TENDER DOCUMENT

TENDER No: NERO/CON/735/353 dated 24.06.2019

FOR

TENDER FOR PROVIDING AND FIXING OF FALSE CEILING WORKS FOR THE PROJECT EXTENSION OF ACADEMIC COMPLEX PHASE V AT IIT GUWAHATI CAMPUS, GUWAHATI

VOLUME–II

NOTICE INVITING TENDER

ADDITIONAL CONDITIONS OF CONTRACT

TECHNICAL SPECIFICATIONS

DRAWINGS
ENGINEERING PROJECTS (INDIA) LTD.
(A Govt. of India Enterprise)

Tender No. NERO/CON/735/353 Dated 24.06.2019

NOTICE INVITING e-TENDER

TENDER FOR PROVIDING AND FIXING OF FALSE CEILING WORKS FOR THE PROJECT EXTENSION OF ACADEMIC COMPLEX PHASE V AT IIT GUWAHATI CAMPUS, GUWAHATI

Engineering Projects (India) Ltd., on behalf of Ministry of Home Affairs invites percentage rate open e-Tenders through e-tendering from the eligible contractors/firms who fulfill the eligibility criteria as per the brief particulars of scope for Construction of Boundary Wall for Sector HQ at Khatla, Mizoram, in single stage Two Envelope system (Technical bid & Price bid) for the following works:

<table>
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<tr>
<th>Sl. No.</th>
<th>NAME OF WORK</th>
<th>ESTIMATED COST (Rs.)</th>
<th>TIME OF COMPLETION</th>
<th>EMD DEPOSIT (Rs.)</th>
<th>TENDER FEES (Rs.)</th>
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<tr>
<td>1</td>
<td>PROVIDING AND FIXING OF FALSE CEILING WORKS FOR THE PROJECT EXTENSION OF ACADEMIC COMPLEX PHASE V AT IIT GUWAHATI CAMPUS, GUWAHATI</td>
<td>Rs. 1,13,48,352.00 (One Crore Thirteen Lakhs Forty Eight Thousand Three Hundred Fifty Two only)</td>
<td>03 (Three) Months</td>
<td>Rs. 1,13,500.00 (Rupees One Lakh Fifty Eight Thousand only)</td>
<td>Rs. 5,900.00 (Rupees Five Thousand Nine Hundred only) (GST @ 18% included)</td>
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</table>

The brief scope of work included in this tender shall include providing all labour, materials, tools and plant, transportation to site, storage and safe custody of the materials, earthwork in excavation, earthwork in filling, PCC, RCC, drains etc. as required in SUPPLY & FIXING OF FALSE CEILING WORKS FOR THE PROJECT EXTENSION OF ACADEMIC COMPLEX PHASE V AT IIT GUWAHATI CAMPUS, GUWAHATI on item rate tender basis as per bill of quantities and tender conditions. Apart from above, any other service but required as per direction of EPI/IIT for completion of works are deemed to be included in the scope of work.

The detailed scope of work is given in tender document.

Time schedule of Tender activities:

(i) Last Date & Time for Downloading of tender documents: 15.07.2019 up to 10:00 am.
(ii) Last Date & Time of submission of Tenders (online and physical documents): by 15.07.2019 upto 11:00 am.
(iii) Date & Time of online opening of tenders (Techno-Commercial Bid): 15.07.2019 at 02.30 pm.

1.0 Contractors who fulfill the following basic qualifying requirements are eligible to participate in this tender. The joint ventures/Consortium is not accepted.
a) The bidder must have experience of having satisfactorily completed following “similar works” during the last 7(seven) years ending last day of month previous to the one in which applications are invited.

a) Three similar works each of costing minimum not less than 40% of the estimated cost put to the tender.

OR

Two similar works each of costing minimum not less than 60% of the estimated cost put to the tender.

OR

One similar work costing minimum not less than 80% of the estimated cost put to the tender.

i) The “similar works” shall mean “Building Works including False Ceiling & allied Works”.

ii) The cost of free issue materials shall not be included in the completion cost of works.

iii) For evaluation purpose, the completion cost of works mentioned in the completion certificate shall be enhanced by 7% per annum till the end of month prior to date of NIT.

b) Should have average annual financial turnover amounting at least 30% of the estimated cost of the work during the last three consecutive financial years ending on 31.03.2018 duly certified by Chartered Accountant supported by audited copies of financial statements.

c) Should not have incurred any loss in more than two years during the immediate last five consecutive financial years, ending 31.03.2018, Copies of balance sheet/Certificate from Chartered Accountant duly self attested by the tenderer shall be submitted.

d) Should have a Solvency of 40% of the estimated cost issued by his bankers in the name of the bidder. The Solvency Certificate should not have been issued earlier than one year of last date of submission of the tender.

e) Should have valid Permanent Account Number of Income Tax and GST registration certificate.

f) Should have valid PF Registration number. In case the bidder does not have this registration number, he shall remain bound to obtain them within one month from the date of LOI or before release of 1st R/A bill whichever is earlier.

g) Bid Capacity: The bidding capacity of the tenderer should be equal to or more than the estimated cost of the work put to Tender.

