown in the Schedule attached hereto.

I / We have satisfied myself / ourselves to the location and conditions of the site & read the article of agreement conditions of contract & specification etc.

I/We understand that the works are to be completed within the specified period & fully understood that the time will be the essence of this contract.

I/We enclose herewith the Earnest Money by demand draft of Rs. ……(Rupees ……) in favour of Jamia Hamdard, Hamdard Nagar, New Delhi-62, which amount is not to bear any interest, even if this tender is accepted
in whole or in part thereof. I / We hereby agree to abide by and fulfill all the terms and conditions of the tender, N.I.T etc. as far as possible, and if found default against the said condition thereof the Registrar Jamia Hamdard have the right to forfeit the sum of money mentioned in the conditions.

I/We agree that the said Executive Engineer Jamia Hamdard or his successors in office shall without prejudice or any other right or remedy be at liberty to forfeit the said Earnest Money absolutely, if we fail to commence the work as specified above. Otherwise he will retain the said earnest money towards security deposit mentioned in general conditions of the contract.

Name of the partner (s)

Yours faithfully,
1. Signature of contractor with seal
2. Dated
3. Address

PRE QUALIFICATION CRITERIA (PQC)

1. **TECHNICAL CRITERIA:**

Bidder should meet the following Technical Criteria of BEC, failing which the offer shall not be considered for further evaluation:

A. The Bidder must have experience of successfully completed **SIMILAR WORKS** during last 3 years ending last day of month previous to the one in which this application has been invited should be either of the following: -

i. Three (3) **SIMILAR WORKS** completed during last seven (7) years having executed value of not less than INR 64 lacs.

ii. Two (2) **SIMILAR WORKS** completed during last seven (7) years having executed value of not less than INR 100 lacs.

iii. One (1) **SIMILAR WORKS** completed during last seven (7) years having executed value of not less than INR 128 lacs.

Contractor/Vendor must have experience of 10 years in the similar field have completed identical/similar nature of works.

Tender invited for LGFS dry wall construction work from experienced civil contractor on turnkey basis including civil, plumbing, electrical and cold form super structure LGFS with finishing items. Contractor will do **MOU** with approved supplier of LGFS system **(the contractor is not allowed to change the designing agency once the MOU is signed and submitted)** and submit it with the tender bid. The scope of work shall include Design, Engineering, Supply of super structure, submission of GA drawings to Architect/EIC for approval. Execution will be done as per standard guideline by Manufacturer's DBR etc with MTC of material with supply.

SIMILAR WORKS here defined as:

Composite contract Establishing of Double Storey LGSF Structure its allied Miscellaneous works including Civil, Plumbing, Interiors, Electrical, works for any reputed educational institutes. Residential & Extension of Existing Structure works shall not be considered in the criteria of similar works.

Approved Supplier of LGFS Structure: -

(EPACK Prefab, BNAL PREFAB PVT.LTD, INTERARCH, NIPANI, EVEREST INDUSTRIES LTD.) The vendor will provide certification from the LGSF manufacturers.

Above work should have been awarded to them by Central/State Government Department / Public Sector Undertaking / Statutory Bodies/ educational universities or reputed organization during the preceding 3 years.

B. DOCUMENTS REQUIRED TO MEET THE TECHNICAL CRITERIA

The bidders are required to submit following documents in support of their meeting the experience criteria during preceding 07 years as detailed above.

i. Copies of work/service orders issued by their client, duly attested by Notary Public.
ii. The completion certificate / client certificate in respect of work/service order mentioned above.

The Completion Certificate / Client Certificate must clearly indicate the following:

i. Reference to relevant work order
ii. Actual value of executed work, and
iii. Actual date of completion.

C. Jobs executed by subsidiary/fellow subsidiary/Holding company:

A job executed by a bidder for its own plant/projects and subsidiaries, sister concern shall not be considered as experience for the purpose of meeting the requirements of BEC of the tender as experience for the purpose of meeting BEC.

2. <u>FINANCIAL CRITERIA:</u>

A. Bidder should meet the following Financial Criteria of BEC;

The following documents to be submitted with CA certification with their membership Number & UDIN number on their letterhead.

i. The Average Annual Turnover of the Bidder should be equal to or more than Rs. 1,00,00,000.00 (Rupee One Crore) in the 3 preceding financial years (i.e. 2021-22, 2022-23, 2023-24).

ii. The Net worth of the Bidder should be positive as per last audited financial statement i.e. for FY 2023-24.

B. DOCUMENTS REQUIRED TO MEET THE FINANCIAL CRITERIA

Annual Turnover, Net Worth : - Copies of Audited Balance Sheets, Trading and P/L A/c, duly attested by Notary Public.

3. DOCUMENTS REQUIRED TO MEET TECHNO-COMMERCIAL CRITERIA

a) Tender Fee - As given in NIT

b) Earnest Money Deposit (EMD) - As given in NIT

c) Attested copy of Work/Service Order of as per the criteria mentioned in technical criteria. Attested copy of Completion Certificate showing the required information in respect of work order submitted with the bid.

d) Attested copies of Audited Balance Sheets of F.Y. 2021-22, 2022-23, 2023-24

e) Attested copy of Trading & P/L accounts for F.Y. 2021-22, 2022-23, 2023-24

f) Various Forms & Formats, duly filled in and signed by the bidder.

g) Duly signed Tender document, as an acceptance of Terms & Conditions of the tender.

h) Duly signed Blank Schedule of Rates (SOR).

i) Undertaking by the bidder that the tender document read and understand by the bidder and has not been modified or tempered in any manner.

GENERAL INSTRUCTION TO BIDDERS

1. COMPARISON OF BIDS

Prices shall be opened in respect of only the techno-commercially acceptable bidders whose bids have been found to be substantially responsive.

A substantially responsive bid is one that meets the terms and conditions of the Tender and / or the acceptance of which bid will not result in indeterminate liability on **JAMIA HAMDARD**. After establishing the eligibility of the bidders and bringing the offer of all the bidders technically and commercially at par, recommendation shall be made for opening of price bids.

The discrepancies in rate filled for various items shall be resolved in the following manner:-

(i) When there is a difference between the rates in figures and words, the rate which corresponds to the amount worked out by the contractor (by multiplying the quantity and rate) shall be taken as correct.

(ii) When the rate quoted by the contractor in figures and words tallies but the amount is incorrect, the rate quoted by the contractor shall be taken as correct and not the amount.

(iii) When it is not possible to ascertain the correct rate, in the manner prescribed above, the rate as quoted in words shall be adopted and the amount worked out, for comparison purposes.

(iv) When the quoted rates and amount are given only in figures, if a discrepancy is observed in rates and amount (by multiplying the quantity and rate), unit rate as quoted by the bidder shall be taken as correct.

(v) Bidders are required to quote for all the items as per SOR. In case it is observed that any bidder has not quoted for any item in the Schedule of Rates (such unquoted item not being in large numbers), the quoted price for the purpose of evaluation shall be considered as the maximum rate quoted by the remaining bidder for such items. If after evaluation, such bidder is found to be the lowest evaluated bidder, the rates for the missing item shall be considered as included in quoted bid price.

(vi) If the estimated price impact of the unquoted items is more than 10% of the bidder's quoted price, the above provision shall not be applicable and such bid shall be rejected.

2. PRICE EVALUATION METHODOLOGY OF BID]

Based on the evaluation of techno-commercially qualified bidders, Price Bids for **"**Establishing Double Storey Prefabricated LGSF Structure and its allied Miscellaneous works including Civil, Interiors, Electrical, etc. for **School of Pharmaceutical Education& Research** (SPER)at Jamia Hamdard New Delhi-110062**."** will be evaluated on overall lowest cost basis to JAMIA HAMDARD (L-1 offer) i.e. considering total quoted price for all items of SOR including Service Tax and all other taxes & duties etc. as per "Schedule of Rates".

The evaluated Contract Value of the bidders shall include total value including material and services, inclusive of all taxes, duties, levies etc. as applicable under this contract.

Based on the evaluation of techno-commercially qualified bidders, the job will be awarded to L-1 bidder.

The bidders are advised not to offer any discount/rebate separately and to offer their prices in the SOR after considering discount/rebate, if any.

If any unconditional rebate has been offered in the quoted rates, the same shall be considered in arriving at the net tendered amount. No cognizance shall be taken for any conditional discount for the purpose of evaluation of the bids.

If any bidder offers sub-moto discount after opening of un-priced bids but before opening of price bids, such reduction / discounts shall not be considered for evaluation. However, if the bidder happens to be the lowest evaluated bidder without considering such discount then the benefit of discount will be availed at the time of award of work.

In the event as a result of techno-commercial discussions or pursuant to seeking clarifications / confirmations from bidders, while evaluating the un-priced part of the bid, any of the bidders submits a sealed envelope stating that it contains revised prices; such bidder(s) will be requested to withdraw the revised prices failing which the bid will not be considered for further evaluation

SCOPE OF WORK

I. GENERAL:-

"Establishing Double Storey Prefabricated LGSF Structure and its allied Miscellaneous works including Civil, Interiors, Electrical, etc. for **School of Pharmaceutical Education& Research** (SPER)at Jamia Hamdard (Deemed to be university) New Delhi-110062**."**

II. BACKGROUND:-

The proposed Establishing Double Storey Prefabricated LGSF Structure and its allied Miscellaneous works including Civil, Interiors, Electrical, etc. for **School of Pharmaceutical Education& Research** (SPER)at Jamia Hamdard (Deemed to be university) New Delhi

1. Facilities Required: Class Rooms, Halls, Faculty Rooms – Male & Female and Toilets addition amenities etc. complete for the smooth functioning of building along with necessary fittings, lighting, electrical, plumbing, Interior finishes etc.

2. The layout for the floor are enclosed with the tender to understand the requirements.

III. SCOPE OF WORK:-

The scope of work covers all Dismantling, Interior, Civil, Plumbing, Electrical works etc. for **School of Pharmaceutical Education& Research** (SPER) at Jamia Hamdard, New Delhi.

1. Broad scope of work -

- Civil Works including removing of existing walls, cleaning of site etc. construction of new foundation, footing, columns, beams, walls, plastering the walls / M.S Structure, Erection of LGSF Structure, flooring and cladding etc.

- New flooring (Vitrified tiles etc.), New dado work on wall- tiles, paint etc.

- New False ceiling, as per approved elevation and of required type, including trap doors, under-deck insulation etc. It is suggested that the false ceiling be restricted to minimum area without compromising on acoustics and aesthetics.

- Door, Window works, as per the specifications as approved.

- Painting/ polishing/ finishing as per specifications as approved.

- Providing Aluminium partitions/wooden partition/cupboards/shelves in plywood/ Gyproc board/Habitto board& laminate/veneer etc. as approved.

- Providing frameless glass partitions, Aluminium glazed partition, doors, Window etc. as approved.

- Electrical system including wiring and fittings etc, power distribution, suitable illumination and other associated services works as approved including integration with existing system.

2. The Scope of Work (SOW) described above is indicative. The items or part of work which are not clearly defined in this document but are required to be carried out for successful completion and commission of the proposed structure shall be deemed to have been included in the scope of work and the bidder shall have to carry out such jobs as per the best industrial practice with due approval from HAMDARD at no extra cost.

3. As the new infrastructure is to be developed in an existing building, the planning and execution should include developing of a proper plan including integration of existing with proposed Lighting, Power distribution, etc. complete without disturbing the essential services to the rest of the building.

4. Obtaining the approval for shop Drawings finally from Jamia Hamdard & Architect before execution within **45 days** from awarding of work.

5. Project Management and quality control by deploying Competent Technical Personnel without any additional cost to Jamia Hamdard.

6. Materials used shall be as per the approved makes. No materials shall be used without the prior approval of Officer- In-Charge / Architect.

7. Sufficient number of samples/ display boards shall be submitted to facilitate approval of finishing and other items.

8. All ancillary items/equipments required to complete the job shall be responsibility of the contractor.

9. The structure shall be designed, supplied by approved LGSF vendors only. Contractor will provide complete, GA drawings with shop drawings of structure etc with design basis report prior to proceed for production. Structural stability certificate to be submitted by Vendor.

IV.FACILITIES TO BE DEVELOPED:-

For the Class Room, Faculty Room etc. complete with furniture and systems/services:

- Class Rooms
- Faculty Room
- Hall
- Common Area
- Toilets
- Lobby area

VI.DISMANTLED MATERIALS:

The dismantled material (unserviceable) retrieved from the site during execution of renovation works in existing area will be the property of the contractor and same to be removed from site on regular basis. **All serviceable material will be property of HAMDARD and to be deposited/stacked properly in building or in the campus near by the building as per instructions of EIC.**

VII.SAFETY / SITE CONDITIONS- HEALTH & SAFETY STANDARDS TO BE ADHERED TO:-

As part of its proposal, the bidder must take full responsibility for the adequacy, stability and safety of all site operations and ensure that the methods of carrying out the work and the project by the

bidder including his workers, employees, sub-contractors and vendors meet all the necessary safety standards and requirements of the HSSE standards of HAMDARD.

Bidder must follow covid appropriate behaviour at the site according to guidelines of HAMDARD and the government (state/centre) that may change time to time and bidder should be well aware about it. All materials/ equipments required to follow safety guidelines, covid-19 appropriate behaviour etc. must be supplied to the workers, employees, sub-contractors and vendors of the executing agency by the bidder only like safety belt, helmet, safety shoes, PPE kit, gloves, sanitizer, mask, face shield etc.

SPECIAL CONDITIONS OF CONTRACT

GENERAL INTRODUCTION

Proposed site is located at Ground for **School of Pharmaceutical Education& Research** (SPER) at Jamia Hamdard, New Delhi.

Where the provisions of these Special Conditions are at variance with the provisions of the General Conditions of the Contract (GCC) the provisions of these Special Conditions of Contract shall take precedence. The copy of the GCC is kept in the office of for ready reference, all bidders must go through the documents before quoting the bid, it will be assumed that the bidders have read the same.

The following special terms and conditions of contract shall supplement the general conditions of contract. Whenever, there is a conflict, the provisions herein shall prevail over those in the General Conditions.

SPECIFICATIONS:

(i) The specifications of the various items of the works will be as per enclosed technical specifications, technical specifications provided to contractor during execution of contract, latest editions of CPWD specifications for work with all correction slips. In absence of any detailed specifications, latest Indian Standard specifications and code of practice shall become applicable. Wherever, these codes are silent, the same shall be governed by sound engineering practice and the decision of EIC in matters of interpretations etc. shall be final and binding on the contractor.

(ii) As detailed in the description of the item of work and relevant drawing.

(iii) Make of materials: The contractor shall use the material of makes given in the BOQ/tender. In case the make of the material not available in the approved list, the contractor has to use the material as approved by EIC. Samples of all materials to be used must be submitted and got approved from EIC.

ORDER OF PRECEDENCE:

In case of ambiguity in Schedule of rates, General Conditions, Specifications, Drawings, the following orders of precedence will prevail:

(i) Telex/Telegram/Fax of Intent, detailed Letter of Intent along with Statement of agreed variation and its enclosures and any Corrigendum/Addendum/ special note to bidders.

(ii) Schedule of Rates.

(iii) Special Conditions of Contract

(iv) Specifications

(v) Drawings in conjunction with each other.

(vi) General Conditions of Contract

EFFECTIVE DATE OF CONTRACT

The effective date of start of contract shall be reckoned from the **7th day** of issue of Letter of Intent/ FOI/LOA.

TIME SCHEDULE

Total period of contract for completion of this work will be for **6 MONTHS**, to be reckoned from the **7thday of issue of letter of award**/FOI or the day of handing over the site, which ever will be later.

Time is the essence of the contract and as such as every effort should be made to complete the work within prescribed time period for the execution of the work as contemplated under this contract.

In case of any hindrance, govt. orders etc. that may effect the work execution, the same to be notified to the EIC through proper channel. Applicability of the same shall be validated by Engineer In-charge as per JAMIA HAMDARD guidelines.

ARCHITECTS/CONSULTANTS

JAMIA HAMDARD has appointed **M/S THE GRID, E-326, GREATER KAILASH PART-II NEW DELHI-110048**, PH-011-29221089, 29221090, as the architectural consultant for the Consultancy services. For any clarification, bidder can contact the architectural consultant under intimation to JAMIA HAMDARD.

1.0 NAME OF THE WORK

Establishing of Double Storey LGSF Structure its allied Miscellaneous works including Civil, Plumbing, Interiors, Electrical, works School of Pharmaceutical Education& Research (SPER) at Jamia Hamdard, New Delhi.shall be carried out as described in Schedule of Rates (SOR). Any other item not specifically mentioned but required for completing the work shall also be executed.

All works shall be operated as per items given in Schedule of Rates (SOR) and those items which are not available in Schedule of Rates (SOR) and required to be operated as per requirement, will be carried out as an Extra item and rates will be derived for extra items as per the provision made in the tender. The jobs of specialized in nature shall be got executed through the specialized agencies only, by the contractor. Before getting executed such jobs the contractor is required to get the agency approved from the EIC. In case, an item has got a guarantee period, then the same is to be passed on to JAMIA HAMDARD. If such item fails before its guarantee period is over, then contractor has to rectify/ replace it at his own cost.

The above gives the general scope of work, however tenderer is supposed to acquaint himself of various items as detailed in SOR. The bidder is advised to see the site conditions and nature of job before quoting his rates. It shall be taken that bidder has seen the site conditions and no claim on this account shall be entertained at a later date. Job shall be done in strict compliance with tender specifications. The various items to be operated have been dealt in schedule of rates attached with tender documents. The rates should include supply of all materials, man power, equipments,

consumables, taxes, duties, royalties, profits and overheads like Labour License, Insurance etc. required for the job as per specifications and BOQ.

2.0 TERMS OF PAYMENT:

RUNNING/FINAL BILL PAYMENT PROCEDURE

(A) PAYMENT OF RUNNING BILL:

90% of SOR shall be paid after execution of works & balance 10 % shall be paid along with Final Bill on site clearance and handing over of works complete in all respect as certified by Engineer In Charge in the RA bill.

The contractor shall submit computerized bill in three copies along with joint measurements and all supporting documents. Contractor shall submit the soft copy containing the details of the bill with their supporting documents for the checking of the E.I.C. The contractor shall inform the EIC or his representative well in advance for recording the joint measurement and shall submit the bills after joint measurement.

(B) PAYMENT OF FINAL BILL:

(i) Contractor must submit his final bill within sixty days of completion of the work and payment of the final bill shall be made to the contractor within 60 days of the submission of the final bill based on the joint measurement with EIC/AC or his authorized representative along with all requisite documents including **"No Claim Certificate"**& all obligations under the contract, site clearance, certificate, as built drawings etc.

(ii) No Claim Certificate: The contractor shall submit final bill along with No Claim Certificate. No Claim Certificate shall be on the contractor's letter head and indemnity Bond in prescribed Performa in the contract on non- judicial stamp paper of Rs. 100/- duly notorized from Notary public indemnifying JAMIA HAMDARD from all liabilities w.r.t persons engaged by the contractor regarding payment of wages, PF/ESI contribution, insurance & other liabilities The final bill shall be processed only on submission of No Claim Certificate, otherwise final bill will be paid only after one year of submission of the same, as per JAMIA HAMDARD records.