The Bidding capacity shall be worked out by the following formula:

\[
\text{Bidding Capacity} = [A \times N \times 2] - B
\]

Where,
A = Maximum value of construction works executed in any one year during the last five years taking into account the Completed as well as works in progress ending last day of the month previous to the one in which applications invited.
N = Number of years prescribed for completion of work for which bids have been invited
B = Value of existing commitments and ongoing works to be completed during the period of completion of work for which bids have been invited. The Tenderer is requested to furnish the existing commitments of works under execution along with stipulated period for completion of remaining for each of the work should be furnished in an affidavit on non-judicial stamp paper of value of Rs. 100/- duly certified that the particulars furnished are correct as per the Performa in Annexure-A

h) Site visit for the subject tender is mandatory. The bidders shall visit the site to Study/assess the tendered work and also acquaint themselves of the prevailing local conditions & detail requirement of the project work before submitting their bid. Bidder has to enclose a certificate counter signed by EPI official or furnish undertaking for having visited the site.

i) Bidders who intend to get exemption from submission of Tender fee and EMD shall submit confirmation letter whether they are registered under MSME Act or not and if yes, then relevant copies of the registration letter (Registered under single point registration scheme of NSIC, Govt. of India, Ministry of MSME, New Delhi) vide Gazette Notification dated 26.03.2012 along with the form of Memorandum-2 (with the concerned DIC) certificate in the appropriate category and limit as applicable under the present tender to be enclosed in Technical Bid and a request letter for exemption from submission of Tender fee and EMD.

j) Even though an applicant may satisfy the eligibility criteria, EPI reserves the right for not issuing the tender document if he has record of poor performance such as abandoning work, not properly completing the work, delay in execution of work, poor quality of work, financial failure / weakness etc.

k) The experience certificates issued by Government Organizations / Semi Government Organizations/ State Government / Public Works Department / Central Government /Public Sector Undertakings/ Autonomous Bodies/Municipal Bodies/Public Limited Companies listed on BSE/NSE shall only be accepted for assessing the eligibility of the tenderer. However, the certificates issued by Public Limited Company and Private Party can be considered only if they are supported by TDS certificates/Turnover Certificate from Chartered Accountant in support of value of work done by the tenderer.

l) Completion certificates from the client shall be in the name of the company who is submitting the tender. The contractor has to produce original documents for their verification as and when demanded by EPI. The tender of any tenderer shall be rejected if on detailed scrutiny; documents submitted along with the tender are found to be unsatisfactory / forged. The decision of EPI in this regard shall be final and the binding on the tenderer.
m) Relevant experience certificates and other documents as mentioned above fulfilling the qualifying criteria duly self-attested by the tenderer shall be enclosed in Envelope-1. Completion Certificates from clients shall be in the name of the Company who is submitting the tender. The bidder has to produce original documents for verification at the time of opening of tender or as and when demanded. The Tender of any tenderer shall be rejected if on detailed scrutiny, documents submitted along with the tender are found to be unsatisfactory. The decision of EPI in this regard shall be final and binding on the tenderer.

n) The tenderers may note that they are liable to be disqualified and not considered for the opening of Price Bid if;
   a) Representation in the forms, statements and attachments submitted in the pre-qualification document are proved to be incorrect, false and misleading.
   b) They have record of poor performance during the past 10 (ten) years such as abandoning the work, rescinding of contract for which the reasons are attributable to the non-performance of the contractor, inordinate delay in completion, consistent history of litigation / arbitration awarded against the contractor or any of its constituents or financial failures due to bankruptcy etc. in their ongoing / past projects.
   c) They have submitted incompletely filled in formats without attaching certified supporting documents and credentials to establish their eligibility to participate in the Tender.
   d) If the tenderers attempt to influence any member of the selection committee.

EPI reserves its right to take appropriate action including disqualification of tenderer(s) as may be deemed fit and proper by EPI at any time without giving any notice to the contractor in this regard. The decision of EPI in the matter of disqualification shall be final and binding on the Tenderers.

The credentials of the Bidders shall be verified and inspection of the works, if required, to be carried out by EPI. If not found satisfactory, their bid will be considered non-responsive.

2.0 Tender documents comprising of the following are available on the website of EPI: www.engineeringprojects.com, CPP-Portal: www.eprocure.gov.in and as well as on MSTC portal https://www.mstcecommerce.com/eprochome/EPIL.

   Volume I: Instructions to Tenderers, Addendum to Instructions to Tenderers, Special Instructions to Bidders for e-Tendering & General Conditions of Contract (ITT&GCC) of EPI
   Volume II: a) Notice inviting Tender
            b) Additional Conditions of Contract
            c) Technical Specifications
            d) Tender Drawings (as mentioned in the list)
   Volume III: Price bid/bill of quantity

3.0 In order to participate, the bidder should have Digital Signature Certificate (DSC) from one of the authorized Certifying Authorities.
4.0 Interested bidders have to necessarily register themselves on the portal http://www.mstcecommerce.com/eprochome/EPIL through M/s MSTC Ltd., Kolkata to participate in the bidding under this invitation for bids. It shall be the sole responsibility of the interested bidders to get themselves registered at the aforesaid portal for which they are required to contact M/s MSTC Ltd., Kolkata at following address to complete the registration formalities:

M/s MSTC Ltd.,
Registered office at 225-C,
Acharya Jagdish Chandra Bose Road,
Kolkata - 700020

They may obtain further information regarding this tender from GM (Contracts) at the address given at Clause No. 18.0 below from 10:00 hours to 17:00 hours on all working days till the last date of online submission of Bidding Documents.