2.1 The quoted rates shall include all costs, transportation of material at all heights and floors to and from the premises as and when required. Nothing extra is payable on this account. Transportation of any wastage, exchange of rejected or defective material, surplus material etc. shall have to be arranged by the contractor at his own risk and costs. Also any material brought inside or taken out of the premises shall have necessary prior permission to do so.

2.2 Contractor has to make all the arrangements for tests / inspection either at site or elsewhere at his own cost and expenses. The contractor shall arrange for the necessary quality tests at his own cost from the reputed laboratory, if required to be done for such items which are not ISI marked or if there is any doubt on the quality of ISI marked material. Contractor has to bring the material at site as per the approved make and for the material for which approved make is not stipulated in the tender same shall be brought of ISI marked as per direction of EIC. The

material required for sampling for testing as per the CPWD specification. Material not found conforming to any of such tests shall have to be unconditionally replaced by the tenderer/contractor and any damage caused by its use be made good by him.

2.3 The drawings, conditions, specifications and schedule of quantities forming contract document are explanatory and are complementary to one another representing together with the work/installation to be carried out. In case of doubt, the matter shall be discussed with EIC and necessary clarifications obtained. If neither the drawing nor the specifications, the schedule of quantities include any provisions which are absolutely necessary to complete the work as per drawings, the contractor shall provide the same, contained in any one viz (i) the drawings, (ii) the specifications and (iii) the schedule of quantities but not specifically appearing in the other all such parts of the contract document and the work shall be executed accordingly.

2.4 The contract shall be carried out in workmen like manner and the workers will abide by all JAMIA HAMDARD rule and norms while inside the premises. They shall also restrict movement to their place of work only. The workmen shall work in close co-ordination of any other agencies working at site. This shall be adhered to at no extra cost.

2.5 The bidder/contractor shall be responsible for any injury caused to persons, animals or things (fittings/fixtures/furnishings etc.) any damage caused to any property of JAMIA HAMDARD etc. which may arise from the operations or neglect of any person of the bidder/contractors or any person engaged by him for any purpose related to the execution of this contract. This clause shall include inter alia, any damaged to buildings, roads, streets, footpaths etc. adjacent to or otherwise to the premises. The bidder/contractor shall indemnify JAMIA HAMDARD of all liabilities arising out of his operations in any way under any acts of the Government and also in award of any compensation or damaged consequent upon any claim arising out of the above. The bidder/contractor shall further make good all damaged caused thus either to JAMIA HAMDARD or to any third party.

2.6 The Bidder shall indemnify JAMIA HAMDARD under Workmen's Compensation Act, Fatal Accident Act, Personal Injuries Act, Insurance Act etc. and or their Industrial Legislation in force from time to time. The contractor / bidder shall indemnify JAMIA HAMDARD for comply the labour laws.

2.7 In the event of any accident occurring during the course of work, which may result in any injury to a person, the responsibility of their medical treatment will fully rest with the bidder/contractor and expenditure incurred thereon will be borne entirely by the bidder/contractor. JAMIA HAMDARD shall be totally indemnified of any liability whatsoever.

3.0 CONTRACTOR PERSONNEL AT SITE:

3.1 Contractor shall appoint a qualified site engineer/site supervisor to execute the work as per drawings/boq and shall be the coordinating person between the contractor's labour and EIC/Architect. Site engineer shall also be responsible for safety of labourers working at the site. **The site engineer shall have degree in civil engineering with experience of minimum 3 years with 5 years experience in the field of civil & interior execution works.**

Contractor shall have to appoint suitable qualified electrical/mechanical engineer at the time of execution of electrical/mechanical works, **if required** or as per condition mentioned in supervision of works

3.2 Contractor shall appoint/deploy a qualified & experienced person as a project manager having experience of execution of similar projects who shall be responsible for billing, measurements, documentation works, etc. and coordination between client, contractor & consultant.

3.3 List of persons employed by Contractor for the subject work mentioning their residential address (id proof) shall be submitted to JAMIA HAMDARD. If required necessary verification from Police / Gram Pradhan shall have to be submitted by the contractor.

3.4 The Contractor shall be directly responsible for any/all disputes arising between him and his personnel and keep JAMIA HAMDARD indemnified against all losses, damage and claims arising thereof.

3.5 The personnel engaged by the Contractor shall be subject to security check by the JAMIA HAMDARD's security staff while entering/leaving the premises. The contractor & his personnel shall be required to follow the rules and regulations of JAMIA HAMDARD in force from time-to-time. The contractor may also be required to provide photo passes to the personnel required by him for security and safety reasons and furnish the details of the same when asked for.

3.6 No other person except Contractor's authorized representative shall be allowed to enter JAMIA HAMDARD premises. Contractor shall also not entertain any outsider or extend any service beyond JAMIA HAMDARD'S premises. Entry of Contractor's persons shall be regulated with proper identity/gate pass.

3.7 Contractor shall be fully responsible for theft, burglary, fire or any mischievous deeds by his staff and any loss to JAMIA HAMDARD shall be recovered from the Bills/ Final bill of the Contractor.

3.8 Contractor shall provide all necessary tools and tackles, equipments, safety belt, safety net, wheel burrow, scaffolding, ladders, drilling m/c & safety equipment etc. required to carry out job at his cost and material used by Contractor shall be of standard make and approval of Engineer-In-Charge shall be taken for the same.

3.9 JAMIA HAMDARD also reserves the right to ask the Contractor to remove particular person(s) from site with immediate effect if in the opinion of JAMIA HAMDARD, his behavior/performance is not up to the mark and/or found indulging in unlawful activities, Contractor shall immediately comply with such instructions.

3.10 It will be the responsibility of contractor to ensure that their personnel behave in a proper manners and behavior.

4.0 NUISANCE:

The contractor shall at any time not do or permit any nuisance in area of work in JAMIA HAMDARD premises, or do anything which shall cause unnecessary disturbance or inconvenience to JAMIA HAMDARD officials or occupants of other properties near the work area and to the public in general.

5.0 SCOPE OF SUPPLY

All materials, manpower, equipments and consumables shall be in the scope of supply of contractor and the quoted rates shall be inclusive of all necessary input to complete the job. Working drawings/Approved for Construction Drawings will be supplied to the contractor by the EIC after award of the contract. If for any item, specific drawing/shop drawing is required, the contractor has to make arrangement at his own cost to provide the same within 03 (three)days for approval of EIC, necessary changes/suggestions in the drawings as deemed fit by EIC is to be made by the contractor. No extra cost will be paid to the contractor on this account.

6.0 WATER & POWER SUPPLY

Electricity: Temporary Electric Connection if required will be supplied by the Jamia Hamdard. The necessary cabling and metering etc. will be done by the contractor at his own cost. He shall be pay for the consumption at the prevailing rates of charges as per bills of Jamia Hamdard.

Water: Contractor to make their own arrangement of potable water for execution of work and drinking of labours by or arrange from outside at their own cost. The Contractor will ensure by Laboratory test that water is fit for construction and drinking purpose, if required.

7.0 VETTING OF STEEL STRUCTURE:

The contractor, on his own cost, shall provide the vetting/certification of the steel structure from a registered Structural Engineer in coordination with the Architect.

EXTRA ITEMS/SUBSTITUTED ITEMS

The rates for extra items/substituted items of work, ordered to be operated/executed shall be derived as under:

a) If the item of work is similar to the item for which, the bidder has quoted rates in schedule of rates the quoted rate shall be applicable.

b) If the rate for the item does not appear in the schedule of rates quoted by the bidder, the rate shall be derived from similar items of work.

c) If the rate for the item does not appear in the schedule of rates quoted by the bidder, EIC may derive the rate from JAMIA HAMDARD's standard SOR and payment shall be done accordingly.

d) The rates for those items of work which cannot be derived from quoted rates in the schedule of rates or from standard SOR of JAMIA HAMDARD, shall be derived from the prevailing market rates of material and labour plus 15% towards contractor's overheads and profits. The opinion of the Engineer in charge as to the current market rates for materials and the quantum of labour and material involved per unit shall be final and binding on the contractor. For this purpose and for the purpose of sub-clause (c) above, the coefficient of

labour, material and wastage shall be adopted from the CPWD analysis of rates/standard schedule of rates as decided by the Engineer in charge. The contractor shall submit vouchers /quotations in proof of rates paid /likely to be paid for material and labour.

Above provisions for derivation of rates of extra items/substituted items shall supersede the provisions indicated in GCC.

8.0 VALIDITY

Validity of quotation shall remain valid for acceptance for a period of 3 (Three) months from the date of opening of the tender.

9.0 DEFECT LIABILITY PERIOD

The bidder shall guarantee all the work executed by him for a period of **12 months** from the date of completion of work. If during this period any defect occur, the same shall be made good by the contractor at his own cost. Failure to comply with this requirement may result in the forfeiture of security deposit.

However, in case of critical items, if the guarantee period is beyond defect liability period, then guarantee shall applicable for that period also.

10.0 INSPECTION OF THE WORK

The work is subject to inspection at all times by the Engineer-In-Charge. The Contractor shall carry out all instructions given during inspection and shall ensure that the work is being carried out according to the technical specifications of this tender. The technical documents, specifications, work procedure, working drawings, relevant codes of practice etc shall also be provided to the contractor as and when required during the execution/performance of the work. The contractor is bound to follow all the technical documents, specifications, work procedure, working drawings, relevant codes of practice etc provided by Engineer In Charge.

The contractor shall take the prior approval of all the materials to be used in this contract.

The contractor shall engage approved expert agencies for carrying take the job of furniture, storage, curtains etc., necessary approval for the same is to be obtained from EIC before carrying out the job. If any approved agency engaged by the contractor is felt unfit for carrying out the quality job at a later stage by the EIC, the same is to be immediately removed from the site and new agency is to be deployed by the contractor after getting the approval for the same.

11.0 SECURITY

The contractor shall have total responsibility for all equipment and materials in his custody, stores, loose, semi-assembled and/or erected by him at site. All materials of the contract shall enter or leave the site only with the written permission of Engineer-in-Charge.

12.0 VARIATION:

During execution of item/work variation in individual quantities may be up to any limit (plus and minus) as per the site requirement.

Nothing extra will be paid to the contractor on this account.

13.0 MOBILISATION ADVANCE

No payment for mobilization advance shall be made in this contract.

14.0 SECURED ADVANCE ON MATERIALS

No payment for secured advance against the supply of the material to be used at site for this work shall be made in this contract.

15.0 PRICE REDUCTION SCHEDULE

15.1 Time is the essence of the CONTRACT. In case the CONTRACTOR fails to complete the entire WORK within the stipulated period, then, unless such failure is due to Force Majeure as defined in GCC or due to Employer's defaults, the Total Contract price shall be reduced by 0.5% of the total Contract Price per complete week of delay or part thereof subject to a maximum of 5% of the Total Contract Price, by way of reduction in price for delay and not as penalty. The said amount will be recovered from amount due to the Contractor/Contractor's Contract Performance Security payable on demand. The decision of the ENGINEER-IN-CHARGE in regard to applicability of Price Reduction Schedule shall be final and binding on the CONTRACTOR.

15.2 All sums payable under this clause is the reduction in price due to delay in completion period at the above agreed rate.

16.0 ARBITRATION

All disputes or difference, whatsoever, arising between the parties hereto pertaining to any part of the contract including its execution or concerning the WORKS or maintenance thereof this CONTRACT or to the rights or to liabilities or the construction meaning operation or effect thereof or to the rights or liabilities of the parties or arising out or in relation thereto whether during or after completion of the CONTRACT or whether before or after determination, foreclosure or breach of the CONTRACT (other than those in respect of which the decision of any person is by the CONTRACT expressed to be final and binding)shall after written notice by either party to the CONTRACT to the other of them and to the Appointing Authority hereinafter be referred for adjudication to a sole arbitrator to be appointed as herein after provided. For the purpose of appointing the Sole Arbitrator referred to above, the appointing authority will send within thirty days of receipt of the notice, to the CONTRACTOR a panel of three name persons who shall all the presently unconnected with the organization for which the WORK is executed. The CONTRACTOR shall on receipt of the names as aforesaid, select any one of the persons named to be appointed as a sole Arbitrator and communicate his name to the Appointing Authority within thirty days of receipt of names. The Appointing Authority shall thereupon without any delay appoint the said person as the sole Arbitrator. If the CONTRACTOR fails to communicate such selection and appoint the selected person as the Sole Arbitrator.

If the Appointing Authority fails to send to the CONTRACTOR the panel of three names of persons who shall all be unconnected with either party, the Appointing Authority shall on receipt of the names as aforesaid select any one of the persons named and appoint him as the sole arbitrator. If the Appointing Authority fails to select the person and appoint him as the sole Arbitrator within 30 days of receipt of the panel and inform the CONTRACTOR accordingly, the CONTRACTOR shall be entitled to appoint one of the persons from the panel as the sole Arbitrator and communicate his name to the appointing Authority. If the Arbitrator so appointed is unable to or unwilling to act or resigns his appoint mentor vacates his office due to any reason whatsoever, anther sole Arbitrator shall be appointed as a foresaid. The WORK under the CONTRACT shall, however continue during the arbitration proceedings and no payment due or payable to the CONTRACTOR shall be withheld on account of such proceedings. The Arbitrator may, from time to time, with the consent of the parties, enlarge the time for making and publishing the award.

The venue of arbitration shall be New Delhi.

The fees, if any, of the Arbitrator shall, if required to be paid before the award is made and published, be paid half and half by each of the parities. The costs of the reference and of the award including the fees if any, of the Arbitrator shall be in the discretion of the Arbitrator who may direct to and by whom and in what manner, such costs or any part thereof shall be paid and may fix or settle the amount of costs to be so paid. Subject to aforesaid the provisions of the Indian Arbitration and Conciliation Act, 1996 or any statutory modification or re-enactment thereof and the rules made there under, and for the time being in force, shall apply to the arbitration proceeding under this clause.

17.0 JURISDICTION

The CONTRACT shall be governed by and constructed according to the laws in force in INDIA. The CONTRACTOR hereby submits to the jurisdiction of the courts situated at DELHI for the purpose of disputes, actions and proceedings arising out of the CONTRACT, the court at Delhi only will have the jurisdiction to hear and decide such disputes, actions and proceeding

18.0 CONFIDENTIALITY

18.1 Confidential information shall mean and include all data, documents, papers, data base, correspondence and any other information relating to JAMIA HAMDARD, its business, operation etc.

18.2 The Service Provider shall maintain the confidentiality of all other orders/information and shall neither disclose to anyone nor use the same for any purpose, what so ever without prior written approval of Consultant /JAMIA HAMDARD.

19.0 MONITORING AND REPORTING

Contractor shall submit progress report periodically.

20.0 FAILURE AND TERMINATION CLAUSE

Time and date of delivery shall be the essence of the contract. If the vendor/contractor fail to deliver the entire quantity of materials ordered/ complete the work or a part thereof within the contractual

delivery/ completion period agreed to for such part or total quantity as per the delivery / time schedule or at any time repudiates the contract before the expiry of such period, JAMIA HAMDARD may without prejudice to any other right or remedy available to it recover damages for breach of the contract in any manner stipulated hereunder:-

a) Recover from the vendor/ contractor an agreed amount towards Price Reduction Schedule and not by way of penalty a sum equivalent to 1/2% (half per cent) of the contract price of the whole unit per week for such delay or part thereof (this is a genuine pre-estimate of damages duly agreed by the parties) which the vendor/contractor has failed to deliver within the period fixed for delivery in the schedule, where delivery thereof is accepted after expiry of the aforesaid period. It may be noted that such recovery of PRS may be up to 5% of the contract price / of the total quantity of items of materials / equipment which the contractor has failed to deliver within the period fixed for delivery;

Or

b) Purchase or authorise the purchase elsewhere on the account and at the risk of the contractor, of the materials not so delivered or others of a similar description, by serving prior notice to the contractor / supplier without canceling the contract in respect of the installment not yet due for delivery;

Or

c) Cancel the contract or a portion thereof by serving prior notice to the contractor and if so desired, purchase or authorise the purchase of the materials not so delivered or others of a similar description (where such materials exactly complying with particulars are not, in the opinion of the purchaser, which shall be final, readily procurable) at the risk and cost of the contractor. If the contractor had defaulted in the performance of the original contract, the purchaser shall have the right to ignore his tender for risk purchases even through the lowest. Where the contract is terminated at the risk and cost of the firm under the provisions of this clause, if shall be solely up to the purchaser to exercise his discretion to collect or not, the security deposit from the firm, on whom the contract is placed, at the risk and expense of the defaulting firm.

d) Where action is taken under sub-clause (b) or sub-clause(c) above, the contractor shall be liable for any loss which the purchaser may sustain on that account, provided the purchase or if there is an agreement to purchase, such agreement is made, in case of failure to deliver the materials within six months from the date of such failure and incase repudiation of the contract within six months from the date of cancellation of contract. The contractor shall not be entitled to any gain on such purchase and the manner and method of such purchase shall be at the entire discretion of the purchaser. It shall be necessary for the purchaser to give a notice of such purchase on the contractor.

e) It may further be noted that clause (a) above provides for recovery of PRS on the cost of contact price of delayed supplies (whole unit) at the rate of 1/2% (half per cent) of the contract price of the whole unit per week for such delay or part thereof up to a ceiling of 5% of the contract price of delayed supplies thus accrued will be recovered by the paying authorities of the purchaser specified in the supply order, from the bill for payment of the cost of the material submitted by the vendor/ contractor in accordance with terms of supply order, or otherwise.]

f) Notwithstanding any thing stated above equipment and materials will be deemed to have been delivered only when all its components, parts are also delivered. If certain components are not delivered in time the equipment and material will be considered as delayed until such time all the missing parts are also delivered.

21.0 DELETION OF WORK

If during the execution of work it is decided to omit/ delete any or part of items wholly or partly or both, the financial implication shall be worked out by the contractor as per stipulations in the tender document elsewhere & to be approved by JAMIA HAMDARD.

22.0 ESCALATION:

The prices offered by the bidder shall be firm throughout the currency of the Contract and are not subject to escalation due to any reason whatsoever may be.

23.0 JOB TO BE DONE ON RISK AND COST

Failing to comply with the specified jobs by the contractor as per the scope of the work. EIC shall be empowered to get the same completed through another party on risk and cost of the contractor, after necessary notice to the contractor in writing. The amount incurred on this account shall be recovered from the due payments/ bills of the contractor.

24.0 PERMISSION FOR WORKING IN NIGHT/HOLIDAY

Since proposed site is situated in a running office, contractor shall have to take prior permission from the JAMIA HAMDARD to work in night and/or on govt. holiday/Sunday. Without prior permission contractor's labourers will not be allowed to work in night/holiday.