For proper uploading of the bids on the portal namely http://www.mstcecommerce.com/eprochome/EPIL (hereinafter referred to as the ‘portal’), it shall be the sole responsibility of the bidders to apprise themselves adequately regarding all the relevant procedures and provisions as detailed at the portal as well as by contacting M/s MSTC Ltd., directly, as and when required, for which contact details are mentioned above. The EPI in no case shall be responsible for any issues related to timely or properly uploading/submission of the bid in accordance with the relevant provisions of Section Instruction to Bidders of the Bidding Documents.

5.0 Bidders can download the bid document from the portal without paying document fees in advance; however, interested bidders have to pay tender fees for participating in the tendering and submitting the bid. For this purpose the interested bidders shall be required to pay ₹ 5,900.00 (Rupees Five Thousand Nine Hundred only, GST @ 18% included), the GSTIN of EPI for Assam is 18AAACE0061C1ZC as non-refundable document fees in the form of Demand Draft in favour of “Engineering Projects (India) Ltd.” payable at Guwahati. The fees to be paid to MSTC are separate.

6.0 E-Bids must be submitted/uploaded along with scanned copies of relevant documents as mentioned at “Addendum to Instructions to Tenderers” on the MSTC portal on or before last date & time of online bid submission. Late bids will not be accepted.

The bid must be accompanied by Earnest Money Deposit (EMD) of 1,13,500.00 (Rupees One Lakh Thirteen Thousand Five Hundred only). This shall be in the form of Crossed Demand Draft or Pay Order (in CTS form) of any Nationalized Bank/Scheduled Bank for the full amount of EMD payable favouring “Engineering Projects (India) Ltd.”, payable at Guwahati. The EMD shall be valid for minimum period of 150 days (one hundred fifty days) from the last day of submission of tender. Tenders submitted without EMD or inadequate amount of EMD shall be rejected. The bid shall be valid for 90 days from date of opening of Price Bid.

Tender fee, EMD (In original), Power of Attorney, NSIC/MSME(Registered under single point registration scheme of NSIC, Govt. of India, Ministry of MSME, New Delhi vide Gazette Notification dated 26.03.2012 along with the form of
Memorandum-2 with the concerned DIC) certificate as per Clause No.1 (i) if bidder is claiming EMD/Tender fee exemption must be submitted in physical form at the address given at Clause No. 14.0 below as stipulated under Time Schedule of Tender Activities. If the above documents are not received in time then their offer shall not be considered and EPI shall not be responsible for any postal delay in respect of submission of hard copy part of the bids.

7.0 The Terms & Conditions contained in the NIT and tender document shall be applicable.

8.0 The tenderers should note that the credentials such as value and volume of works completed, as submitted by the tenderers along with their offers shall be forwarded by EPI to Client for his opinion. The offer of tenderers against whom client does not give satisfactory remarks shall be rejected by EPI.

9.0 The corrigendum or addendum, extension, cancellation of this NIT, if any, shall be hosted on the EPI's website/CPP portal as well as on MSTC portal https://www.mstcecommerce.com/eprochome/EPIL the bidders are required to check these websites regularly for this purpose, to take into account before uploading/submission of tender. All Corrigendum and addendum are to be uploaded duly signed & stamped with tender documents as bid Annexure.

10.0 The tenderers should note that the credential such as value and volume of works completed as submitted by the tenderers along with their offers may be forwarded by EPI to the owner, DGAR for his opinion. The offer of the tenderers against whom the Owner does not give satisfactory remarks shall be rejected by EPI.

11.0 The price bid of those bidders who are found to be prima-facie techno-commercially acceptable based on the documents submitted at the time of bid submission and subject to confirmation of authenticity of the PQ documents/ EMD /Tender fee from the concerned department/ bank with prior intimation to them. Hence the intending bidders must furnish their e-mail id and contact phone number along with the techno-commercial part. In case the PQ documents such as work experience certificate, bank solvency certificate etc submitted by a bidder is found to be fake the EMD submitted by him shall be forfeited by EPI without making any reference to him. Further such a tenderer shall be at a risk of losing his right to participate in any tender called by EPI for a minimum period of one year.

12.0 EPI reserves the right to accept any tender or reject any or all tenders or split the work of tender or annul this tendering process without assigning any reason and liability whatsoever and to re-invite tender at its sole discretion.

13.0 In case of tie-tender, where two firms are bidding lowest, EPI reserves the right to split the work among these bidders and / or EPI will reserve the right to award the tender to any one of such bidder.

14.0 Tender documents shall be issued by and submitted to:
  General Manager
  Engineering Projects (India) Ltd.
  North Eastern Regional Office
  4th Floor, Hindustan Tower,
  Jawahar Nagar, National Highway No.37,
  Guwahati (Assam) -781022 (Tel No. 8486653300)
15.0 Contact details for site related quarries:
Shri U. Patowary, DGM, EPI
Mobile No. – 9436779102

Shri Kishor Kalita, S/I, IIT Guwahati Site
Mobile No: 9435561629

For more information on EPI, visit our website at: http://www.engineeringprojects.com
For more information on the e-tender, visit website of M/s MSTC: at https://www.mstcecommerce.com/eprochome/EPIL

General Manager (Contracts)
**BID CAPACITY**

**Name of the Work:** TENDER FOR PROVIDING AND FIXING OF FALSE CEILING WORKS FOR THE PROJECT EXTENSION OF ACADEMIC COMPLEX PHASE V AT IIT GUWAHATI CAMPUS, GUWAHATI

**NIT No:** NERO/CON/735/353 Dated 24.06.2019

**ESTIMATED COST PUT TO TENDER:** Rs. 1,13,48,352.00

Bid Capacity: The bidding capacity of the contractor should be equal to or more than the estimated cost of the work put to Tender. The bidding capacity shall be worked out by the following formula:

\[
Bidding \text{ Capacity} = [A \times N \times 2] - B
\]

Where,

- A = Maximum value of construction works executed in any one year during the last five years taking into account the completed as well as works in progress
- N = Number of years prescribed for completion of work for which bids have been invited
- B = Value of existing commitments and ongoing works to be completed during the period of completion of work for which bids have been invited (Format enclosed)

**BID CAPACITY CALCULATION BY BIDDER**

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**SIGN & STAMP OF BIDDER**
ANNEXURE-A

AFFIDAVIT
(To be typed on Rs. 100/- non-judicial stamp paper)

I/We .......................................aged ..............years son of .......................................do hereby solemnly affirm and declare as follows for and on behalf of the Firm:

LIST OF EXISTING COMMITMENT AND ONGOING WORKS

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<tr>
<th>Sl. No.</th>
<th>Name of Works</th>
<th>Client Name &amp; Address</th>
<th>Work Order Value (in Rs)</th>
<th>Work Executed till Date (Rs)</th>
<th>Balance Amount of work to be completed (Rs)</th>
<th>Balance period to complete the works (Total months)</th>
<th>Work to be completed in 03 months (Rs)</th>
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Balance Commitments during 03 months as per NIT Rs.

It is certified that the above particulars furnished are true and correct. If any information given is found to be concealed at a later date, the Contract will be terminated forthwith without prejudice to the rights thereon consequent on termination and the bidder will be blacklisted. I/We agree for debarring tendering for one year if any facts are suppressed.

SIGN AND STAMP OF BIDDER
ADDITIONAL CONDITIONS OF CONTRACT (ACC)

1.0 The following Additional Conditions of Contract shall be read in conjunction with General Conditions of Contract (GCC) of EPI and other conditions of the tender documents. If there are any provisions in these Additional Conditions of Contract, which are at variance with the provisions of GCC and other conditions of the tender documents, the provisions in these Additional Conditions of Contract shall take precedence.

2.0 Engineering Projects (India) Limited has entered into an agreement for execution of the work for “Extension of Academic Complex Phase-V at IITG Campus”. The tender shall include (but not limited to) providing labour, tools and plants, machineries, transport and all other components including all materials (except those which are specifically excluded from scope/present tender as spelt out elsewhere in the tender documents) required for completion of construction work in the buildings as mentioned in the NIT.

3.0 The IIT Guwahati Campus is located on the North Bank of the river Brahmaputra. This is accessible by road via NH 31 as well as via North Guwahati-Hajo Road from the junction point of North approach of Saraighat Bridge and Guwahati Hajo by-lane.

4.0 The word “Contractor” appearing anywhere in the GCC and the other tender documents shall mean the “sub-contractor” i.e. the successful tenderer on whom the work under the present tender is awarded by EPI.

5.0 Clause no 3.0 of GCC shall stand amended as below:

The items of work given in the tender documents are for general guidance of the intending tenderers and the works shall be carried out by the successful tenderer i.e. the sub-contractor on item rate basis in conformity with the detailed drawing, technical specifications, additional conditions of the tender documents (including any addition/modification/alteration/deletion made from time to time therein found essential for completion of works). The sub-contractor shall be deemed to have satisfied himself before tendering as to the sufficiency and correctness of his tender for the works and of the rates and prices quoted in the brief specifications, drawings, scope of work and site conditions (including but not limited to) execution of works at different heights and in different buildings where already classes are being held which rates and prices shall, except as otherwise provided, cover all obligations under the contract and all matters and things found necessary for proper completion and maintenance of the works. It shall be responsibility of the sub-contractor to incorporate the changes that may be in the scope of work envisaged at the time of tendering and as actually required to be executed. The sub-contractor has quoted his rates after clearly studying the scope of work given in Tender Documents and getting fully satisfied with the various items and technical intricacies involved in the work under his scope of work as envisaged in the tender. EPI shall not entertain any claim of the
contractor on account of error or omission by him in this respect except what is admitted by the client.

6.0 No mobilisation advance shall be paid and hence clause no. 8 shall stand deleted.

7.0 Safety Code:

General
Contractor shall adhere of safe construction practice and guard against hazardous and unsafe working conditions and shall comply with Owner's safety rules as set forth herein. Prior to start of construction, Contractor will be furnished of Owner's —Safety Codell for information and guidance, if it has been prepared.

First Aid and Industrial Injuries
(1) Contractor shall maintain first aid facilities for his employee and labours.

(2) Contractor shall make out side agreements for ambulance service and for the treatment of industrial injuries. Names of those providing these services shall be furnished to the Owner prior to start of construction and their telephone numbers shall be prominently posted in Contractor's field office.

(3) All critical industrial injuries shall be reported promptly to the Owner, and a copy of Contractor's report covering each personal injury requiring the attention of a physician shall be furnished to the Owner.