While execution it should be taken care that no noise or hindrance effect working of persons at other floors. In case of some hindrance deemed to be happen then prior permission of the same shall be taken from JAMIA HAMDARD and it should be intimidated to persons/floor with proper channel.

25.0 COMPLIANCE WITH LABOUR/INDUSTRIAL LAWS

The contractor is responsible for compliance of the points given below under this contract:

a) The contractor is required to obtain labor license under the provisions of Contract Labor (R &A) Act, 1970.

b) The contractor shall have its own PF code no. with the RPFC as required under employee PF & Miscellaneous Provisions Act, 1952.

c) The contractor shall submit the proof of depositing the employee's as well as Employer's PF contribution with RPFC.

d) The contractor shall have an independent ESIC code

e) The contractor shall ensure the regular supervision and control by the contractor himself or by his authorized representative on the personnel deployed by him for JAMIA HAMDARD's work and necessary direction should flow from the contractor to his workforce for undertaking the contractual obligations.

f) It shall be the sole liability of the contractor (including the contracting firm/ company) to obtain and to abide by all necessary licenses/ permissions from the concerned authorities as provided under the various labour legislations including the labour license obtained as per the provisions of the contract labour (Regulation & Abolition) Act 1970.

g) The contractor shall discharge obligations as provided under various statutory enactments including the employees provident fund and Miscellaneous Provisions Act, 1952., the employees state Insurance (ESI) Act, 1948, the Contract Labor (R&A) Act, 1970, the inter-state Migrant workmen (Regulation of employment & conditions of service) Act, 1979, Minimum Wages Act, 1948, Payment of Wages Act, 1936, Workman Compensation Act, 1923 and other relevant acts, rules and regulations enforced from time to time.

h) The contractor shall be responsible for required contributions towards P.F. pension, ESI or any other statutory payments to be made in respect of the contract and the personnel employed for rendering service to JAMIA HAMDARD and shall deposit these amounts on or before the prescribed dates. The contractor shall submit the proof of depositing the employee's and Employer's contributions. The contractor shall also be responsible to pay any administrative/ inspection charges thereof, wherever applicable, in respect of the personnel employed by him for the work of JAMIA HAMDARD.

i) The contractor shall regularly submit all relevant records/ documents to JAMIA HAMDARD representative for verification and upon such satisfaction only, JAMIA HAMDARD will allow reimbursement of the amounts paid.

j) The contractor shall be solely responsible for the payment of wages and other dues to the personnel deployed by him latest by 7th day of the subsequent month. The contractor shall be directly responsible and indemnify the company against all charges, dues, claims, etc, arising out of the disputes relating to the dues and employment of personnel deployed by him.

k) The contractor shall indemnify JAMIA HAMDARD against all losses or damages, if any, caused to it on account of acts of the personnel, if any, deployed by him.

l) The contractor shall ensure regular and effective supervision and control of the personnel, if any, deployed by him and gives suitable direction for undertaking the contractual obligations.

26.0 SPECIAL NOTE TO TENDERERS

While quoting the rates in the tender by the bidder they should consider all the provisions of the tender including statuary requirement prevailing during the course of the contract

TECHNICAL SPECIFICATIONS:

Dismantling, Civil, Plumbing, Interior, Fittings, Finishes, Electrical, etc.

In case of any arbitration, disputes or difference whatsoever arises related to scope of work, specifications, mode of measurements or any other information that may not be available in this scope of work then CPWD specifications and/or relevant Indian Standards (IS codes) shall be referred.

General Conditions:

1.All Materials brought on site of works and meant to be used in the same shall be the best of their respective kinds and to the approval to the EIC.

2.Samples of all materials shall be got approved by the EIC and shall be deposited with him before the order for the material is placed with the suppliers. The material brought on the works shall confirm in every respects with approved samples.

3.The contractors shall check each fresh consignment of materials as it is brought on the site of the works, to see that they confirm in all respects to the satisfactions and/or samples approved by the EIC.

4.The EIC will have the option to have any of, the materials tested to find whether they are in accordance with the satisfaction and the contractor will bear all expenses in that connection. All bills, vouchers and test certificates which, in the opinion of the EIC or the representative, as necessary to convince him as to the quality of the materials of their suitability shall be produced for his inspection on requisition Testing charges, if any shall have to be borne by the contractor.

5.Any material that have not been found to confirm to the specification will be rejected forthwith and shall be removed from the site by the contractors within 48 hours at their own cost.

6.The EIC shall have power to cause the contractors to purchase and use such materials, from any particular source, as may in his opinion be necessary for the proper execution of the work.

7.Workmanship: All works shall be to level plumb and square comers, edges and arises in all cases shall be unbroken and finished neat.

8.Skilled labour for the respective trades shall employed by the contractors to check to the work in progress and to instruct and extract the right kind of workmanship from the men employed on the works, Instructions given to such miseries by the architect or his representative shall be carried out with a view to get the work executed in a neat and workman like manner according to these specification.

9.The EIC may order the inspection of any finished work as he chooses and in a manner he decides, and the contractors shall bear all expenses in the connection. If the results of such inspection prove that the workmanship is not of the standard required, the work will be rejected and removed forthwith and he replaced by works of the accepted standard of quality.

A. LGSF WORK

Designing, preparation of drawings, Fabrication, Supply & erection Light Gauge Framing System (LGFS) cold form structure system comprising C-frame in size 89mm x 41mm x 1.2/0.95mm thick for load bearing and non-load bearing walls consist Hi-tensile Bare Galvalume steel (AZ150 gsm/ 550 MPA yield strength) or Hi-tensile Pre-Galvanized steel coils (Z-275 gsm Zinc coating mass both sides/ 550 MPA Yield strength) for all internal, external walls and trusses. The framing section shall be C type having (89mm depth x 41 mm flange x 11 lip) in required length as per site condition with pre-punched dimple/slot at required location as per manufacture approved drawings at various locations. The frame shall be supplied in knock down condition at site and fixed by mean of wafer head galvanised steel screws 4mm. The LGFS Frame structure shall be fixed to Plinth beam using hold on steel expanded fasteners. The work is including the cost of shuttering/ scaffolding/safety net/harness etc required for necessary completion of the works and barricading at site with MS. Sheets all around and not be paid separately.

Vertical member shall be supported maximum 600mm c/c and horizontally frame at 800mm max. All framing shall be factory finished with service hole of 30mm round dia at 3 different levels to run conduits. Frame opening provision shall be made with- in the dry wall system as per approved architectural door and window schedule

B. CIVIL WORK

1. CONCRETE AND MORTARS

INDIAN STANDARDS

All relevant Standards as specified elsewhere in this Volume are applicable.

Indian Standards to be followed are:

(1)	IS 269	Specification for Ordinary and low heat, Portland cement.
(2)	IS 383	Specification for Coarse and fine aggregates from natural Sources for concrete.
(3)	IS 456	Code of practice for plain and reinforced concrete.
(4)	IS 460 (Part I, II &III)	Specification for test sieves: i) Wire doth test service ii) Perforated plate lest sieve iii) Method of examination of test sieve
(5)	IS 516	Method of test for strength of concrete
(6)	IS 1199	Method of Sampling and analysis of concrete.

(7)	IS 1489	Specification for Portland pozzolana cement
(8)	IS 1542	Specification for Sand for plaster
(9)	IS 2116	Specification for Sand for masonry mortars
(10)	IS 2386 (Part I, II, & III)	Method of tea for aggregate concrete. i) Particle size and shape ii) Estimation of deleterious materials and organic impurities iii) Specific gravity, density, voids, absorption and bulking
(11)	IS 2646	Specification for Integral cement water proofing compound.
(12)	IS 3025	Methods of Sampling and test (Physical and Chemical for Water used in Industry
(13)	IS 3068	Specification for Broken brick (burnt clay) coarse Aggregate for use in lime concrete
(14)	IS 4031 (Part i to xii)	Method of Physical test for hydraulic cement
(15)	IS 4032	Method of chemical analysis for hydraulic cement.
(16)	IS 6452	Specification for high Alumina cement for structure use
(17)	IS 6909	Specification for super sulphated weather
(18)	IS 7861	Code of practice for extreme weather concreting i) Recommended practice for hot weather concreting ii) Recommended practice for cold weather concreting
(19)	IS 8041	Specification for Rapid hardening Portland cement,
(20)	IS 8112	Specification for high strength ordinary port land cement.
(21)	IS 9103	Specification for admixture for concrete
(22)	IS 11433	Specification for one part gun grade i) Poly sulphate based joint sealant: general requirements.
(23)	IS 12118(part l)	Specification for two parts poly sulphide based sealant:

		General requirements.
(24)	SP 23	Handbook on concrete mix
(25)	SP 24	Explanatory handbook on Indian Standards code for plain And reinforced concrete (IS 456)
(26)	SP 27	Handbook of method of measurement of building works.

3.1 MATERIALS

3.1.1 CEMENT

i) Cement shall be Ordinary Portland Cement (OPC) conforming to IS 269 for all purpose.

It shall be received in bags of 50 kg and each batch shall be accompanied with a test certificate of the factory. Also it shall e tested before use to ascertain its strength, setting time, etc. In no case cement has been stored over -4 -weeks shall be used unless tested as per the direction of the Bank/Architect/PMC prior to use in the works.

ii) Cement shall be stored in such locations so as to prevent deterioration due to moisture dampness. A dry and water proof shed shall be best suited for this. Bags shall be stacked on rigid water-proof platforms about 15 to 20 cm clear above the floors and 25 to 35 cm dear or away from the surrounding walls. A maximum high stack of 12 bags is permitted Stacks shall be so arranged that the first batches are used first, and (FIFO) that they permit easy access for inspection and handling.

iii) The following other types of cement may be used in works if specified or with prior approval of the Bank/Architect/PMC in writing purpose. Specialist literature shall be consulted for guidance regarding use of these types of cement.

Rapid hardening Portland cements conforming to IS 8041.

Portland Pozzolana Cement (PPC) conforming to IS 1489-Part-1

High strength Ordinary Portland Cement conforming to IS 8112.

High alumina cements conforming to IS 6452.

Super sulphated cement conforming to IS 6909.

3.1.2 COARSE AGGREGATE

i) Coarse aggregate shall be obtained from natural sources such as stone, gravel etc, crushed or uncrushed or a combination thereof from approved quarried. Aggregate shall be hard, strong, dense, durable, clean and free from veins and adherent

coating. It shall be free from soft, feeble, thin, elongated or laminated pieces and shall be roughly cubical in shape. It shall consist of coarse material most of which is retained on 4.75 mm IS sieve

ii) Coarse aggregate shall not contain any harmful material such as iron, pyrites, coal, mica shale or similar laminated material neither shall it contain clay, alkali, soft fragments, sea shells, organic impurities etc. in such quantities that adversely affects the strength and durability of the concrete. In addition to the above, in reinforced concrete the aggregate shall not contain any material, which might attack the reinforcement. The maximum quantities of deleterious materials in the coarse aggregate when determined in accordance with IS 2386 Part I and Part II "Method of test for aggregates for concrete' shall not exceed the limits laid down in table 1 of Annexure.

iii) Aggregate crushing value, impact value, abrasion value and soundness of aggregate shall respectively be in accordance with Para 3.3, 3.4, 3.5 and 3.6 of IS 383.

iv) Grading of coarse aggregate shall be in conformity with the requirements laid down in IS 383. See Table 2 and Table 3 of Annexure.

v) Source of aggregate shall be from an approved Government location. It shall be tested prior to the approval of the Architect from an approved testing laboratory. In case available aggregates do not meet certain requirements of IS 383 or any other specification, required processing shall be carried out by the contractor at his cost. No extra cost towards these processes, treatment or combination of both shall be paid, it shall be the duty of the contractor to make sure that aggregate material received by him is from Government approve quarries and with fully paid royalties, taxes, duties etc. as may be in force from time to time for respective locations.

vi) Aggregates shall be stored in such a way that it does not get mixed with mud, grass vegetables and other foreign matter. The best way is to have a hard surface platform made out of concrete, bricks or planks. It should be to the approval of the Architect.

vii) Coarse aggregate shall have a minimum specific gravity of 2.6 (Saturated surface dry basis). Aggregate below this specific gravity shall not be used without the special permission of the Architect.

viii) One a specific source of supply of coarse aggregate is approved; the source shall not be changed without the prior approval of the Architect.

3.1.3 FINE AGGREGATE

i) Natural sand deposited by stream or glacial agencies as a result of disintegration of rock is the best form of fine aggregate. The fine aggregate shall confirm to following standards.

i. For plain and reinforced concrete: IS 383 Specification for coarse and fine aggregates from natural sources for concrete.

ii. Mortar and grout : IS 2116 Specification for sand for masonry mortars.

iii. For plastering : IS 1542 Specification for sand for plaster (Class A grading)

3.1.3.1

i) Some times it is obtained from crushed stone screening but often contains a high percentage of dust and clay. It tends to be flaky and angular. This type produces harsh concrete and should be avoided.

ii) Sea sand should not be used unless approved by the Architect. If approved, the required treatment shall be done at the contractor's cost.

3.1.3.2 Sand shall be hard, durable, clean and free from adherent coatings and organic matter and shall not contain any appreciable amount of clay. Sand shall not contain harmful impurities such as iron, pyrites, coal particles, lignite, mica shale or similar laminated material, alkali, and organic impurities in such form or quantities as to affect the strength of durability of concrete or mortar. Also it should not contain any material liable to attack the steel reinforcement.

i) When tested as per IS 2386 Part I and Part II, fine aggregate shall not exceed permissible quantities of deleterious materials as given in table 1 of Annexure.

ii) Fine aggregate shall be thoroughly washed at site with clean fresh water such that the percentage of all deleterious materials is within the permissible limits laid down.

3.1.3.3 Grading of fine aggregate shall conform to IS and shall fall within limits of one of the four zones given in table 4 of IS 383 and of Annexure.

3.1.3.4 Damp and moist sand increases the volume and is called bulking. Due allowance is to be made while preparing the mixes based on volume measurements. It shall be determined as per IS 2386 Part III Appendix A- For rough guidance table 5 of Annexure gives the relation between moisture content and percentage of bulking.

3.1.3.5 Storing of aggregate shall be as given in clause 2.2.6.

3.1.4 WATER

i) Water used for mixing and curing shall be clean, reasonably clear and free from objectionable quantities of silt, oils, alkalies, acids, slats so as not to weaken mortar, or concrete or cause efflorescence or attach the steet in RCC while curing. It shall be free of elements, which significantly affects the hydration reaction or otherwise interferes with hardening of concrete during curing or those elements, which

produced objectionable stains or deposits. Potable water is generally satisfactory but is shall be tested prior to use in the works.

ii) Water tested shall be in accordance with IS 3025. Maximum permissible limits of deleterious materials in water as given in IS 456 are reproduced for ready reference in table 6 of Annexure.

iii) Suitability of water shall be ascertained by the compressive strength and initial setting time test as specified under:

a) Average 28 days compressive strength of at least three 15 cm concrete cubes prepared with water proposed to be used shall not be less than 90% of the average strength of three similar concrete cubes prepared with distilled water. Preparation and testing in accordance of IS 516.

b) The initial setting time of tests blocks made with proposed cement and water to be used shall not be less than 30 minutes and shall not differ by ± 30 minutes from the initial setting time o f control test block prepared with the same cement and distilled water Preparation and testing of block shall be in accordance with IS 4031 iv) The PH value of water shall not be less than 6 and more than 9

v) Water storage tanks shall be such as to prevent any deleterious materials getting mixed with it.

vi) Water shall be tested and approved in writing by the Bank/Architect/PMC prior to use in the works.

vii) Sea Water

Seawater in concrete shall not be permitted unless specifically approved in writing by the Bank/Architect/PMC for purpose stated. The Bank/Architect/PMC under unavoidable circumstances may allow mixing or curing of seawater in concrete construction, which are permanently under seawater.

3.1.5 ADMIXTURE

i) These are substances other than cement, aggregate and water and shall be permitted to be used to modify the properties of concrete for single or a combination of purposes. This shall be used only on the written approved for specific purpose and at the cost of the contractor. Good concrete shall be achieved without the aid of any admixtures.

ii) Admixtures should be free from chlorides and sulphate, which might affect concrete or any other material which may cause problems to the concrete in the due course of time. Also it should have no effect on the reinforcement in case of Reinforced Cement Concrete.

iii) Admixtures generally in use are classified as under

a) Accelerators

b) Retarders

c) Workability agents

d) Water -repelling agents

e) Air-entraining agents

f) Gas-forming agents.

These are manufactured and sold by various companies under brand names. The contractor proposing to use any of them shall submit to the Architect technical literature with its chemical composition, purpose of use and method recommended by the manufacturer and what he proposes to follow at site for strict control,

iv) The contractor's proposal shall accompany the following with his request to use admixture.

a) The trade name of the admixture, its source and the manufacturer's recommended method of use.

b) Typical dosage rates and the possible detrimental effects of under and over-dosage.

c) Whether the admixture contains chloride in any free form or any other chemical present as an active ingredient, which is a likely cause of corrosion of reinforcement or deterioration of concrete

d) The average expected air content of freshly mixed concrete containing an admixture, which causes air to be entrained when used at the manufacturer's recommended rate of dosage.

3.2 CONCRETE

Concrete is prepared by mixing graded aggregate stone along with cement, in a specified proportion. Mixing shall be done by a mechanical mixer. Manual hand mixing shall be permitted in specific cases with the written permission of the Architect on account of small quantity or location or any other reason acceptable to the Architect.

3.2.1 CEMENT CONCRETE

This shall be classified as plain cement concrete or reinforced cement concrete. Plain cement concrete shall be in leveling course under foundations, floors, copings etc. and shall include form work as part of the work-Reinforced cement concrete shall be at all locations and

comprises form work, reinforcement and concrete Payment of reinforced cement concrete may be composite or item wise as specified in the BOQ.

3.2.1. Concrete shall be classified its compressive strength at the 28th day. The concrete grades shall be as designated in table 2 of IS 456:2000 and are given as ready reference in table -7- of Annexure.

3.2.2. BOQ shall specify various types of concrete aimed to be used in works. It shall be the responsibility of the contractor to carry out design mixes and approval of the same shall be obtained from the Architect at least 35 days in advance from the actual pouring of concrete at site in the permanent works. The basic aim of mix design shall be to find the most economic proportion of cement, aggregates and water which will give the desired strength of concrete, proper workability and durability. Also it is important that the mix should be easily worked with the help of equipment available at site. The operations involved at site are, measurement of materials, their mixing, placing, compacting, finishing required and curing. The design shall be carried out strictly to IS specifications and IS code practice 456, SP 23 and SP 24

Further the contractor should ensure that the minimum cement content per cubic meter of reinforced concrete should not be less than that stipulated in table 23, 24, 25 and 26 of SP 23. For ready reference refer table 8 and 9of Annexure, but the BOQ shall specify minimum cement content for each item.

3.2.3. For expected strength of cubes tested on the 28"1 day the design mix at preliminary test and work site shall be as per table 10 of Annexure. The water cement ratio shall be 0.5 to 0.52. Additional water may be permitted only at the discretion of the Structural Engineer The slump shall be 25 mm to 35 mm depending upon the location and type of work Higher slump with use of plasticizers shall be permitted

3.2.4. Design mix and trial mixes

3.2.4.1.As stated above in clause 3-1.2 the contractor shall submit, at least 5 weeks in advance, to the Architect the mix design that the proposes to use at site. The mix design shall also give basic details (when tested according to IS 1199 and IS 2386 - Part III, 1963) such as,

a) Slump

b) Bleeding

c) Compacting factor

d) Vee-Bee time

e) Cement required for one cubic meter of concrete.

3.2.4.2 On receipt of this, the Architect may immediately order to carry out work site test before the final approval. This shall be done with mixer and materials actually being used at site.

This shall give the contractor additional chance to check for himself actual workability and make sure that the mix proposed by him will be fully satisfactory with regards to slump, segregation, bleeding, water -cement ratio and workability.

5 cubes shall be taken from each of the 3 batches to test the mix. Cubes shall be cast, stored, cured, transported and tested to IS 516. The test may be carried out at site or laboratory as approved by the Architect.

Trial mixes shall be approved provided that average strength of 3 consecutive cubes is not less than that specified and that one out of three may give a value less than specified but limited to a maximum of 90% of the specified strength.

3.2.4.3. In case the trial mix falls below the above criteria, the Architect shall order fresh trial mixes to be made as before, until the desired strength is arrived at.

3.2.4.4. This design mix and trial mix hold good so long as the materials continue to be of the same quality and from the same sources. For any change, the Architect may order fresh design mix and trial mixes to be carried out before the same is used at site.

3.2.4.5. It is the responsibility of the contractor to prepare and get the cubes tested and to provide all the material, labour, moulds, equipment, casting and curing facility, charges for testing etc.

Further, the contractor shall have to provide and maintain all the equipment and staff at the site throughout to cany out the following tests in a small laboratory or get these tests from approved laboratories without extra cost to the contract.

a) Slump

b) Grading of coarse and fine aggregates.

c) Silt content of sand.

d) Moisture content of coarse and fine aggregates.

e) Slump test of concrete.

f) Concrete cube test.

The contractor shall maintain full records of all above tests in a register.

The format of records shall be prepared in consultation with the Architect and either he or his representative shall have full access to the contractor's laboratory.

The contractor shall include charges for the above work in his rates and no extra whatsoever shall be admissible on this account of designing, testing maintaining laboratory etc.

3.3 Concrete Mix

1 READY MIX CONCRETE (RMC)

1.1 CEMENT

1.1.1. The type of cement used for this work shall be **Ordinary Portland Cement (OPC)** only.

1.1.2. Cement shall be used in the order in which it is received. Cement in bags in storage for more than -3- months shall be re-tested before use.

Aggregates: Used for concrete shall be in accordance with the requirements of IS 456.Ref. IS 4926:2003 R.M.C .code of practice clause 4.4

1.1.3. TESTING:-

A sample taken once for every 1000 bags shall be tested. Tests shall be carried out for Fineness, initial and final setting time, compressive strength (IS: 4031) and the results approved by the Engineer, before use of the cement in permanent works. Samples shall be taken immediately on receipt of cement at site. The methods and procedure of sampling shall be in accordance with IS: 35S55

1.1.4 The Engineer may specify other forms of sampling and tests including chemical analysis (IS. 4032). If in his opinion the cement is of doubtful quality, the costs of such additional tests shall be bome by the contractors.

1.2. MIXERS AND VIBRATORS:-

1.2.1. For all structural concrete work the contractor shall provide platform types of weighing machinery of a capacity not less than 200 kg.

1.2.2. The contractor shall provide concrete mixers (!S:l79l)-Batch type concrete mixers (ls>2439)-roller APN mixer and vibrators (IS :2505)-concrete vibrators Immersion type (IS:20506) - screed-board concrete-vibrators(IS 250) - screed board concert vibrators (IS :4656)-form-vibrators for concrete supplied by recognized manufacturers.

1.3 CONVEYING:

Concrete shall be conveyed from mixer to forms as rapidly as practicable by methods which will prevent segregation and/or loss of ingredients. In case such segregation occurs invade concrete shall be remarked before being placed in final position. 11 shall be deposited in final position as early as practicable, but always within a period of 30 minutes after mixing. When initial set has taken place in Concrete before it is placed in final position, such concrete shall be rejected and taken away from the site to a distance and disposed off as ordered by the Engineer's Representative.

1.4 GRADE OF CONCRETE:

The Concrete is designated as M-15, M-20, M-25, M-30. The letter M refers to the Mix and the number represents the characteristic compressive strength in mpa (Mega Pascal's). Minimum content of cement as per table 5 of IS 456; 2000

1.5. TRIAL MIXES:

1.5.1. The Contractor is entirely responsible for the design of Concrete mixes. The designs however to be approved by the Architect at least B weeks before commencing any concreting in the works and which have been tested in an approved laboratory. A dean dry mixer shall be used and the first batch discarded.

1.5.2. The required average strengths of different grades of concrete at 28 days, for which the mixes shall be designed, are specified below:

Grade Concrete	Characteristic strength at 28 days (mpa)	Target Mean Strength at 7^{th} day(mpa)	F' cm (Mpa) at 28 days
M15	15	18	24
M25	20	21	29
M25	25	23	24
M30	30	26	39
M35	35	31	44
M40	40	36	49
M45	45	40	54

The mixes are designed to yield mean strengths (F'cm) greater than the corresponding specified characteristic strengths (F' ck) as indicated in above table. The difference between F'cm and F'ck is called the current Margin. The value of the cur margin has been set at 9 Mpa for all grades of concrete. The concrete mixes shall be designed on the basis of required strength, desired workability, the maximum size of aggregate and also upon the various grades of cements as specified in IS 10262-1982. Accordingly the required cement content shall be ascertained. The Contractor may be allowed to use either 7proved plasticizers or increased cement content to achieve the required strengths at his own cost.

1.5 3 for each grade a total of 18 cubes shall be made. Of these 18 cubes made, not more than 6 may be made on any day and further of the 6 cubes made in one day, not more than 2 cubes, each representing a different batch of concrete shall be tested at the age of -7 - of 28 days. The making of the cubes, their curing, storing, transporting and testing shall be in accordance with Indian Standards IS. 516. The test shall be carried out in a laboratory approved by the Architect.

1.5.4. If the average strength of the concrete cubes falls below the required strength, fresh preliminary mixes for that grade shall be made as before, until the trial mixes yield cubes of compressive strength at 28 days greater than the required average strength at that age.

1.5.5. Whenever there is a significant change in the quality of any of the ingredients for concrete, the Architect may at his discretion, order the carrying out of fresh trial mixes. All costs for

trial mixes and tests shall be to the Contractor's account and held to be included in the contract rates,

1.5.6. Before commencing the work, the contractor shall submit to the Architect for approval full details of all preliminary trial mixes and tests.

1.5.7. When the proportions of a concrete mix have been approved by the Architect, the Contractor shall not vary the quality or source of the material or the mix without written approval of the Architect.

1.6 CONCRETE CUBE TEST:

Quality of hardened concrete will be certified by the following procedures

1.6,1. The Engineer or his representative shall select random batches of concrete for examination without warning the Contractor and sampling will generally be done at point of discharge from the mixer.

1.6.2. Rom the batches thus selected, 6 concrete cubes shall be made from any single batch, of these. 6 cubes may be made from any single batch. Of these 6 cubes thus made, 3 cubes (each cube representing Concrete of different batches) shall be tested at 7 days and the remaining 3 cubes shall be tested at 28 days.

1.6.3. All cubes shall be made, cured, stored, transported and tested in accordance with Indian standards. The tests shall be carried out in a laboratory approved by the Engineer.

1.6.4. At least 6 cubes shall be made on each days concreting until 60 cubes have been made for each grade of concrete. This is lie initial period.

1.6.5 After the initial period, subject to the acceptance of the Engineer, the frequency at which the I cubes shall be made may be reduced as follows: 1 set of 6 cubes, on each day's Concreting consisting of.

a) 1 set for every 10 Cum. or part thereof of concrete for critical structural elements like columns, large cantilevers, plus:

b) 1 set for every 40 Cum, or part thereof for all other elements. If concrete is latched at more than one point simultaneously, the above frequency of making cubes shall be followed at each point of batching.

c) Of the cubes if each set shall be tested at 7 days and the remaining 3 cubes shall be tested at 28 days from the day of casting the cubes.

1.7. ACCEPTABILITY CRITERIA:

1.7.1. The strength requirement of any particular grade of concrete will be considered satisfactory if the 28 days compressive strengths of individual sets (each set consists of 3 cubes) and of individual cubes satisfy the following requirements:

1.7.1.1 **FOR THE FIRST FIVE SETS:**

a) The average strength determined from any group of three consecutive test cubes exceeds the specified characteristic strength (f ck) by not less than 0.8.

b) Only one individual cube test result in any set may fall below the specified characteristic strength provided that this value is not less than 95 % of the specified characteristic strength.

1.7.1.2. Provided that the average strength of any fifteen consecutive cubes exceeds the specified characteristic cube strength by at least 0.9 times the current margin. All the subsequent test results may be considered acceptable if.

a) The average strength as determined from any group of three consecutive lest cubes exceeds the specified characteristic strength (V ck) by not less than 0.6 limes the current margin.

b) Only one individual cube test result in any set may fall below the specified characteristic strength provided this value is not less than 90 % of the specified characteristic strength.

1.7.1.3.Whenever a mix is redesigned due to a change in the quality of Aggregate or of cement or for any other reason, it shall be considered a new mix and initially be subject to the acceptability criteria as stated above.

1.7.1.4.The above specification is based on an assumed standard deviation of 5.5 Mps, and a probability of concrete strengths failing below the desired minimum strength of 1 to 20. In case quality control is very good at site and the cube test results consistently show a standard deviation better than the standard deviation assumed here, the Engineer may in his discretion reduce the required target strength fcm for any particular grade of concrete, and in current the current margin.

1.7.1.5.If the concrete produced at site does not satisfy the above strength requirements, the Architect will reserve the right to require the Contractor to improve the methods of batching, the quality of the ingredients and redesign the mix with increased cement content if necessary. The Contractor shall not be claimed any extra cost for the extra cement used for the modifications stipulated by the Engineer for fulfilling the strength requirements specified.

1.7.1 .6.It is the complete responsibility of the Contractor to design the concrete mixes by approved standard methods and to produce the required concrete conforming to specifications and the strength requirements approved by the Engineer. It is expected that the contractor will have competent staff to carry out this work.

1.8. As frequently as the Architect may require, testing shall be carried out in the field for

1. Moisture content of sand

2. Moisture content of Aggregates

3. Silt content of sand.

1.9 FAILURE TO MEET SPECIFIED REQUIREMENTS:

If from the cube-test results it appears that some portion of the works has not attained the required strength, the Architect may order that portion of the structure be subjected to further testing of any kind whatsoever as desired by the Architect including, if so desired by him, full load testing of the suspected as well as adjacent portions of the structure as specified in the Conditions of contract. Such testing shall be at the contractor's cost. If the strength of concrete in any portion of the structure is lower than the required strength, but is considered nevertheless adequate by the Architect so that demolition is not necessary, the Contractor shall be paid a lower rate such lower strength concrete as determined by the Architect.

1.10. As frequently as the Engineer's Representative may require, testing shall be carried out in the field for

1. Moisture content of sand
2. Moisture content of Aggregates
3. Silt content of sand
4. Grading of sand
5. Slump test of concrete
6. Grading of Aggregates
7. Concrete cube test

The Contractor shall provide and maintain at all times, until the works are completed, equipment and staff required for carrying out these tests at his own cost. The Contractor shall grant the Architect or his representative full access to this laboratory at all times and shall produce on demand complete records of all tests carried out on site. Before concreting commences on any section of the works the contractor shall obtain approval of the Architect or his Representative as regards the form and reinforcement confirming with the drawings. He shall also indicate to Architect in writing and obtain his approval for position of construction joints the Architect or his representative's approval shall not relieve the Contractor of any of his obligations to comply with the provisions of this Specification or contract.

1.11. ADMIXTURES**:**

Approved admixtures and air entraining may be permitted by the Engineer at his discretion provided that the strength requirements are not affected by their use. Any cement saving

due to their use will be to the benefit of the EMPLOYER. The admixture will not be paid for separately. (IS 4926: 2003 Ready mix concrete code of practice clause 4.50)

1.12. TRANSPORTING, PLACING, COMPACTING AND CURING:

1.12.1. Transporting, placing, compacting and curing of concrete shall be in accordance with IS: 456. For workability ref to clause 6.2 of IS 4926:2003 RMC code of practice

1.12.2. All rubbish etc. Inside the shuttering and curing of concrete shall be washed out immediately prior to placing of concrete. A layer is placed and separate batches shall follow each other so closely that the succeeding layer shall immediately below have taken initial set. The method of segregation, concreting of any portion or section of the work shall be carried out in one continuous operation and no interruption of concreting work will be allowed without approval of the Engineer or his representative. It should be held in position until air bubbles cease to come to the surface and then slowly withdrawn so that the concrete can flow into the space previously occupied by the vibrator. The vibrator shall not be dragged through the concrete nor used to help heaps of concrete to spread out. It may be used vertically, horizontally or at an angle depending on the nature of the work.

1.12.3. To secure even and dense surfaces free from aggregate pocket, vibration shall be supplemented by tamping or rodding by hand in the comers of forms and along the form surfaces while the concrete is plastic.

1.12.4. A sufficient number of spare vibrators shall be kept readily accessible to the place of deposition of concrete to assure adequate compaction in case of breakdown of those in use.

1.12.5. Form vibrators wt used shall be clamped to the sides of formwork and shall not be fixed more than 450 mm. above the base of the new formwork and concrete shall be filled not higher than 230 mm. above the vibrator. The formwork must be made serially strong and watertight where this type of vibrator is used. Care must be taken to guard against over vibration especially where the workability or the concrete mix is high since this will encourage segregation of the concrete. All concrete shall be protected from falling earth during and after placing Concrete placed in ground containing deleterious substances shall be kept free from contract with such ground and with water draining there from during placing and for a period of seven days or as otherwise instructed thereafter. Approved means shall be taken to protect immature concrete from damage by debris, excessive loading, abrasion, vibrations, deleterious ground water, mixing with earth or other materials and other influences that may impair the strength and durability of the concrete.

2. **CONCRETE AT SITE**

2.1 Weight batching shall be preferred at site but the Architect may permit designed mix to be converted to volumetric if requested by the contractor on specific grounds. The contractor shall provide required boxes to measure the ingredients of concrete.

2.2 The contractor shall provide concrete batch mixes, vibrators, weight batches conforming to relevant IS specification. The capacity and number of mixers and vibrators required at site from time to time shall be to the approval of the Architect. No equipment from site shall be removed without the prior written approval of the Architect. The contractor shall also maintain a platform weighing scale of capacity 300 kg with fraction upto 100 Gms at the site

2.3 and As directed by the Architect, a weekly or periodic calibration of all machines shall be done records of these calibrations shall be maintained in a register.

2.4 Regular maintenance of machinery shall also be carried out on a weekly basis or as directed by the manufacturer of machines

2.5 The mixer shall be run for a minimum period of 2 minutes after all materials are loaded in full quantity. The concrete produced shall be uniform in colour and consistency.

2.6. The placing temperature of concrete shall not be more than 34° C. If it is more, the Architect may order addition of ice or chilled water to the concrete. Also the contractor shall take the following precautions.

a) Mixers and weight batches shall be painted with white colour

b) Aggregate storing bins shall not be exposed to the Sun.

c) Water shall be sprinkled on aggregates well before concreting to keep the temperature low.

3. LAYING OF CONCRETE

Concreting shall commence only after form work is approved, reinforcement is recorded and permission to proceed with concreting has been approved in writing from the Bank/PMC/Architect.

Formwork should be clean, free from sawdust, pieces of wood or any other foreign material. It should have been treated by form releasing agent prior to the laying of reinforcement and concrete.

Concrete shall be as gently deposited as is practically possible. In its final position to avoid re-handling and shall be so deposited that segregation of aggregates does not occur. In case of deep trenches and footing, if may be done with the help of a chute. Columns and walls shall be so adjusted in form work so that maximum depth is 1.5 meter unless consented to by the Bank/PMC/Architect. Concrete from wheelbarrows shall not be dumped away from the face concrete already in place. It shall be dumped into the face of concrete already in place.

Concrete onto a sloping surface shall be discharged by providing a chute with a baffle and a drop at its end so that the concrete remains on the slope.

Columns and walls shall be concreted in the operation to their full height to avoid any horizontal construction joints as far as possible.

All slabs, beams, wooden planks and cat-walk shall be provided clear of reinforcement

Concrete shall be placed in position within 30 minutes from the time it is produced. Concrete shall be laid during normal working hours- Concreting at night or on holidays shall be permitted only on the written approval of the Bank/PMC/Architect

4. COMPACTION OF CONCRETE

Concrete shall be thoroughly compacted, as depositing shall proceed by means of suitable vibrators. The vibrators shall maintain the entire concrete under treatment in an adequate state of agitation and shall continue during the whole period occupied by placing of concrete. Care shall be taken not to over- vibrate the concrete. While withdrawing needles no holes should be visible in concreting. Compacting shall be completed before the initial setting time. Concrete already set shall not be disturbed by successive vibrations.

It shall be ensured that the needle vibrators are not applied on reinforcement, which may destroy the bond between concrete and reinforcement. When electric vibrators are in use, the standby petrol vibrator must always be available at the concreting point.

5. **SHRINKAGE CRACKS**

Concreting shall be avoided in very warm weather, if necessary; it shall be covered with damped Hessian within 2 hours of placing of concrete.

To achieve good results the concrete shall be immediately covered with a plastic sheet and not allowed any direct wind contact. This shall eliminate shrinkage cracks.

6. CONSTRUCTION JOINTS

In large pours, it is practically not possible to carry on concreting continuously. Hence construction joints shall be provided. Location of construction joint shall be submitted by the contractor for approval of the Architect Such joints shall be kept to a minimum The joints shall be at places where shear forces nil or minimum and these shall be straight and at right angles to the direction of the main reinforcement. Slop ends provided shall be with necessary slots for reinforcement bars to pass feely without bending or any other obstruction. Also a trapezoidal fillet nailed on stop board shall be provided to form a regular keyed joint. Joints shall be straight and truly vertical or horizontal.

Before commencement of concrete, adjacent concrete stopper and surfaces shall be chipped and roughened to expose aggregate, then wire brushed and cleaned. The concrete surface shall be sprayed with water for 24 hours before casting and kept wet until casting.

True horizontal joints shall also be provided with a keyed joint by inserting planed greased timber.

It shall be treated as above prior to the start of fresh concreting.

For vertical joints neat cement slurry shall be applied on the surface just before concreting- For horizontal joints, the surface shall be covered with a layer of mortar about 10 to 15 mm thick composed of cement and sand in the same ratio as the cement and sand in the concrete mix. This layer of cement slurry shall be freshly mixed and applied just before concreting.