General Rules
Smoking within the battery area, tank farm or dock limits is strictly prohibited. Violators of the no smoking rules shall be discharged immediately

Contractors Barricades
(1) Sub-contractor shall erect and maintain barricades required in connection with his operation to guard or protect.

(a) Excavations.

(b) Hoisting areas.

(c) Areas adjudged hazardous Contractor's or Owner's inspectors.

(d) Owner's existing property subject to damage by Contractor's operations.

(e) Rail road unloading spots.

(2) Sub-contractor's employees and workmen shall become acquainted with owner’s barricading practices and shall respect the provisions thereof.

(3) Barricades and hazardous areas adjacent to but not located in normal routes of travel shall be marked by red flasher lanterns at nights.

Scaffolding
(i) Suitable scaffolding should be provide for workmen for all works that safety be done from the ground or from solid construction except such short period work as can be done safely
from ladders. When a ladder is used an extra Mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well, suitable footholds and handholds shall be provided on the ladder shall be given an inclination not steeper than 1 in 4 (1 horizontal and 4 vertical)

(ii) Scaffolding or staging than 4 meters above the ground or floor, swing suspended from an overhead support or erected with stationary support shall have a guard rail properly attached, bolted, braced and otherwise rewarded at least 3 ft. High above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

(iii) Every opening on the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 1 metre.

(iv) Working platform, gangways and stairways should be so constructed that they should not sag unduly or unequally and if the height of the platform of the gangway or the stairway is more than 4 metres above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in (ii) above.

(v) Safe- means of access shall be provided to all working platforms and other working places, every ladder should be securely fixed. No portable single ladder shall be over 9 metres in length while the width between side rails in rung ladder shall in no case be less than 30cms for ladder up to and including 3 metres in length. For longer ladder this width should be increased at least 5 mm for each additional foot of length. Uniform steps spacing shall not exceed 30 cms. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the site of work shall be so stacked or placed to cause danger or inconvenience to any person or public. The Contractor shall also provide all necessary fencing and light to protect the workers and staff from accidents, and shall be bound to bear the expenses of defence of every suit, action or other proceedings of law that may be brought by any person for injury sustained owing to neglect of the above precautions and pay any damages and costs which may be awarded in any such suit or action or proceedings to any such person or which may with the consent of the Contractor be paid to compromise any claim by any such person.

Excavation and Trenching

All trenches 1.2 metres or more in depth, shall at all times be supplied with at least one ladder for each 50 metres length or fraction thereof. Ladder shall be extended from bottom of the trench to at least 1 metre above the surface of the ground. The sides of the trenches which are 1.5 metres in depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger of sides to collapse. The excavated materials shall not be placed within 1.5 metres of the edge of the trench or half of the trench width whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.
Demolition

(i) Before any demolition work is commenced and also during the progress of the work.
   (a) All road and open areas adjacent to the work site shall either be closed or suitably protected
   (b) No electric cable or apparatus which is liable to be a source of danger shall remain electrically charged.
   (c) All practical precautions shall be taken to prevent danger to persons employed from risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render it unsafe.

(ii) All necessary personal safety equipment as considered adequate by the Engineer-in-charge, should be kept available for the use of the persons employed on the site and maintained in condition suitable for immediate use, and the sub-contractor shall take adequate steps to ensure proper use of equipment by those concerned.
   (a) Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective gloves.
   (b) Those engaged in white washing and mixing or stacking of cement bags or any materials which are injurious to the eyes shall be provided with protective goggles.
   (c) Those engaged in welding and cutting works shall be provided with protective face and eye shields, hand gloves etc.
   (d) Stone breakers shall be provided with protective goggles and protective clothing, and seated sufficiently safe intervals.
   (e) When workers are employed in sewers and manholes, which are in use, the sub-contractor shall ensure that the manhole covers are opened and are ventilated at least for an hour before the workers are allowed to get in to the manholes, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or board to prevent accident to the public.
   (f) The sub-contractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form. Wherever men above the age of 18 years are employed on the work of lead painting, the following precautions should be taken,
      (1) No paint containing lead or lead product shall be used except in the form of paste or ready-made paint.
      (2) Suitable face masks should be supplied for use by the workers when Paints are applied in the form of spray or a surface having lead paint dry rubbed and scrapped.
      (3) Overalls shall be supplied by the sub-contractor to the workmen and adequate facilities shall be provided to enable the working painters to wash them during and on cessation of work.

(iii) When the work is done near any place where there is a risk of drowning, all necessary safety equipment should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

(iv) Use of hoisting machines and tackles including their attachments, anchorage and supports shall conform to the following standards or conditions:-
   (a) These shall be of good mechanical construction, sound materials and adequate strength and free from patent defect and shall be kept in good working order.
   (b) Every rope used in hoisting or lowering materials or as means of suspension shall be of durable quality and adequate strength and free from patent defects.
   c) Every crane driver or hoisting appliance operator shall be properly qualified and no
person under the age of 12 years should be in charge of any hoisting machine including any scaffolding, which or give signals to the operator.

d) In case of every hoisting machine and of every chain ring hook, shackle, swivel, and pulley block used in hoisting or lowering or as means of suspension, the safe working load shall be ascertained by adequate means. Every hoisting machine and all gears referred to above shall be plainly marked with the safe working load of the conditions under which it is applicable which shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.

(e) In case of departmental machine, the safe working load shall be notified by the Engineer-in-charge. As regards his own machineries, the sub-contractor shall notify the safe working load of the machineries to the Engineer-in-charge whenever he brings any machinery to site of work and get it verified by the Engineers concerned.

(v) Motors, gearing transmission, electric wiring and other dangerous part of hoisting appliances should be provided with such means as to reduce to the minimum the accidental descent of the load, adequate precautions should be taken to reduce to the minimum the risk of any part or any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energized, insulating mats, wearing apparel, such as gloves, sleeves, and boots as may be necessary should be provided. The workers shall not wear any rings, watches and carry keys or other materials which are good conductors of electricity.

(vi) All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe conditions and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near places of work.

(vii) These safety provisions should be brought to the notice of all concerned by the displaying on a notice board at a prominent place at the work-spot. The person responsible for compliance of the safety code shall be named therein by the sub-contractor.

(viii) To ensure effective enforcement of the rules and regulations relating to safety precautions, the arrangements made by the Contractor shall be open to inspection by the Welfare Officer, Engineer-in-Charge or safety Engineer of the administration or their representatives.

(ix) Notwithstanding the above clauses there is nothing in these to exempt the contractor from the operations of any other Act or rules in force in the Republic of India. The works throughout including any temporary works shall be carried out in such a manner as not to interfere in any way whatsoever with the traffic on any roads or footpaths at the site or in the vicinity thereto or any exiting works whether the property of the Administration or of a third party. In addition to the above, the sub-contractor shall abide by the safety code provision as per C.P.W.D. Safety Code and Indian standard Safety Code framed from time to time.

8.0 The clause no. 10.0 of GCC shall stand amended as below:

An amount @5% (Five percent) of the gross value of the running bill shall be deducted from each running bill by way of retention money. In case the EMD has been deposited by the sub-contractor in the form of demand draft, the said amount of EMD shall be adjusted first towards the retention money and further recovery of retention money shall commence when the upto date amount of retention money exceeds the amount of EMD deposited in the form of demand draft. The retention money shall become refundable to the sub-contractor at the
end of the defects liability period free of any interest provided always that the sub-contractor has rectified all the defects arising during the defect liability period pertaining to his scope of work, EPI did not have to incur any expenditure in setting right the defects, if any, pertaining to the sub-contractor’s scope of work, the sub-contractor has demolished and removed all structures including foundations and withdrawn fully from the worksite and EPI has received the clearance certificate from the concerned Labour Enforcement Officer/RLC pertaining to the labour etc. deployed by him at the worksite or there is nothing on record against him in the local market affecting functions of EPI. In case EPI has been required to make any expenditure on any of these accounts EPI will keep the retention money till the time all these matters are settled in full including recovery of the expenses, if any, made by EPI from the retention money. Further the sub-contractor has to furnish a ‘No Claim’ certificate to EPI in confirmation of his having no claim on getting refunded the retention money to EPI at the time of claiming refund of retention money.

9.0 The following shall stand added to clause no. 11.0 of GCC:

Water: The contractor shall arrange water fit for the purpose of drinking and construction at his own cost. (Boring is permitted at site)

Power: Owner will supply power at a point near the work site at his discretion from where the contractor will make his own arrangement for distribution. All the works of the contractor shall be done as per Indian Electricity Act and Rules framed there under and approved by the Engineer-in-Charge. The temporary lines will be removed forthwith after the completion of the work or if there is any hindrance caused to the other work due to the alignment of these lines, the contractor will re-route or remove the temporary lines at his own cost. The contractor at his own cost will also provide suitable electric meters, fuses, switches etc. These shall be in the custody and control of the Owner. The cost of power supply shall be payable to the Owner every month at the prevailing rates from time to time or will be deducted from the running account bills.

Owner, however, does not guarantee uninterrupted power supply and this does not relieve the contractor of his responsibility for the timely completion of various works as stipulated, nor any compensation shall be paid to the contractor for any failure or short supplies of Power. The contractor shall therefore make his own arrangement for standby power supply at his own cost.

The coarse and fine aggregates shall conform to the grading as mentioned in the Technical Specification.

Cement of ‘approved make’ shall be provided by EPI on ‘cost recoverable’ basis to the petty contractor, based on landed cost of cement at site, however if the party consumes more cement beyond permissible consumption, the extra consumed shall be charged at Rs. 500.00 per MT above landed cost.

Samples of all tiles and sanitary and plumbing items shall be got approved by EIC before incorporation in the permanent works.

The petty contractor shall make the required arrangements for safe custody of the material to be issued by EPI as well as these brought by him at site at his cost and remain bound to follow the CPWD specifications for storage of cement at site. However, the petty contractor
shall at all times remain bound to give his requirement of above materials to EPI well in advance (not less than 30 days before the date he intends to bring them into use with a tentative schedule of consumption of the materials) to enable to arrange these materials. The petty contractor may associate him or a person duly authorised by him on his behalf with EPI in procurement of the materials. The petty contractor shall also remain bound to construct and maintain proper storage arrangement for safe and proper custody of these materials including their unloading and local handling, keeping watch and ward and proper inventory of such materials.

For sanitary and plumbing works the contractor shall engage a person having valid license for carrying out PHE works.

10.0 Work in monsoon and dewatering

The completion of the work may entail working in monsoon also. The Contractor must maintain minimum labour force as may be required for the job and plan and execute the construction and erection according to the prescribed schedule. No extra rate will be considered such work in monsoon.