7. EXPANSION JOINTS

Expansion joints shall be formed and located as detailed in the drawing.

8. **CURING**

Curing of concrete is most important. There shall be no compromise on this activity and It is for the contractor to arrange for everything necessary to make sure that the concrete is cured to the complete satisfaction of the Architect. As said above in clause 3.1.8, after concrete has begun to harden i.e. about 1 to 2 hours after laying. It shall be protected from quick drying with moist or damped Hessian doth or any other material approved by the Architect. After 24 hours of laying of the concrete. the surface shall be cured by flooding with water or covering with damp Hessian cloth for a period of 7 days to keep it moist.

For the next 7 days the surface shall be kept wet all the time by sprinkling water continuously.

For membrane curing, details as listed in 12.5 of SP 24 shall be followed.

9. **FINISHING**

Concrete shall be finished keeping in mind the next operation to be carried out over the surface. For guidance the following points shall be noted but the Architect shall be consulted prior to start of concreting and his decision in this regard shall be final.

a) Roof slab shall be troweled even and smooth with a wooden float

b) The surface that will receive plaster shall be roughened immediately.

c) Surfaces that will be in contract with any masonry work shall be roughened immediately.

d) The surface that will receive mosaic floor or IPS or any other type of tiled work shall be roughened while it is green. Every care shall be taken not to disturb the freshly laid concrete.

10. **INSPECTION AND CORRECTIVE MEASURES**

On removal of form work, the surface shall be examined by the Architect. Till such time, no remedial measures shall be carried out by the contractor. All patching, rectification or chipping shall be done only on the Architect's instructions. In case of any violation of this rule, the concrete poured stands rejected. The decision of the Architect in this regard shall be final and binding on all parties.

Sagged, bulged, patched, honeycombed work shall stand to be rejected for surface that are exposed, or required fair face finish or decorative textured finish. The Architect may permit any work found structurally safe and areas of unexposed faces, for repairing. As directed by the Architect these works shall be retained and the cost of repair shall be at the contractor's account.

10.1. Cracks observed shall be brought to the notice of the PMC/Architect who shall examine them. It shall be kept under observation and a record shall be maintained for a period of 45 days. It shall be shown to the Structural Engineer and the following procedure shall be followed.

i) Cracks not developing further and in the opinion of Structural Engineer not detrimental to the strength of the construction shall be grouted with non-shrinking cement slurry or as directed by the Architect.

ii) Cracks developing further and in the opinion of the Structural Engineer, detrimental to the strength of construction, shall be tested as per the relevant Indian Standard.

i) Based on result of the test, the PMC/Architect in consultation with the structural engineer shall order remedial measures or order the contractor to dismantle construction, cart away the debris, replace the construction and cany out all the consequential works thereto.

iv) Cost of the above shall be borne by the contractor if the failure was on his part In case it is due to design faults, it shall be borne by the employer.

v) The decision of the Bank/PMC/Architect in this matter shall be final and binding on all parties. This decision shall not be open for arbitration.

11. QUANTUM OF CUBES AND TESTING

The minimum frequency of cube casting shall be as follows. Each sample shall consist of 6 cubes

Concrete quantity	Number of Samples.
Up to 5 cum in a day	1
5 cum. to 15 cum.	2
15 cum. to 30 cum.	3
30 cum. to 50 cum	4
More than 50 cum.	4 + one additional per each 50 cum. or part thereof.

Three cubes shall be tested on the 7^{tfl} day and other three cubes on the 28th day.

12. ACCEPTANCE OF WORK

It shall be as given in IS 456:2000, SP 23 and SP 24. The guidance brief is as under;

Part or element of work shall be deemed to be accepted, provided the results of the 28th day cube testing conform to the criteria stated as under

a) The average of the three consecutive cube's strength shall not be less than the specified strength

b) No individual cube strength shall be less than 90% of the specified strength.

c) If the individual cube strength exhibits more than 33% of the specified strength, such a cube shall be classified as freak and the criteria in (a) and (b) shall be applied to the remaining two cubes and their acceptability determined.

d) If the concrete tests fail to meet the acceptance criteria of the minimum strength required for respective grades of concrete, the Architect may take one of the following decisions:

i) Instruct the contractor to carry out such additional tests (e.g. core tests, load tests etc) and / or remedial measures to ensure the soundness of the structure at the contractor's expense.

ii) Any decision to accept the work shall be entirely at the discretion of the engineer who may a reduction in the rate of the appropriate item.

ii) The work will be rejected and any consequential action as needed shall be taken at the contractor's expense including cutting out and replacing a part or whole of the work.

3.4. CONCRETING UNDER SPECIAL CONDITIONS

3.4.1 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 or as directed by the Bank/PMC/Architect.

3.4.2 UNDERWATER CONCRETING

The procedure set out under 132 of IS 456 shall be followed or as directed by the Bank/PMC/Architect.

3.4.3. CONCRETING IN SEAWATER

The procedure set out under 13.3 of IS 456 shall be followed or as directed by the Bank/PMC/Architect.

3.4.4. CONCRETING IN AGGRESSIVE SOILS AND WATER

Guidelines laid down in 13.4 of IS 456 shall be followed together with the instruction of the Bank/PMC/Architect.

3.4.5. MEASUREMENTS

3.4.5.1.All works shall be measured in the decimal system.

a) Dimensions shall be measured to the nearest 0.01 meter except for thickness of slab which shall be measured to the nearest 0.005 meter.

b) Areas shall be worked out to the nearest 0.01 sq. m.

c) Cubic contents shall be worked out to the nearest 0.01 cu. m.

3.4.5.2.All measurements of cutting shall, unless otherwise stated, be held to include the consequent waste.

3.4.5.3.Cement concrete work shall be classified as under

a) Concrete cast-in-situ Plain and reinforced

b) Precast concrete Plain and reinforced

c) Pre-stressed concrete Cast-in-situ or pre-cast

3.4.5.4 All concrete, except as hereinafter provided, shall be measured in cubic meters.

3.4.5.5. The price of concrete shall include ingredient material, mixing, transporting, hoisting to any height and lowering to any depth, pouring or laying, consolidating, leaving pockets, holes and protecting them till the next operation or completion of work, hacking the surface to provide key for further work including cleaning, wetting surface etc. and preparing construction joints as described in clause 3-19 of this section.

3.4.5.6.Concrete processed in a special manner for any specific purpose, such as cooled, heated, waterproofed, acid-proofed, heat-resistant shall be measured separately.

3.4.5.7Admixtures shall be used if necessary at the request of the contractor for workability and the price for that shall deemed to be included in the contractor's quoted price of concrete.

3.4.5.8.No reductions shall be made for;

a) Ends of dissimilar materials (for example beams, posts, girders, purlins, corbels and steps) up to 500 sq, cm in section.

b) Opening up to 0.1 Sq Mtr

c) Volume occupied by reinforcement

d) Volume occupied by drainage, water pipes, conduits, etc. not exceeding 100 sq.cm in cross sectional area.

e) Small voids each not exceeding 40 Sq.mt. in section.

f) Small moulds, drip moulds, chamfers, splays, rounded or covered angles, beads, grooves and rebates upto 10 cm in depth and width.

3.4.5.9Expansion joints shall be measured in running meter or sq. m. as the case may be. Price shall include required shuttering, special treatment if any, filler and finishing material as detailed in drawing or the BOQ.

3.4.5.10 Water proofing of concrete shall be measured separately as an extra over ordinary concrete stating the quantity of water proofing material inliers or kilograms.

3.4.5.11. Surface treatment shall be measured in square meters stating number of coats and proportioning of water proofing liquid to water

3.4.5.12. Cement grouting shall be measured in square meters and the mix specified.

3.4.5.13. Grouting of holding-down bolts and providing temporary boxing or wedges to form holes shall be enumerated. The mix shall be specified. The price shall include required shuttering, grouting etc.

3.4.5.14. To keep surface dry while concreting, dewatering due to rains and seepage shall be included in the price of concrete.

4 MORTARS

4.0.1. Mortars shall be prepared by mixing fine graded aggregate with cement, in the proportion specified for respective items of work as detailed in the BOQ. Mixing of mortars shall be done by mechanical mixers only. Hand mixing may be permitted in specified cases on the written permission of the Architect.

4.0.2. Mortars shall be specified by proportion only and not by strength, volumetric mixing shall be based on dry volumes of each ingredient. For convenience, measurement shall correspond to volume of one cement bag i.e. 0.035 Cu.mt. Boxes shall be of size of 40 x 35 x 25 cm. These shall be marked as mortar mixing boxes by red paint and shall be used throughout the contract. Hand mixing or mechanical mixing proportions shall be done with the use of these boxes.

4.1. CEMENT MORTAR

4.1.1. Cement mortar shall be prepared by mixing cement and sand in specified proportions. Proportioning shall be carried out as detailed above. Sand shall be added suitably to allow for bulk age, if required. Bulk age shall be determined as specified in IS 2386 Part III. Cement and sand added to mixer shall be thoroughly mixed and water shall be added to it gradually after addition of water the mixer shall run for a minimum of 3 minutes. The mortar mixed shall be consumed within 30 minutes of its mixing.

5. Reinforced Cement Concrete & Mortar Works General:

This section covers the requirements for furnishing of cement concrete including materials proportioning batching, mixing, testing, placing, compacting, finishing jointing, curing and alt other work as required for cast-in-place reinforced concrete. Cement concrete shall be composed of cement, fine aggregate, coarse aggregate, water, with or without admixture as approved, proportioned and mixed as specified herein.

5.1 INDIAN STANDARDS

All relevant Standards as specified elsewhere in this Volume are applicable. Indian Standards to be followed are:

(1)	IS 269	Specification for Ordinary and low heat, Portland cement.
(2)	IS 383	Specification for Coarse and fine aggregates from natural Sources for concrete.
(3)	IS 456:2000	Code of practice for plain and reinforced concrete.
(4)	IS 460 (Part I, II &III)	Specification for test sieves: i) Wire doth test service ii) Perforated plate lest sieve iii) Method of examination of test sieve
(5)	IS 516	Method of test for strength of concrete
(6)	IS 1199	Method of Sampling and analysis of concrete.
(7)	IS 1489-PART1	Specification for Portland Pozzolana cement
(8)	IS 1542	Specification for Sand for plaster
(9)	IS 2116	Specification for Sand for masonry mortars
(10)	IS 2386 (Part I, II, & III)	Method of tea for aggregate concrete. i) Particle size and shape ii) Estimation of deleterious materials and organic impurities iii) Specific gravity, density, voids, absorption and bulking
(11)	IS 2646	Specification for Integral cement water proofing compound.
(12)	IS 3025	Methods of Sampling and test (Physical and Chemical for Water used in Industry
(13)	IS 3068	Specification for Broken brick (burnt clay) coarse Aggregate for use in lime concrete

(14)	IS 4031 (Part i to xii)	Method of Physical test for hydraulic cement
(15)	IS 4032	Method of chemical analysis for hydraulic cement.
(16)	IS 6452	Specification for high Alumina cement for structure use
(17)	IS 6909	Specification for super sulphated weather
(18)	IS 7861	Code of practice for extreme weather concreting i) Recommended practice for hot weather concreting ii) Recommended practice for cold weather concreting
(19)	IS 8041	Specification for Rapid hardening Portland cement,
(20)	IS 8112	Specification for high strength ordinary port land cement.
(21)	IS 9103	Specification for admixture for concrete
(22)	IS 11433	Specification for one part gun grade i) Poly sulphate based joint sealant: general requirements.
(23)	IS 12118(part l)	Specification for two parts poly sulphide based sealant: General requirements.
(24)	SP 23	Handbook on concrete mix
(25)	SP 24	Explanatory handbook on Indian Standards code for plain And reinforced concrete (IS 456)
(26)	SP 27	Handbook of method of measurement of building works.

REINFROCEMENT AND FORM WORK

1.0. INDIAN STANDARDS

All relevant Standards as specified elsewhere in this Volume are applicable.

Indian Standards to be followed are:

(1)	IS 226	Specification for structural steel standard quality

(2)	IS 228	Methods for chemical analysis of steels
(3)	IS 280	Specification for mild steel wire for general engineering purpose
(4)	IS 303	Specification for plywood for general purpose.
(5)	IS 432	Specification for mild steel and medium tensile steel bars and hard drawn steel wires for concrete reinforcement.
	Part-1	Mild steel and Medium tensile steel bars.
	Part-2	Hard drawn steel wire
(6)	IS 456	Code of practice for construction and design of reinforced concrete
(7)	IS 723	Specification for steel counter sunk head wire nails.
(8)	IS 808	Dimensions for hot rolled steel beams, channels and angle section
(9)	IS 814	Covered electrodes for metal arc welding of structural steel.
(10)	IS 961	Specification for structural steel: high tensile steel bars.
(11)	IS 1139	Hot rolled MS. medium tensile steel and high field strength deformed bars for concrete reinforcement.
(12)	IS 1387	General requirements for supply of metallurgical materials.
(13)	IS 1599	Method for bend test for steel products other than sheets, strip, wire and tube.
(14)	IS 1608	Method of tensile testing: steel products
(15)	IS 1730	Dimensions for steel plates, sheets and strip for structural and general engineering purpose.
	Part-1	Plates
	Part-2	Sheets
	Part-3	Strips
(16)	IS 1786	Specification for cold worked steel high strength deformed steel bars for concrete reinforcement (Superseding IS 1139)

(17)	IS 1977	Specifications for structural steel: ordinary quality.
(18)	IS 2062	Specification for structural steel: fusion welding quality.
(19)	IS 2502	Code of practice for bending and fixing of bars for concrete reinforcement
(20)	IS 3696	Safety Code of scaffolds and ladders :
	Part-1	Scaffolds
	Part-2	Ladders
(21)	IS 4014	Code of practice for steel tubular scaffolding.
	Part-1 &2	
(22)	IS 4082	Recommendation on stacking and storage of construction materials at site.
(23)	IS 8989	Safety code for erection of concrete framed structures
(24)	IS 9417	Recommendations for welding cold worked steel bars for reinforced concrete construction.

2. REINFORCEMENT

2 1. Reinforcement bars used in construction shall be mild steel or medium tensile round bars and high strength deformed bars.

2.1.1. **M.S. Plain**

Rolled mild steel and medium tensile steel plain round bars used in concrete shall conform to IS 432 Part I. Steel received shall conform to the following IS with regards to manufacturing and chemical composition.

i) M.S. bar Grade I Steel designation Fe 410-S of IS 226

ii) M.S. bar Grade II Steel designation Fe410-O of IS 1977

iii) Medium Tensile Steel designation Fe 540 W-HT IS 961 Steel bars

2.1.2. National sizes and tolerances shall be as specified in IS 432 Part I. Physical requirements shall be determined in accordance with IS 1608 read in conjunction with IS 226. For ready reference of minimum requirements, properties are tabulated in table 11 of the Annexure.

2.2. Tor Steel

2.2.1. High strength deformed bars for use as reinforced in concrete shall be of grade Fe 415, Fe 500 and Fe 550 conforming to IS 1786.

2.2.2. Chemical composition shall conform to IS 1786 when made as a relevant part of IS 228. Permissible limits shall be as shown in table 12 of the Annexure,

2.2.3. Welding of cold work steel bars in reinforcement shall be permitted as per IS 9417 (Recommendation for welding cold worked steel bars for RCC)

2.2.4. Nominal sizes, cross sectional areas and their mass shall be as specified in IS 1786, allowing due consideration for tolerance specified therein.

2.2.5. Physical properties

a) !t shall satisfy IS 1599 test for bend and re-bend test in conjunction with IS 226

b) Bond requirements shall be deemed to have been satisfied if it meets clause 4.0 of IS 1786

c) Tensile, proof stress and percent elongation shall be as per table 3 of IS 1786 and reproduced as table 13 of Annexure for ready reference.

2.3 Quality of Material

2.3.1. Material received at site shall have ISI certification mark. Each bundle or coil containing the bars shall be suitably marked with ISI certification mark Also bars shall be marked to identify categories. This shall be done as per IS 1387

2.3.2. In case bars are without ISI certification mark, the manufacturer shall give a certificate stating process of manufacturer, chemical composition and mechanical properties. Each certificate shall indicate the number or identification mark of the batch production / cast to which it applied. Corresponding number or identification mark should be found on the material-

2.3.3. All reinforcement material shall be free from loose mill scale, excessive rust, loose rust, pitting, oil, grease, paint, mud or any foreign deleterious material present on the surface. Cleaning shall be done to the satisfaction of the Architect.

2.3.4. Each batch brought at site shall be tested prior to use for respective specification/ Physical properties Cost of all such tests shall be borne by the contractor. Material acceptable as per IS shall be allowed into the works. All rejected material shall be removed from site by the contractor within 3 days of rejection. If the same is not done, the Architect shall impose a penalty of Rs. 5007- per metric ton per day. This will be without any appeal and shall not be subjected to arbitration.

2.3.5. Reinforcement bars received at site shall be stored on hard concrete platform and clear of the ground with the use of timber sleeper, concrete sleeper or any other means. Reinforcement material shall be kept covered by tarpaulins or plastic to avoid corrosion and other contamination. It is advised to follow storage methods as described in IS 4082.

2.4. Miscellaneous

2.4.1. Cover blocks shall be of non-corrosive material such as plastic but not wooden or broken bricks or stone. Specially PVC made cover spacers shall be used in the Works. Concrete cover spaces may me permitted by the Architect. Such concrete spaces shall be cast from concrete and not cement mortar. Strength of these blocks shall be equal to the strength of concrete in use. These should be fully cured prior to use in works.

2.4.2. Binding wire shall be 16 gauge annealed wire conforming to IS 280. Binding shall be done with double wire. It shall be free from rust. oil. paint, grease, loose mill scale or any other deleterious material undesirable for the reinforcement and concrete or which may prevent adhesion of concrete with reinforcement.

2.4.3. Deformed bars for concrete reinforcement and rolled mild steel and medium tensile steel conforming to IS 1139 shall be allowed in construction provided they are approved by the Architect.

2.4.4. Weight payable for reinforcement per meter shall be as follows:

1	6 mm	0.222 kg/Rmt
2	8 mm	0.395 kg/Rmt
3	10 mm	0 617 kg/Rmt
4	12 mm	0.888 kg/Rmt
5	16 mm	1.578kgYRmt
6	18 mm	1.998 kg/Rmt
7	20 mm	2.467 kg/Rmt
8	22 mm	2 984 kg/Rmt
9	25 mm	3.853 kg/Rmt
10	28 mm	4. 834 kg/Rmt
11	32 mm	6. 313 kg/Rmt
12	36 mm	7.990 kg/Rmt
13	40 mm	9.865 kg/Rmt

2.5 Fabrication of reinforcement

Reinforcement shall be fabricated as per the drawing. Bending shall be done mechanically with use of machine or if approved with hand but to the correct radius, with proper tools and platform and shall conform to IS 2502. Bending of material shall be cold bending only.