During monsoon and other period, it shall be the responsibility of the Contractor to keep the construction work site free from water at his own cost.

11.0 Work on Sundays and holidays

For carrying out work on Sundays and holidays, the Contractor will approach the Engineer-in-Charge or his representative at least two days in advance and obtain permission in writing.

12.0 General conditions for construction and erection mark

The working time at the time of work is 48 hours per week. Over time work is permitted in cases of need and the Owner will not compensate the same. Shift working at 2 or 3 shifts per day will become necessary and the sub-contractor should take this aspect into consideration for formulating his rates for quotation. No extra claims will be entertained by the EPI on this account. The Sub-Contractor must arrange for the placement of workers in such a way that delayed completion of the work or any part thereof for any reason whatsoever will not affect their proper employment. EPI will not entertain any claim for idle time payment whatsoever.

13.0 Setting out works

The Engineer-in-Charge of Owner shall furnish the Contractor with only the four corners of the work site and a level bench mark and the Contractor shall set out the works and shall provide efficient staff for the purpose and shall be solely responsible for the accuracy of such setting out.

The Contractor shall provide, fix and be responsible for the maintenance of all stakes, templates, level marks, profiles and other similar things and shall take necessary precautions to prevent their removal or disturbance and shall be responsible for the consequence of such removal or disturbance should the same take place and for their efficient and timely reinstatement. The Contractor shall also be responsible for the maintenance of all existing survey marks, boundary marks, distance marks and centre line marks, either existing or supplied and fixed by the sub-contractor. The work shall be set out
to the satisfaction of the Owner. The approval thereof or joining with the sub-contractor by the Owner in setting out the work shall not relieve the sub-contractor or any of his responsibilities.

Before beginning the works, the sub-contractor shall at his own cost, provide all necessary reference and level posts, pegs, bamboo, flags, ranging rods, strings and other materials for proper layout of the work in accordance with the scheme for bearing marks acceptable to the Owner. The Centre, longitudinal or face lines and cross lines shall be marked by means of small masonry pillars. Each pillar shall have distinct marks at the centre to enable a theodolite to be set over it. No work shall be started until all these points are checked and approved by the Engineer-in-Charge in writing but such approval shall not relieve the sub-contractor of any of his responsibility. The Contractor shall also provide all labour, material and other facilities, as necessary, for the proper checking of layout and inspection of the points during construction.

Pillars bearing geodetic marks located at the sites of units of works under construction should be protected and fenced by the sub-contractor.

On completion of works, the sub-contractor must submit the geodetic documents according to which the work was carried out.

14.0 Responsibility for level and alignment

The sub-contractor shall be entirely and exclusively responsible for the horizontal and vertical alignment, the levels and correctness of every part of the work and shall rectify effectually any errors or imperfections therein. Such rectifications shall be carried out by the Contractor, at his own cost, when instructions are issued to that effect by the Engineer-in-Charge.

It is highly possible that there shall be more than one agency working at the same time at the site. The sub-contractor shall at all times remain bound to co-ordinate with the agencies, deployed by EPI for the above works, including providing free access and making required provisions for them in execution of works pertaining to their portion of works. He shall also remain bound to ensure uninterrupted progress of work by these agencies in a peaceful and smooth manner. He shall also remain bound to make the required changes/additions/alterations in the works done by him to accommodate the items under the scope of work of such other agencies deployed by EPI or the client. The sub-contractor is deemed to have made the estimated allowances in this respect while quoting his rates at the tendering stage.

All the drawings provided at the tendering stage are for general guidance only and the works shall be carried out as per the drawings and instructions issued by the Owner from time-to time. EPI shall not entertain any claim of the sub-contractor on account of any omission or any error by him on this account.

Further even though EPI shall take all care to attach all the drawings as issued by the client it shall be the responsibility of the sub-contractor to interpret the drawings for completion of the works under this contract. EPI shall not give any design or bill of quantities except what are being provided with the tender documents. EPI shall not entertain any claim of the sub-contractor on account of any omission or any error by him on this account.

The list of minimum tools, plant and machinery to be provided by the sub-contractor within the period mentioned against the respective item is given at Annexure-A.
15.0 The following shall also be read with relevant clause:

a) The bidder/contractor must be registered with GST and should have valid GSTIN number
b) The bidder/contractor must submit as an compliance under GST Act, the invoices in GST complaint format failing which the GST amount shall be recovered/ adjusted without any prior notice from the next invoices or available dues with EPI.
c) The bidder/contractor are required to update/upload the GST/Taxes data periodically so as to avail ITC credit by EPI failing which it shall be recovered/adjusted by EPI without any prior intimation
d) The rates quoted by the contractor shall be “inclusive of all taxes and duties, cess including GST” which shall be reimbursed to him subject to raising of tax invoice and filing of return and payment of tax as per GST law, failing which EPI shall not be able to honour his claims for any payment. The contractor has quoted his rates knowing fully well that submission of return and display of the same on GSTN portal is mandatory.
e) Incase of any reduction in rate of GST or other taxes in future or the project getting exemption status prior to the last date of Bid submission or afterwards, the subcontractor shall pass on the benefit to EPIL immediately, failing which EPIL shall have the right to recover the differential amount from the amounts due to the subcontractor. Further in case of any increase in rate of GST or other taxes in future or the project losing exemption status prior to last date of bid submission or afterwards, the said increase of taxes shall be paid/reimbursed to the subcontractors, subject to the condition that the client reimburses the said increased taxes to EPIL.