Material shall be inspected for visible defects such as cracks, brittle, excessive rust, loose mill scale etc. Cracked ends of bars shall not be used in Works. Also the bars should be free from any deleterious material and hence the best practice shall be to hose down reinforcement just prior to concreting.

It is important that bending, straightening, cutting etc. shall be carried out in a manner not injurious to the material and the safety of the persons working should be ensured.

2.5.1. Anchoring of bars and stirrup shall be provided exactly as detailed in the structural drawing or as directed by the Architect.

2.5.2. **Lapping of bar**

Laps shall be strictly as per the drawing or as directed by the Structural Engineer for general guidance, the following principles shall be followed as given in IS 456.

a) Splices shall be provided as far as possible away from sections of maximum stress and be staggered.

b) Not more than half of the total bars shall be spliced at a section

c) Where more than one half of the bars are spliced at a section or where splices are made at points of maximum stress, special precautions shall be taken, such as increasing the length of lap and / or using spirals or closely spaced stirrups around the length of the splice.

d) Lap splices shall not be used for bars larger than 36 mm diameter, for larger diameters, bars may be welded. In cases where welding is not practical, lapping of bars larger than 36 mm diameter may be permitted and additional spirals should be provided around the lapped bars.

e) Lap length including anchorage value of hooks in flexural tension shall be LD (as defined in 25.2.1 of IS 456) or 30 dia whichever is greater and for direct tension 2 LD or 30 dia whichever is greater. The straight length of lap shall not be less than 15 dia or 20 cm. Where LD is the development length as described in 25.2.1 of IS 456.

f) When splicing of welded wire fabric is to be carried out, lap splices or wires shall be made so that the overlap measured between the extreme cross wires shall be not less than the spacing of cross wires plus 10 cm.

g) The lap length in compression shall be equal to the development length in compression, calculated as described in 25.2.1 of IS 456 or as specified in drawing but not less than 24 dia.

2.5.3 Spacing of bars

Bars shall be placed in position as shown in the drawing. Following guidelines as given in IS 456 shall be followed in case of difficulties or shall be carried out as directed by the Architect.

a) Horizontal distance between two parallel main reinforcing bars shall usually not be less than the greatest of the following.

   i) The diameter of the bars, if the diameters are equal,

   ii) The diameter or larger bar, if the diameters are unequal, and

   iii) 5 mm more than the nominal maximum size of coarse aggregate (by using reduced size of aggregate in congested reinforced area, conditions given hereof should be overcome)

   iv) Greater horizontal distance should be provided. But when needle vibrators are used, distance between bars of a group may be reduced to two-third of the nominal maximum size of the coarse aggregate, provided sufficient space is left between groups of bars to enable the vibrator to be immersed.

   v) Where there are two or more rows, the bars shall be vertically in line and the minimum vertical distance between the bars shall be 15 mm two third the nominal maximum size of the aggregate or the maximum size of bar, whichever is more.

2.6 Cover to reinforcement

Reinforcement shall have concrete cover and the thickness of such cover (exclusive of plaster or other decorative finish) shall be as specified in drawing or as directed by the Architect. The following guidelines are to be observed in the absence of the above.

a) At each end of the reinforcing bar, not less than 25 mm. nor less than twice the diameter of such bar.

b) For a longitudinal bar in a column, not less than 40 mm, nor less than the diameter of such bar. In case of columns of minimum dimension of 200mm or under, whose reinforcing bars do not exceed 12 mm, a cover of 25 mm.

c) For longitudinal reinforcing bar in beam, not less than 25 mm, nor less than the diameter of such bar

d) For tensile, compressive, shear or other reinforcement, in slab not less than 15 mm, nor less than the diameter of such bar and

e) For any other reinforcement, not less than 15 mm, nor less than the diameter of such bar.

f) Increased thickness shall be provided in case the concrete members are in the surrounding of harmful chemicals; saline atmosphere etc. and the cover shall be 50 mm or more as directed by the Architect.

g) For concrete members totally immersed in seawater, the cover shall be 40 mm more than specified above (a) to (f).

This shall be 50 mm more for periodical immersion in seawater.

h) Concrete cover should not exceed 75 mm in any case. Cover to reinforcement shall be as specified in the drawing or as directed by the Architect.

Details given in sub Para (a) to (h) are for guidance and shall be followed in absence of any specific direction.

2.7. Fixing in position

Correctly cut and bent bars shall be accurately placed in position as detailed in the drawing. Unless otherwise specified by the Architect, reinforcement shall be positioned within the tolerance as under

a) For effective depth 200 mm or less ±10 mm

b) For effective depth more than 200 mm ± 15 mm

But in no case shall the cover be reduced by more than 5 mm of that specified. There shall be no compromise on cover for foundation work

Reinforcing bars shall be held in position during the placing of concrete by use of PVC or concrete cover blocks (made of equal / of higher grade strength of well-cured concrete in use) steel chair spacers, steel hangers, supporting wires, etc. and secured by tying with an annealed binding wire of 16 to 18 gauge as approved by the Architect.

Layer of bars shall be separated by precast concrete spacer blocks or spacer bars. Reinforcement shall be in correct position prior to start of concreting. No reinforcing bar shall be placed on freshly laid concrete for adjusting bar spacing. Care shall be taken to maintain reinforcement in position and keep it clean, throughout the period till it is embedded in the concrete. For maintaining cover, pieces of broken stone or brick or wooden blocks shall not be used at any stage.

Binding wire used shall conform to IS 280.

2.7.1 Welded joints or mechanical connections

Welded joints or mechanical connections in reinforcement may be used but in all cases or important connections, tests shall be made to prove that the joints are of the full strength of the connected bars. Welding of reinforcement shall be done in accordance with IS recommendation.

2.7.2. Where reinforcement bars are bent aside at construction joints and afterwards bent back into their original position, care should be taken to ensure that at no time is the radius of the bend less than 4 bar diameters in case of plain mild steel or 6 bar diameters for deformed bars. Care shall be taken when bending back bars to ensure that the concrete around is not damaged / disturbed.

2.7.3. Welding rods used shall conform to IS 814: covered electrodes for metal arc welding of structural steel. Work shall be carried out by a competent welder. Samples from Work site shall be taken at regular Intervals and tested. Frequency and number of samples shall be as directed by the Architect.

2.8 Measurements

Reinforcement shall be measured as follows:

2.8.1. Lengths of different diameters of bars actually used included authorized overlaps shall be measured nearest to a centimeter and their weight calculated as given in table 2.4.4 shall be used.

2.8.2. Chairs and spacer bars shall not be measured and paid. The contractor shall account for all these in his quoted price.

2.8.3. In case of welded coupled joints, measurement for payment shall be equivalent to the length of overlap, as per design

2.8.4. Price build-up shall include, in addition to cost of material.

a) Cover blocks of PVC or concrete.

b) Spacer bars, chairs and unauthorized overlaps (Allowed for convenience)

c) Cutting, bending, placing and fixing in position.

d) Binding wire as approved.

e) Wastage / Rolling margin.

f) Cleaning of bars.

2.8.5. For purpose of reconciliation, maximum wastage permitted shall be 5% of the actual material used. Balance amount shall be borne by the Contractors.

3. OPENING / INSERTS

3.1. All required openings and pockets should be provided as detailed in the drawing. They may be enumerated or paid on area basis as detailed in the BOQ. The contractor shall provide for the required materials, labour, for fixing and supporting during concreting In his quoted price. It is imperative that all openings and pockets shall be de-shuttered with care and all comers of openings shall be preserved. All openings/pocked shall be in a correct line and level. After concreting, the openings shall be secured against any accident by proper covering and guardrail and warning notice, if any.

3.2 The contractor shall clean and grout the pocket at a later date with a non-shrinking compound added to the grout mix or non-shrinking cement shall be used. It shall be well-cured and protected to correct line and level till handling over.

3.3 Inserts are material such as timber, steel, plastic, and dowels. Bolts, locks, brackets, pipes, etc. left in concrete partly or fully embedded to receive connection with foreign member at a later date. These may be fabricated by the contractor or provided by the EMPLOYER as received from specialist, manufacturer, etc. These shall be protected from weathering and damage in course of the construction. The cleaning required after concreting and any treatment such as oiling, greasing or covering with paint etc. shall be carried out by the contractor at his cost.

3.4 It is very important that the providing and fixing as contemplated in the BOQ shall be carried out with the "utmost precision" and to the entire satisfaction of the Architect. Any deviation from that as shown in the drawings or instructions shall be rectified by the contractor at his own cost and responsibility

C. PARTITION WORK

1. All internal woodwork / Plywood shall be treated with anti-termite preservative. All internal frame work shall be of Aluminum unless otherwise specified as Teakwood. AII exposed edges of Plywood shall be fixed with C.P. Teak Lipping of size as directed by Architect. The skinning shall be in BWR Plywood unless otherwise specified.

2. Frame Work
   First of all the shop drawings for each type of partitions/doors/windows/ventilators etc. shall be prepared by using suitable sections based on architectural drawings, adequate to meet the requirement/ specifications and by taking into consideration varying profiles of aluminum sections being extruded by approved manufacturers. The shop drawings shall show full size sections of glazed doors, partitions, windows, ventilators etc. The shop drawings shall also show the details of fittings and joints. Before start of the work, all the shop drawings shall be got approved from the Engineer-in-Charge.

3. Fixing of Frames
   The holes in concrete/masonry/wood/any other members for fixing anchor bolts/fasteners/screws shall be drilled with an appropriate electric drill. Partitions/Windows/doors/ventilators etc. shall be placed in correct final position in the opening and fixed to Sal wood backing using stainless steel screws of star headed, counter sunk and matching size groove. of required size at spacing not more than 250 mm c/c or dash fastener. All joints shall be sealed with approved silicone sealants.
   Where aluminum comes into contact with stone masonry, brick work, concrete, plaster or dissimilar metal, it shall be coated with an approved insulation lacquer, paint or plastic tape to ensure that electrochemical corrosion is avoided. Insulation material shall be trimmed off to a clean flush line on completion.
   The contractor shall be responsible for the doors, windows, partitions etc. being set straight, plumb, level and for their satisfactory operation after fixing is complete.

4. The Partitions & Paneling shall be inclusive of providing & fixing in between the aluminum frames, 50mm thick Rock insul Slabs of Rockwool India Ltd of density 96 kgs / cumt of standard width as per the available clear distances between the existing frames as directed wherever required & instructed including above false ceiling framework (paid in separate items).

5. Measurement of Partition & Paneling shall be limited upto the False Ceiling level. However the cost towards any additional support for frameworks to be fixed to the main ceiling shall be deemed to have been considered in the quoted rates and no separate payment shall be made for supporting elements of partitions / paneling items, above the false ceiling level.

6. The rate shall be all inclusive of the necessary hardware, fittings, and fixtures & including glass & finishing for the same. The rate shall be also inclusive of pattas& bands, grooves at any level, any design in veneer, textures etc. including the necessary framing/ openings for Electrical, Telephone & AC outlets. Further it is important to note that the Glasses wherever specified for the items of Partitions & Paneling if any shall have beveled edges as per the direction & thickness as indicated by the Architect or Engineer in charge.

7. The rates quoted for the Items of Partitions & Paneling of any / all types shall include the cost towards providing and fixing additional 75mm wide Patta raised over and above the given ply for design including designer grooves etc. complete as per the instructions and to the complete satisfaction. Nothing additional would be paid on account of any pattas / bands provided for the said items.

8. **Measurement of height** shall be taken from finished floor level up to the level of False ceiling, in case of varying heights on either side of partition, average height shall considered. The rate to include Provision of extra frame work as necessary for skirting and making cutouts for electrical switch plates, switch boxes, light fittings light etc. making provision for laying conduit; as per drawings & directions. In case of wood framework to be applied with 1 coat of anti-termite wood preservative.

9. Gypsum/ Gyproc/ Habito Board Partitions
   50 X 50 Al sections can be used for framework having vertical members at 600mm c/c fixed with horizontal noggins at floor and soffit and the centers, wherever required in line and level, 12.5mm tapered edge. Gyp board (Conforming to IS –2095-1982) is then screw fixed to either side of aluminum frame with 25mm long drywall screws at 300mm c/c with joints staggered to avoid through joints. Finally, the face layer of the boards to be jointed and finished so as to have a flush look which includes filling and finishing with jointing compound, paper tape and two coats of primer suitable for Gypboard (as per recommended practices of India gypsum or equivalent.)
10. Full Height Half- Glazed Partition
    Same as in full height partition but partly glazed partition with12mm thick toughened clear glass /as per BOQ and detailed drawings & with Gypsum partition below as per Gypsum partition specifications etc., Complete as directed with infill and also 12 mm aluminum channel to be provided at the intersection of two materials.

11. Partly Height Double Glazed Partition

Same as in full height double gypsum partition but partly Double glazed partition of 136mm thick. with (12mm thick toughened clear glass) above 2100 mm from floor till 3000mm ht. &with Gypsum partition below as per Gypsum partition specifications etc., Complete as directed with infill and also 12 mm AL channel to be provided at the intersection of two materials.

12. Full Height Glazed Partition

Full Height Double Glazed Partitions to be provided with 12mm thick toughened glass using 54mm x 25mm x 2mm thick modular section as per BOQ and approved by EIC channel on top and bottom, including cutting groove in the floor to fit C channel and the gap is filled with GE silicone gel and top with MS framework to fix the C channel and painting the MS framework with enamel paint, complete as per drawing and directions of engineer in charge

13. Partition Above False Ceiling

Partition above false ceiling with AL frame of 25mm x50 mm or 50mmx50mm as per specs at 600mm x 600mm c/c. Frame to be fixed to the ceiling. All internal frame members to be screw fixed. Internal voids to be glass wool in filled for soundproofing. No finishing required. Provide required cutout for Return Air passage.

D. FLOORING WORKS

When tile flooring is to be laid over the existing flooring without dismantling old flooring it can be laid with adhesive. The old flooring shall be thoroughly cleaned and checked for undulations, if any shall be rectified with cement mortar 1:3 (1 cement: 3 coarse sand). Old cement concrete surface shall be hacked and cleaned off to have proper bond with the old surface.
The surface of the flooring shall be frequently checked during laying with straight edge of above 2m long so as to attain a true surface with required slope.

1. Flooring Ceramic Tile / Vitrified Tile Flooring / Dado /Skirting

The ceramic tile shall be of approved quality, make, color, size and shape or as specified in drawings. On the approval of the sample by the Engineer In-charge, the order for the tiles shall be placed from one source and procurement done preferably from one batch/consignment to prevent any shape/shade variation. Tiles to be sorted out at site before laying.

The floor surface over which the tiles are to be laid shall be properly cleaned and wetted. 3 to 6 mm Solid bed of BALCEM GOLDSTAR or equivalent (POLYMER MODIFIED CEMENTITIOUS ADHESIVE) & in conjunction with BAL-ADMIX AD1(POLYMER MODIFIED LIQUID)shall be applied over an area adequate to accommodate about 20 tiles at a time. Tiles shall be washed clean and pressed on to the grout and gently tapped in its proper position. The tiles shall be placed perfectly side by side so as to have fine joints truly vertical and horizontal and in level with adjoining tiles.

The joints shall be as specified in the drawing, if grooves are to be provided, it shall not exceed 1.5mm or as specified in the drawing, and shall be done using spacers of

approved quality. The excess content slurry bulging/oozing out in joints shall be removed by wiping immediately. Joints between the tiles to be filled with BAL GROUT to match the COLOR of tiles as per the manufacturers specifications (COLOR as approved by EIC).

Thereafter, the joints shall be raked out to the required depth and loose cement/mortar shall be revved and joints shall be cleaned.

In the case of the dado, the wall surface shall be cleaned and plastered with Cement mortar 1:4 to a thickness of not less than 10 mm to form a uniform backing surface and finished rough and allowed to harden.

The tiles, which have been soaked in water, shall be cleaned and cement paste of butter-like consistency applied to the backside of tiles and the tiles shall be pressed on the wall face and gently tapped in its position. In this way, tiles shall be placed one after another starting from the bottom line and lay upwards.

The joints shall be truly vertical and horizontal, where required spacers – glass strips or ceramic strips – are used to achieve spacing between tiles of width as specified in the drawing, and the tile surface shall be of infirm level in all directions without any depressions and dulling which shall be tested by a straight edge as directed by EIC/CONSULTANT.

Curing and pointing of tiles in Dado shall be carried out as specified for flooring and as directed by Engineer In charge.

E. HARDWARE & METALS:

- Tables side units back units consoles or other articles as per schedule of quantities shall be deemed to be inclusive of all the hardware required e.g. locks, sliding channels handles / knobs, bolts screws PVC buffers for the legs of sofas chairs tables etc. as per instructions of engineer in charge.
- Screws are to match the finish of the articles to be fixed and to be round or flat headed or counter sunk as required.
- The contractor should cover up and protect the brass and bronze surfaces with thick transparent grease or other suitable protective materials renew as necessary and subsequently clean off and clear away join completion.
- Aluminum and stainless steel shall be of approved manufacturer and suitable for its particular application. Generally, surface of aluminum shall have an iodized finish or powder coated finish and both shall comply with the samples approved by the EIC All stainless steel sheets shall be 304 S.S. Japan or equivalent with gauge as specified but not thinner than 16 gauge. All exposed steel surfaces shall also have powder coated finish and shall completed with samples approved by EIC.
- All steel, brass, bronze, aluminum and stainless steel articles shall be subjected to a reasonable test for strength if so required by the EIC at the contractor's expense.
- All branching and welding are to be executed in a clean and smooth manner rubbed down and left in the flattest and tidiest way, particularly where exposed.
- Chromium plating shall be in accordance with IS standard or as per approved specification for normal outdoor conditions and shall be on a base material of copper brass or as specified.

F. PAINT AND POLISHES:

- All materials required for the works shall be of specified and approved manufacturer, delivered to the site in the manufacturer's containers with the seals, etc., unbroken and clearly marked with the manufacturer's name or trade mark with a description of the contents and color. All materials are to be stored on the site of the work.

- Spray painting with the approved machines will be permitted only if written approval has been obtained from the Engineer In charge. The paint used for sparing is to be specially prepared by the manufacturer for spray Thinning of paint made for brushing will not be allowed.

- Wood preservative shall be Ascu Green Saver or any other equal and approved impregnating wood preservative at all concealed wood work shall be treated with wood preservative.
- All brushes, tools pots, kettles, etc. used in carrying out the work shall be clean and free from foreign matter and at to be thoroughly cleaned out before being used with a different type of class of material.

- All iron or steel surfaces shall be thoroughly scraped and rubbed with wire brushes and shall be entity free from rusting mill scale etc. before applying the priming coat.

- Surfaces of new wood work which are to be painted are to be rubbed down and cleaned to the approval of the EIC.

- All exposed teakwood surfaces and teak ply surfaces and surfaces which are not treated otherwise shall be finish with stained polish to the required shade and melamine matt finish.

- All exposed cedar wood surfaces and clear ply surfaces shall be finished with ready mixed wax polish to give natural shade.

- The tendered rates shall include cost of seasoning and providing wood preservative and as given in the specification

1. Polish:-

- Pure shellac varying from pale orange to lemon yellow color free from resin or dirt shall be dissolved methylated spirit at the rate of 140 gm of shellac to 1 liter of spirit. Suitable pigment shall be added to get the required shade.

- The surface shall be cleaned. All unevenness shall be rubbed from smooth with the sand paper and well sets if variable shall be covered with a preparation of red lead and the size land on white hot Hoes an mgehtations on the surface small be stopped with plazsr's putty. The surface shall then be given a coat of won filler by mixing whiting (ground chalk) in methylated spirit at the rate of 1.50kg of whiting per liter of spirit. The required staining agent shall be added to get

the required sand. The surface shall again be rubbed down perfect smooth with glass paper and wiped clean.

- The polishing rubber, the most important implement in French polish shall consist of a pad of cotton wool, which acts as a reservoir for the polish and a soft white linen or cotton fabric similar to a well worn handkerchief, which acts as a filter. The rubber must never be dipped in to the polish. It should be charged by pouring the polish on the pad with the cover remove.

- The surface shall be worked upon evenly a slow figure of eight motion until the surface is coated with a thin layer of polish. The object shall be to apply a series to thin coats, allowing only a few minutes for drying between the coats, when a level and even bodied surface is obtained the work is considered ready for the second stage is spiriting off. Allowing the work to stand for at least eight hours, a fresh rubber with a double thickness of cover material shall be rubber with a double thickness or cover shall be taken and charged with methylated spirit. The surface shall be sprite off to remove the rubber marks and to give the brilliance of finish. The rubber shall be worked in the direction grain an continued till the surface is free from smears and rubber marks and left to harden off.

2. MALAMINE FINISH:

Melamine finishing shall be done on wooden surfaces. The finish shall be Matt, glossy, semi-glossy type which shall be as approved by the Engineer In charge.

All uneven and rough surfaces shall be rubbed-using sandpaper of the required grades till a smooth surface is obtained and the surface shall then be well dusted. The nail marks/ pores in the wood shall be filled with wood filler and the surface shall be rubbed with the required grade of sandpaper so that the entire surface is uniformly smooth.

After preparing the surface as specified above, the application of a sealer coat shall be done. Wherever necessary the pores in the wood shall be again filled with wood filler and the surface shall be rubbed with the required grade of sandpaper in the presence of water so that the entire surface is uniformly smooth. Staining as required shall be done manually, application of the second coat of sealers shall be done. Finally, 3 coats of Melamine spraying, strictly under dust-free condition, shall be done, after which the surface is buffed with Wax & Oil.

The Specialists/Manufacture's specification/instruction in using the product shall strictly be adhered to, in preference to the specification in the contract. It is preferable to carryout the process under warm weather condition. The spray gun before/after using shall be cleared thoroughly using thinner or spirit.

G. WOOD :

1. TIMBER:

- The timber shall be of the species stipulated in the schedule of Quantities/Drawings.
- Teak wood shall be of C.P. Teakwood variety.
- Wood for frame work/ rough wood shall be teak wood even though drawings may show Miranti/ hollock.

- All dimensions given in the schedule of quantities and drawings are the required finished size.
- Timber shall be well seasoned and kiln dried with a moisture content of 12% nominal +2% for teakwood. The contractor should get the timber tested for moisture content of wood at his own cost as per the directions of the EIC.
- All timber shall be treated with preservatives and anti termite chemicals as directed.
- All timber shall be free from worm holes, loose or dead knots or other defects and shall not suffer from warping splitting or other defects. All timber shall be approved by the EIC before use.

2. MDF BOARD/BLOCK BOARD/PLYWOOD/PARTICLE BOARD:

- MDF boards block boards/plywood/particle board etc. as specified in the approved list of manufacturers shall only be used.
- Only B.W.R. grade phenol formaldehyde bonded boards to be used.
- MDF board shall comply with I.S. 12406-1988. Manufacturer's specification shall be followed in the use of MDF boards for the various usages.

3. PLYWOOD :

Plywood for general purpose shall confirm ISI 303 iV 1975. It shall be of B.W.R. grade in the specified thickness for the commercial type B.W.R. grade plywood, Intermediate veneers in two opposite grain direction shall be 1:1. The moisture content shall not be more that 12.5% by mass. It shall be of approved made. Where B.W.P. grade is specified it should be boiling water proof confirming to I.S. Standards.

4. MELAMINE FACED PARTICAL BOARD:

It should be three layered wood based particle board, such as Nova pan melamine faced pre-laminated on both sides. Particle board should be ISI 3087FPTH (type II, 1965) marked on edges and should also confirm to German Din Standard viz DIN 66761. it should impart good bending strength, modules of elasticity, internal bond strength and screw holding strength. Melamine faced surface should has resistant to crack at 100 and should pass cigarette burn test.

5. GYPROC FIRELINE BOARD

Gyproc Fireline Boardis gypsum based interior Wall & Ceiling product used in areas where High Fire Resistance Performance is required to restrict fire to pass from one side of wall to the other side.
Gyproc Fireline Board's gypsum core incorporates glass fibers & other fire resistive additives that are encased & firmly bonded to strong pink colored paper liners. It Provides fire resistance from 60 Minutes to 240Minutes in Wall, Ceiling , Shaft wall & Beam / Column En casement systems. Below are standard size details:

Thickness	**Width**	**Length**	**Edge type**
9.5 mm	1220 mm	1829 mm	TE/SE
12.5 mm	1219 mm	1829 mm	TE/SE

12.5 mm	1219 mm	2438 mm	TE/SE
15 mm	1219 mm	1829 mm	TE/SE
15 mm	1219 mm	2438 mm	TE/SE

Manufacturing Standard: EN 520:2004, Type F ASTM C1396, Type X
Properties: Thermal Conductivity: 0.24 (w/mºK)
Thermal resistance: 0.05 for 12mm thick board
0.06 For 15mm thick board
Board Colour: Pink face paper
Brown reverse side paper
Edges: Taper edge along length of board
Square edge along width of board

Flexural breaking load of GyprocFirestop as per EN 520: 2004, Type F :
For 12.5 mm board:Transverse direction (N) = 210 ,Logitudnal Direction (N) = 550
For 15 mm board:Transverse direction (N) = 250 ,Logitudnal Direction (N) = 650

6. GYPROC HABITO BOARD

Characteristics of Habitoboard : Calcium sulphatedihydrate encased in paper liners, with glass fibers and other additives. The Habito boards are part of a new generation of products specially designed to give flexibility of loading anywhere on the drywall to utilise space in a fast and functional way.
It Complies with EN 520:2004 – Type A, D, R, I. standards.

Properties:
Thermal Conductivity: 0.24 (w/mºK)
Thermal resistance: 0.05 (m2K/w) for 12.5mm thick board

Board Colour:
Faced with ivory coloured paper
Reverse faced with brown coloured paper

Edges: Taper edge along length of board
Square edge along width of board

Flexural breaking load of GyprocHabito Board as per EN 520: 2004, Type A,D,R,I :
For 12.5 mm board:(size 1220x2440)Transverse direction (N) = 850 ,Logitudnal Direction (N) = 1100

7. PRE LAMINATION / VENEERING TREATMENT

Before Lamination/Veneering the Commercial Flush board with Laminate/ Veneer sheet, the surface to be laminated/veneered should be thoroughly cleaned,allcracksandnailsholesfilledasdirected.Thelaminatesheetshall be fixed using the approved quality adhesive recommended by the manufacturer and applied strictly in accordance with their instruction/specifications. The adhesive shall be applied on both

member in a thin layer and while still tacky, it shall be spread evenly with steel in both directions to assume full contact with the adhesive / Fevicol / SR. A constant and even pressure is applied for not less than 24 hours to ensure good bonding ofthe sheet to the board. The laminate/veneer surface shall be cleaned as recommended by the manufacturer of all stains/ adhesive marksetc.

AllWoodenandVeneeredsurfaceshallbewatercutmelaminefinishedafter it has been approved and passed by the Engineer In charge. All portions of timber-built into masonry or abutting a concrete portion of the building or buried in ground shall be coated with boiling coal tar or another type of approved wood preservative or primer before fixing them inposition.

All fittings and fixtures for the doors, storage and worktops shall be as indicated in the schedule shown in the drawings. The samples along with manufacturer's / brand name, test certificate etc, shall be submitted to the Engineer In-charge for approval before placing order.

8. LAMINATES:

- Thickness of the laminate to be used shall be 1.0 mm.
- Joints in laminates will not be permitted until and unless the same is unavoidable or is required as per the drawings.
- Measurements: Length and breadth of the plan area of the finished work shall be measured correct to a cm. no deductions shall be made for small openings like switch cockets, AC grills/ diffusers, light fixtures etc, nor shall extra material or labour involved in such openings shall be provided. Rate shall include provision access panel with MDF panel. Rate to include decorative work with sunk raised levels in false ceiling. Rate shall include all scaffoldings staging etc.
- The tendered rates shall apply for all floors heights.
- All chair stands shall be 5-prong tilting as approved by EIC / Architects, with a diameter of 25-1/2 inches, and finished with powder coating of high quality. In case M.S stands are approved, the same shall be embossed M.S with a seven-tank antirust treatment procedure before powder coating.
- All castors shall be of approved make, quality and type. They shall be glass reinforced nylon castors, with twin wheels having independent movement, and with a load carrying capacity of 100 Kg. per castors.

9. SHOP DRAWINGS:

The contractor shall submit shop drawing for approval all joinery details for total furniture. Shop drawings shall relate to site measurements and shall show in detail the construction of various parts of the work, the method of jointing, thickness and type of material, the finishes to be

applied to the various exposed surfaces, details of anchoring, joints, welds, fastening and all other relevant information.

H. ACOUSTIC INSULATION

Dry Wall Insulation helps attain acoustic privacy and fire rating. TwigaInsul slabs are to be placed in the cavities of the grid structure for partition wall. Both side of the grid is then covered with single or multiple layers of Ply. With 50mm, TwigaInsul slabs of density 48 Kg/m3, STC value of 34 , 67 dB and thermal resistance (R-value) of 0.75 to 3.33 sq.m K/W can be obtained.
The overall Thermal transmittance or U-value should be less than 0.44 W/sq.m. K to conform requirement. The insulation should conform to non-combustibility, Class-P(not easily ignitable), Class 1(surface spread of flame NIL), as per BS 476 standards.

I. POWDER COATING

The process of coating is basically.

- Degreasing
- Watering
- Picking/chromatin
- Waterrising
- Phosphating
- Oven heatingand
- Cooling at room temperature etc.

VAPOCURING-

Vapocuring finish shall be done for Metal surfaces exposed to both interior and exterior atmosphere. The putty material, hardener, base coats material, Polyurethane coat material and the paints used shall strictly be in accordance with the manufacturers' specification.

Heating shall be at 70°C. The temperature may be varied depending on the hardener added with the color in the specified recommended proportion. The surface to be vapocured should be first made free from dust, dirt, grease or any such foreign material. The porches of Vapocuring shall be done under a dust-free environment and basically consist of

- Preparation of the surface
- Putty Work
- Spray coat either mixed with hardener or otherwise
- Heat treatment
- Polyurethane coating, etc.

J. FALSE CEILING

1. Item includes false ceiling in design with **coves & curves**, Suspending system and frame work shall match layout of A.C. Ducts / grills, electrical / fire protection wiring / fixtures, Return Air grills etc. Rate to include provision of extra height (Total Floor to floor height is 4.5 Mtr approx.) supports for frame work needed due to layout referred above and fixtures etc. Rates to include necessary scaffolding. (**PAYMENT WILL BE DONE FOR GYPSUM AREA ONLY).**

2. The false ceiling design can be stepped / curved/architectural design, cove etc. However only board surface area shall be measured for the purpose of payment. Nothing extra for design or curve. Existing floor to slab height on the site shall vary. Ceiling shall be hung from the existing slab through hangers. Rate quoted in the tender shall be applicable for all floor levels /all floor height (approx. 4.5 Mtr floor to floor approx.) including scaffolding, etc. complete. The rate of false ceiling items also includes 6 mm ply backing for supporting light fixtures in the false ceiling. The rate of false ceiling items also includes making all necessary cut outs & frame work for electrical fixtures / air conditioning work coves etc.

3. For technical details B.O.Q, drawings and technical specifications shall be referred, in case any details which are not available in these documents manufacturer's standard details shall be referred and that must be approved by EIC prior to procurement and supply at site.

4. **Mineral Fibre Board False ceiling**

   Mineral Fiber Ceiling Tiles shall be made of granulated high-density Mineral Wool as the main material and top production technique which gives it superior features of fire-proofing, sound absorption, heat insulation & sag resistance. They are cost effective and are mainly used for acoustics and decoration.

   Tiles shall be appropriate class and of finished thickness as specified in the description of the item. Only selected tiles of uniform width shall be used. Unless otherwise specified in the description of the item or shown in the drawings, the width of tiles selected for use shall not be less than 595 x 595mm in size and of approved texture, design and patterns and patterns and shall be of 15mm/ 16mm thick Beveled Tegular edge type.

   Where width of room/ corridor is in multiple of standard width of tiles, same pattern shall be maintained throughout the length. Where the width of rooms/ corridor is not in multiple of standard width of tiles, borders with appropriate width and material of boards shall be provided in design approved by the Engineer-in-charge and maintained uniformly throughout of the length/ width of room/ corridor. Mineral Fibre tiles shall have the following properties:

   (a) Surface: Shall be of approved texture, design and pattern.
   (b) Dimensions: 595mm x 595mm x 16mm thick Beveled Tegular edge type. Size referred to are always module sizes. The nominal panel size may differ depending on the suspension system used.
   (c) Relative humidity: 99% RH resistant.
   (d) Fire resistance: Fire performance as per BS:476 (Part-6 & 7)
   (e) Thermal conductivity: 0.052 W/m–K – 0.057 W/m–K
   (f) Acoustic control: Noise reduction coefficient (NRC) = 0.50 to 0.60
   (g) Light reflectance:>85%.
   (h) Weight: 3.10 Kg/m2 (for 16mm thick) & 5.29 Kg/m2 (for 20mm thick)

(i) Suspension system: Suspension system shall be made of interlocking metal T-grids of hot-dipped all round galvanized steel.

K. ELECTRICAL WORKS

TECHNICAL SPECIFICATIONS –ELECTRICAL WORKS

1.00 GENERAL

It is not the intention to specify completely herein all aspects of design and constructional features of equipment's and details of the work to be carried out, nevertheless, the equipment and work shall confirm in all respects to high standards of Engineering, Design and workmanship and shall be capable of performing in continuous commercial operation in a manner acceptable to the owner who will interpret the meaning of the specifications and drawings and shall have right to reject or accept any work or material which in his assessment is not complete to meet the requirements of this specifications and / or applicable code and standards mentioned elsewhere in this specifications.

2.00 **SCOPE OF WORK**

The scope of work under these specifications shall include design, manufacture, testing, supply, storage, erections, testing and commissioning of various items for complete electrification including labour, tools, tackles and plants etc. as required.

SERVICES

a) For Electrical points, telephone, fire alarm system wiring, cabling connections and their terminations at required points with respective accessories.
b) Laying of conduits, made of PVC/MS with respective accessories.
c) Panel and distribution boards with accessories and their terminations.
d) Raising mains/sub-mains/bus ducts with accessories and their terminations.
e) Earthing system.
f) The scope of work shall also include all minor/ civil works associated with lighting, power panels, Distribution boards, Cables, cable trays, conduits either on surface or in walls or ceiling for light points, switch boxes cutting and chasing the walls, ceiling including refilling, plastering the same.

g) Materials and components not specifically mentioned in the specifications but necessary for satisfactory installations and operations of the system mentioned therein shall be deemed to have been included in the scope of work of this specification and NO extra payment shall be made for the same.

2.02 The installation shall comply in all respects with the requirements of Indian Electricity Act 1910 as amended up to date. Indian Electricity Rules 1956, there under and special requirements, if any of the state electricity boards etc.

DRAWINGS

i) Few drawings showing general layout of building and distribution as such are enclosed with these specifications or can be seen at consultant/ Architect's office. These drawings are meant to give a general Idea to bidder regarding the nature of work covered by these specifications.

ii) No information/Data shown/not shown in these drawings shall relieve the contractor of his responsibility to carry out the work as per these specifications and or drawings after the award of the work. Prices shall not be subject to variation after award of work due to difference in drawings and actual construction drawings released from time to time.

iii) Contractor shall prepare and submit shop drawings to the consultant for his approval, detailed shop drawings of all system of wiring, Distribution boards, panels etc. All work shall be carried out on the approval of these drawings. However approval of these drawings does not release the contractor of his responsibility with the intent of the specifications.

METALLIC CONDUIT WIRING SYSTEM

Scope

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

Application

(i) Recessed conduit is suitable generally for all applications. Surface conduit work may be adopted in places like workshops, plant rooms, pump rooms, wiring above false ceiling/below false flooring, and at locations where recessed work may not be possible to be done. The type of work, viz. surface or recessed, shall be as specified in the respective works.

(ii) Flexible conduits may only be permitted for interconnections between switchgear, DBs and conduit terminations in wall.

Material

Conduits

(i) All rigid conduit pipes shall be of steel and be ISI marked. The wall thickness shall be not less than 1.6 mm (16 SWG) for conduits upto 32 mm dia and not less than 2 mm (14 SWG) for conduits above 32 mm dia. These shall be solid drawn or reamed by welding, and finished with galvanized or stove enameled surface.

(ii) The maximum number of PVC insulated cables conforming to IS 694 : 1990 that can be drawn in one conduit will be followed as per CPWD Norms, and the number of cables per conduit shall not be exceeded. Conduit sizes shall be selected accordingly in each run.

(iii) No steel conduit less than 20 mm in diameter shall be used.

Conduit Accessories

(i) The conduit wiring system shall be complete in all respects, including their accessories.

(ii) All conduit accessories shall be of threaded type, and under no circumstances pin grip type or clamp grip type accessories shall be used.

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

(iv) (a) saddles for surface conduit work on wall shall not be less than 0.55 mm (24 gauges) for conduits upto 25 mm dia and not less than 0.9 mm (20 gauges) for larger diameter. The corresponding widths shall be 19 mm & 25 mm.

(b) The minimum width and the thickness of girder clips used for fixing conduits to steel joists, and clamps shall be as per CPWD.

ELECTRIC POWER DISTRIBUTION AND WIRING

Introduction

The electric power will be received and distributed in a building, through following means:-

(i) Cabling and switchgear to receive power.

The building is divided into convenient number of parts, each part served by a rising main system to distribute power vertically/horizontally.

(ii) Power flows from rising main through tap-off box to floor main board to final DBs and then to wiring.

(iii) Dedicated circuit for different loads such as lighting, HVAC, power plug loads shall be provided, wherever possible.

(iv) Rising main, which takes care of general lighting and power outlet load of the building, should have independent cables for lighting as well as power, wherever possible. Other loads like lifts, water pump sets, other motor loads are fed by independent cables of suitable capacity fed from properly designed essential/ non-essential LT power panels with suitably designed switchgear having necessary control and safely features.

(v) Therefore the distribution/wiring system essentially consists of provision of cables, switchgear, rising main, bus-ducting, earthing, laying of pipes/ conduits etc. (in surface or recess) based on proper detailed designing to decide on various sizes/ capacities of these components and various controls and safeties involved, to provide an efficient, reliable, safe and adequate electrical distribution and wiring system.

(vi) A typical schematic diagram of power distribution of a building is enclosed. (See Fig. 3)

System of Distribution and Wiring

(i) The wiring shall be done from a distribution system through main and/or branch distribution boards. The system design and location of boards will be properly worked out.

(ii) Each main distribution board and branch distribution board shall be controlled by an incoming circuit breaker/linked switch with fuse. Each outgoing circuit shall be controlled by a circuit breaker/switch with fuse

(iii) For non-residential and residential buildings as far as possible DBs shall be separate for light and power.

(iv) Only MCCB/MCB/HRC fuse type DBs shall be used. Re-wirable type fuses shall not be used.

(v) Three phase DBs shall not be used for final circuit distribution as far as possible.

(vi) 'Power' wiring shall be kept separate and distinct from light wiring, from the level of circuits, i.e., beyond the branch distribution boards. Conduits for light/power wiring shall be separate.

(vii) Essential/non-essential/UPS distribution each will have a completely independent and separate distribution system starting from the main, switchboard upto final wiring for each system. As for example, conduit carrying non-essential wiring shall not have essential or UPS wiring. Wiring for essential and UPS supply will have their own conduit system. No mixing of wiring is allowed.

(viii) Generally, no switchboard will have more than one source of incoming supply. More than one incoming supply will be allowed only at main board with proper safety and interlocking so that only one source can be switched on at a time.

(ix) Each MDB/DB/Switch Board will have reasonable spare outgoing ways for future expansion.

(x) Balancing of 3-phase circuit shall be done.

Wiring

Sub-main & Circuit Wiring

(a) **Sub-main Wiring**

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

(b) Circuit Wiring

Circuit wiring shall mean the wiring from the distribution board to the 1st tapping point inside the switch box, from where point wiring starts.

Measurement of Sub main and Circuit Wiring

(i) Circuit and sub main wiring shall be measured on linear basis along the run of the wiring. The measurement shall include all lengths from end to end of conduit or channel as the case may be, including Protective (loop earthing) conductors, which are run along the circuit wiring and the submain wiring, but exclusive of interconnections inside the switchboard etc. The increase on account of diversion or slackness shall not be included in the measurement.

(ii) The length of circuit wiring with two wires shall be measured from the distribution board to the nearest switch box from which the point wiring starts. Looping of switch boxes also will be counted towards circuit wiring, measured along the length of conduit/channel

(iii) When wires of different circuits are grouped in a single conduit/ channel, the same shall be measured on linear basis depending on the actual number and sizes of wires run.

Note: Conduit carrying submain will not carry circuit/point wiring. Similarly conduit carrying circuit wiring will not carry submain/point wiring. Conduit carrying point wiring will not carry submain/circuit wiring.

Measurement of Other Wiring Work

Except as specified above for point wiring, circuit wiring and sub-main wiring, other types of wiring shall be measured separately on linear basis along the run of wiring depending on the actual number and sizes of wires run.

POINT WIRING

Definition

A point (other than socket outlet point) shall include all work necessary in complete wiring to the following outlets from the controlling switch or MCB.

(a) Ceiling rose or connector (in the case of points for ceiling/exhaust fan points, prewired light fittings, and call bells).
(b) Ceiling rose (in case of pendants except stiff pendants).
(c) Back plate (in the case of stiff pendants).
(d) Lamp holder (in the case of goose neck type wall brackets, batten holders and fittings which are not prewired).

Scope

Following shall be deemed to be included in point wiring:

(a) Conduit/channel as the case may be, accessories for the same and wiring cables between the switch box and the point outlet, loop protective earthing of each fan/ light fixture.
(b) All fixing accessories such as clips, screws, Phil plug, rawl plug etc. as required.
(c) Metal or PVC switch boxes for control switches, regulators, sockets etc, recessed or surface type, and phenolic laminated sheet covers over the same.
(d) Outlet boxes, junction boxes, pull-through boxes etc. but excluding metal boxes if any, provided with switchboards for loose wires/conduit terminations.
(e) Control switch or MCB, as specified.
(f) 3 Pin or 6 pin socket, ceiling rose or connector as required. (2 pin and 5 pin socket outlet shall not be permitted.)
(g) Connections to ceiling rose, connector, socket outlet, lamp holder, switch etc.
(h) Bushed conduit or porcelain tubing where wiring cables pass through wall etc.

(Note: In areas where false ceiling are provided, termination of wires should be at the fittings. Flexible conduits from ceiling junction box to the fittings shall be provided duly coupled at both ends. This shall be included within the scope of point wiring.)

(i) Interconnecting wiring between switches within the switch box on the same circuit.

Twin Control Light Point Wiring

I. A light point controlled by two numbers of two way switches shall be measured as two points from the fitting to the switches on either side.
II. No recovery shall be made for non-provision of more than one ceiling rose or connector in such cases.

Wiring System

I. Wiring shall be done only by the looping system. Phase/live conductors shall be looped at the switch box. For point wiring, neutral wire/earth wire looping for the 1st point shall be done in the switch box; and neutral/earth looping of subsequent points will be made from point outlets.
II. In wiring, no joints in wiring will be permitted any where, except in switch box or point outlets, where jointing of wires will be allowed with use of suitable connector.
III. The wiring throughout the installation shall be such that there is no break in the neutral wire except in the form of linked switchgear.
IV. Light fans and call bells shall be wired in the 'lighting' circuits. 15A/16A socket outlets and other power outlets shall be wired in the 'power' circuits.
V. Colour Coding
Following colour coding shall be followed in wiring:

Phase: Red/Yellow/Blue.(Three phase wiring)

Live: Red (Single phase wiring)

Neutral: Black

Earth: Yellow/Green.

(**vi) Termination of Circuit into Switchboard**

Circuit will consist of phase/neutral/earth wire. Circuit will terminate in a switch board (first tapping point, where from point wiring starts) in following manner:

Phase wire terminated in phase connector.

Neutral wire terminated in neutral connector.

Earth wire terminated in earth connector.

The switchboard will have phase, neutral and earth terminal connector blocks to receive phase/ neutral/ earth wire.

Run of Wiring

(i) The type of wiring shall be as specified in the tender documents namely, surface conduit/recessed conduit, steel/PVC, channel.

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

(iii) Above false ceiling, in no case, open wiring shall be allowed. Wiring will be done in recessed conduit or surface steel conduit.

(iv) In recessed conduit system, routes of conduit will be planned, so that various inspection boxes provided don't present a shabby look. Such boxes can be provided 5 mm above plaster level, and they can be covered with plaster of paris with marking of junction boxes.

(v) Where number of electrical services like electrical wiring, telephone wiring, computer cabling, pass through corridors, it may be proper to plan such service with properly designed aluminium/PVC channels duly covered by a false ceiling, so that subsequently such service can be maintained and additional cables can be provided.

(vi) Generally conduits for wiring will not be taken in floor slabs. When it is unavoidable, special precaution to be taken to provide floor channels, with provision for safety and maintenance. Alternatively false flooring can be provided.

PASSING THROUGH WALLS OR FLOORS

I. When wiring cables are to pass through a wall, these shall be taken through a protection (steel/ PVC) pipe or porcelain tube of suitable size such that they pass through in a straight line without twist or cross in them on either porcelain, PVC or other approved material.
II. All floor openings for carrying any wiring shall be suitably sealed after installation.

Joints in Wiring

I. No bare conductor in phase and/or neutral or twisted joints in phase, neutral, and/or protective conductors in wiring shall be permitted.
II. There shall be no joints in the through-runs of cables. If the length of final circuit or sub main is more than the length of a standard coil, thus necessitating a through joint, such joints shall be made by means of approved mechanical connectors in suitable junction boxes.
III. Termination of multi stranded conductors shall be done using suitable crimping type thimbles.

Capacity of Circuits

Lighting circuit shall feed light/fan/ call bell points. Each circuit shall not have more than 800 Watt connected load or more than 10 points whichever is less. However, in case of CFL points where load per point may be less, number of points may be suitably increased.

I. Power circuit in non-residential building will have only one outlet per circuit.
II. Each power circuit in residential building can feed following outlets:
(a) Not more than 1 Nos. 16A outlets.
(b) Not more than 1 No.16A and 1 Nos. 6A outlets.

Socket Outlets

I. Socket outlets modular type shall be 6A 5 pin, 16 Amp 3 pin or 16/6 Amp 6 pin. The third pin shall be connected to earth through protective (loop earthing) conductor. 2 pin sockets shall not be permitted to be used.
II. Conductors connecting electrical appliances with socket outlets shall be of flexible type with an earthing conductor for connection to the earth terminal of plug and the metallic body of the electrical appliance.
III. Where specified, shutter type (interlocking type) of sockets shall be used.
IV. Every socket outlet shall be controlled by a switch or MCB, as specified. The control switch/MCB shall be connected on the 'live' side of the line.
V. Unless and otherwise specified, the control switches for the 6A and 16A socket outlets shall be kept along with the socket outlets.

Cables

I. Copper conductor cable only will be used for sub main/ circuit/ point wiring.
II. Minimum size of wiring:
Light Circuit Wiring: 2.5 Sq.mm

Light Point Wiring: 1.5 sq.mm.

Power Wiring: 4.0 sq.mm.

(iii) Insulation: Copper conductor cable shall be PVC insulated conforming to BIS Specification.

(iv) Multi stranded: Cables are permitted to be used.

Wiring Accessories

a) Control Switches for Point
    i. Control switches (single pole switch) carrying not more than 16A shall be modular type. The switch shall be 'On' when the knob is down.
    ii. Modular type switches to be provided All types of points as may be decided by the Architect/ user department.
b) Switch Box
    i. Switch box shall be hot dip galvanized, factory fabricated, suitable in size for surface/ recess mounting and suitable in size for accommodating the required number of switches and accessories.
    ii. Switch box also can be of non-metallic material. The technical sanctioning authority will approve specified makes of reputed quality and specifications.

Fittings

Types : The type of fittings shall be as specified in tender documents.

Indoor Type Fittings

I. Where conductors are required to be drawn through tube or channel leading to the fitting, the tube or channel must be free from sharp angles or projecting edge, and of such size as will enable them to be wired with the conductors used for the final circuit without removing the braiding or sheathing. As far as possible all such tubes or channels should be of sufficient size to permit looping back.

II. Wires used within prewired fittings shall be flexible with PVC insulation and 14/0.193 mm (minimum) copper conductors. The leads shall be terminated on built-in-terminal block, ceiling rose or connector, as required.

III. Fittings using discharge lamps shall be complete with power factor correction capacitors, either integrally or externally. An earth terminal with suitable marking shall be provided for each fitting for discharge lamps.

IV. Fittings made of CRCA shall be phosphatized and powder/epoxy painted.

Outdoor Fittings

Outdoor fittings shall have suitable IP protection. It is preferable that street light fittings are of cast Aluminium body of IP 65, for reducing recurring maintenance cost and improved performance. Wherever required, IP 66 fittings also can be provided for reducing maintenance frequency and cost.

POSITION OF POINTS, DISTRIBUTION BOARDS & SWITCHBOARDS

a) The recommended position of the light point, control switches, distribution boards as shown on the drawings shall be adhered to as far as practicable. In case of location changes due to Architectural requirements, no extra payments will be made on this account.
b) Should there be any discrepancy or incomplete description ambiguity or emission in the drawings or in other documents whether original or supplementary forming the contract, the tenderer shall immediately on discovering the same shall draw attention of the Architect / consultant.

c) Before commencement of work, the exact final position of all points, switch boxes and the distribution boards shall be ascertained by the tenderer from the Architects / Consultants.

SAMPLES

The contractor shall submit 2 sets of samples of accessories and apparatus; he proposes to use in the installations, at site for approval a required. This specification shall not be departed from without any written instructions from the consultants.

MANUFACTURER'S INSTRUCTIONS.

Where manufacturers have furnished specific instructions relating to the material/ equipment to be used in this job, covering points, not specifically mentioned in these documents, manufacturer's instructions shall be followed.

MATERIALS AND EQUIPMENTS

All the materials and equipments shall be of approved make and design, Unless otherwise called for, only the best quality materials and equipment shall be used.

PRICES

Prices shall remain firm and free from variations due to rise in the cost of materials/ labour during the stipulated period of execution and during extended period of Completion of project.

LIST OF APPROVED MAKE, BRANDS &MANUFACTURERS

All materials to be used for furnishing & interior work is to be of following approved make, manufacturers other than listed below may also be considered at the discretion of the Engineer in charge/ Architect.

Unless otherwise mentioned, any one of the following approved makes or brands shall only be allowed to be used. In case of non-availability due to any verifiable reason, EIC may allow alternate brand(s), if sufficient options are not available. In case of a product not mentioned in the list, material/brand/model needs to be approved by Engineer-in-Charge and/or Architect, before use.

FOR CIVIL/ INTERIOR WORKS

SR NO	MATERIAL	APPROVED MANUFACTURER / SUB CONTRACTOR / SUPPLIERS
1	Cement	Ultra Tech, ACC, Ambuja
2	White cement	Birla, J.K.
3	Carpet Flooring	Belgotex, Welpsun or as similar approved
4	Wood Preservative	ASCU PS-2 or equivalent
5	Tile adhesive cement and joint filling compound	MYK Laticrete, Ardex,
6	Glazed tiles (1st Quality)	Kajaria, Somany, Orient Bell, Johnson
7	Vitrified tiles (1st Quality)	Kajaria, Somany, Orient Bell, Johnson
8	Ceramic tiles(1st Quality)	Kajaria, Somany, Orient Bell, Johnson
9	Plasterboard wall	Gyproc or equivalent
10	Insulation Wool	U.F. Twiga, Crown, Lloyd
11	Charcol flute panel	Ventura, Euro prateek
12	Double Side tape	SGG PlaniFIX or equivalent
	HARDWARE /PAINT/PLYWOOD	
13	Hinges and hardware	Hafele, Hettich,Vedic or equivalent
14	Paint-Plastic Emulsion/ Exterior/ OBD/ Luster	Asian paint, ICI Dulux, Burger, Nerolac

15	Fire retardant paint	Akzonnobel, Newkem, Viper
16	Texture paint	Asian Royale Play, Oikos or equivalent
17	Surface texture wall coating	Unitile, OIKOS, Asian, Acro paints
18	Locks	Godrej, Kich, Hetich, Hafele or equivalent
19	Laminate	Greenlam, Formica, Century, Archid, Merino, Duro
20	Block board/Plywood	DURO Primium, Green ply (only green ply not subsidiary ply accepted like Ecotech), Century (only century ply not subsidiary ply accepted like Sanik), Archid Assam Only. All ply certificate must be supplied at site by company
21	BWP Board/ply	DURO Primium, Green ply (only green ply not subsidiary ply accepted like Ecotech), Century (only century ply not subsidiary ply accepted like Sanik), Archid Assam Only. All ply certificate must be supplied at site by company
22	Soft Board	Sitatex or equivalent
23	Veneer	Archid, Century, Green Lam, Duro
24	Acrylic solid Surfaces	Cori an(Du-point), LG, Marino
25	Stainless steel handle	Kich, Dorma, Geze, Hafele, ozone
26	Floor spring / Door closer / fittings	Dorma, Hafele, Geze, Ozone, Vedic
27	Flush Doors	Archid, Century, Greenply
28	Fire retardant fabric	RSWM, Arvind, Mafatlal
29	Wall paper	Poly décor, Marshal, Green Terrior
30	Glass/ Mirror/ lacquered	Asahi, Saint Gobain, Modiguard or Equivalent
31	UPVC Window	Veka, Fenesta, LG Hausys, Rehau or equivalent
32	Blind	Vista, Mac, Hunter Douglus Or Equivalent
	FURNITURE	
33	Chairs, tables, sofas, storage units, other furniture	Godrej/Durian/ BP Ergo / Wipro/Spark

FOR FALSE CEILING & MISC ITEMS

Sr No	**Material**	**Approved Manufacturer / Subcontractor / Suppliers**
	False Ceiling	
1	Calcium Silicate false ceiling	Gyproc , USG or Equivalent
2	Gypsum board	India Gypsum/ USG Boral / Saint Gobain, Gyproc
3	GI Section	Saint Gobain, Gyproc/India Gypsum/ USG Boral
4	Open Cell Ceiling	Durlum / Armstrong/saint gobain
5	Aluminum false ceiling	Durlum / Armstrong/ saint gobain
6	Acoustical false ceiling & Paneling	Armstrong / Ecophone/ AMF / saint gobain /USG Boral
7	Stretch Ceiling	Euroceil or equivalent
8	Mineral Fibre Tile Ceiling	Armstrong, Durlum, USG

ELECTRICAL WORKS

Sr. No	**MATERIAL**	**NAME OF MANUFACTURER**
1	Wires (FRLS)	Polycab, Finolex, KEI, Gloster, Havells.
2	Switches , Sockets , face plates, TV, telephone, data outlets and GI back box	Legrand (Mosaic/ Arteor), MK (Blenze), ABB (Cherian), Anchor Roma
3	Conduits	Precision, AKG, BEC
4	Electrical panels	CPRI Approved
5	Distribution boards	Legrand , Siemens, Schneider, L&T.(double door only)
6	Switchgears(ACB/MCCB/MCB)	Legrand, Siemens, Schneider, L&T
7	Cables	Polycab, KEI, Gloster, Havells.
8	Chemical earthing	Indelec

9	Light Fitting	Philips / Havells / Jaquar / Wipro
10	Underfloor Raceway	MK, Legrand
11	CAT 6 Cabling	TE Connectivity (AMP Netconnect)/ Systimax/ ADC Krone/ Panduit/ Siemon
12	Patch Panel	TE Connectivity (AMP Netconnect)/ Systimax/ ADC Krone/ Panduit/ Siemon
13	Switches	Legrand or equivalent
14	Racks	Valrack or equivalent
15	Intelligent addressable Fire alarm system	Honeywell/ Essar/ Johnson/ Siemens or equivalent
16	Public address system	Bosch, Honey well, Yamaha or equivalent
17	UPS	Emerson, Schenider, APC or equivalent
18	Exhaust fan	Usha/Bajaj/Crompton/Havells
19	Emergency Exit Light Fixture	Prolite
20	Batteries	Exide /Amaron/ Amara Raja
21	Cable Tray	UB/Profab/Legrand

The Contractor shall supply ISI marked material as per any of the makes or brands indicated above. In case ISI marked material for any of the brands is not being manufactured, first quality material shall be accepted. The samples of the material shall in either case have to be got approved form the Engineer.

Material where no make/brand has been mentioned, ISI marked samples shall be submitted by the Contractor for approval of Site Engineer. For those classes of materials, where no firm exists with ISI approval, sample of first quality material of the firm shall be submitted for the approval of the Site Engineer.