16.0 If the bidder quotes abnormally low rate/s compared to estimated cost put to tender, in such cases the rate/s of the lowest bidder if found in rate/s of the item/s are abnormally low, then additional bank guarantee/s equivalent to the difference of quoted rate/s and justified rate/s of the item/s shall be required to be furnished by the bidder before issue of LOI of the work. Additional Bank Guarantee/s obtained in these context shall be returned to the bidder after the satisfactory execution (duly certified by Site In-charge) of work at site

17.0 ARBITRATION: Clause no. 76.1 of GCC shall stand amended as below:
Before resorting to arbitration as per the clause given below, the parties if they so agree may explore the possibility of conciliation as per the provisions of Part III of the Arbitration and Conciliation Act, 1996 as amended by Arbitration and Conciliation (Amendment) Act, 2015. When such conciliation has failed, the parties shall adopt the following procedure for arbitration:

i) Except where otherwise provided for in the contract, any disputes and differences relating to the meaning of the Specifications, Design, Drawing and Instructions herein before mentioned and as to the quality of workmanship or materials used in the work or as to any other questions, claim, right, matter or things whatsoever in any way arising out of or relating to the Contract, Designs, Drawings, Specifications, Estimates, Instructions, or these conditions or otherwise concerning the works of the execution or failure to execute the same whether arising during the progress of the work or after the completion or abandonment thereof shall be
referred to the Sole Arbitrator appointed by the Chairman & Managing Director (CMD) of Engineering Projects (India) Limited (EPI) or any other person discharging the functions of CMD of EPI. The person approached for appointment as Arbitrator shall disclose in writing circumstances, in terms of Sub-Section (1) of Section (12) of the Arbitration and Conciliation Act, 1996 as amended by Arbitration and Conciliation (Amendment) Act, 2015 as follows:

a) such as the existence either direct or indirect, of any past or present relationship with or interest in any of the parties or in relation to the subject-matter in dispute, whether financial, business, professional or other kind, which is likely to give rise to justifiable doubts as to his independence or impartiality; and

b) Which are likely to affect his ability to devote sufficient time to the arbitration and in particular his ability to complete the entire arbitration within a period of twelve months.

The Arbitrator shall be appointed within 30 days of the receipt of letter of invocation of arbitration duly satisfying the requirements of this clause.

ii) if the arbitrator so appointed resigns or is unable or unwilling to act due to any reason whatsoever, or dies, the Chairman & Managing Director aforesaid or in his absence the person discharging the duties of the CMD of EPI may appoint a new arbitrator in accordance with these terms and conditions of the contract, to act in his place and the new arbitrator so appointed may proceed from the stage at which it was left by his predecessor.

iii) It is a term of the contract that the party invoking the arbitration shall specify the disputes, differences or questions to be referred to the Arbitrator under this clause together with the amounts claimed in respect of each dispute.

iv) The Arbitrator may proceed with the arbitration ex-parte, if either party, in spite of a notice from the arbitrator, fails to take part in the proceedings.

v) The work under the contract shall continue as directed by the Engineer-In-Charge, during the arbitration proceedings.

vi) Unless otherwise agreed, the venue of arbitration proceedings shall be at the venue given in the 'Memorandum' to the 'Form of Tender'.

vii) The award of the Arbitrator shall be final, conclusive and binding on both the parties.

viii) Subject to the aforesaid, the provisions of the Arbitration and Conciliation Act, 1996 as amended by Arbitration and Conciliation (Amendment) Act, 2015 or any statutory modifications or re-enactment thereof and the Rules made there under and for the time being in force shall apply to the arbitration proceedings and Arbitrator shall publish his Award accordingly.

17.2 Clause no 76.2 of GCC shall stand amended as under

“In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSE) /
18.0 The clause nos. 17.0, 18.0 & 19.0 of GCC of EPI shall stand amended as under:

Insurance charges for insurances to be taken by EPI for the project like Contractor’s All Risk Policy, Erection All Risk Policy including transit and third party liability shall be borne by the sub-contractor in proportion to his contract price. However, the sub-contractor shall take insurance cover at its own cost towards Workman Compensation Act for its own workers and employees engaged by it for the works under the present tender/sub-contract within 10 days of issuance of Letter of Intent by EPI and shall furnish documentary proof of the same to EPI. In case the sub-contractor fails to do so, EPI shall be at liberty to withhold all payments to the sub-contractor till the submission of such documentary evidence or take the required insurance policy under the Workman Compensation Act and recover the cost of the insurance premium(s) paid in this respect by EPI to the insurance company from the sub-contractor’s bill(s). Notwithstanding payment of such insurance premiums and the resulting recovery thereto the sub-contractor shall remain bound to assist EPI in follow up with the insurance company in case of any claim related to the sub-contractor’s scope of work. EPI is not liable to pay any claim of the sub-contractor if it is not paid by insurance company due to any reasons whatsoever. The insurance company providing such insurance cover must be approved by IRDA.

Employee State Insurance Act

The sub-contractor agrees to and does hereby accept full and exclusive liability for compliance with all obligations imposed by the Employees State Insurance Act, 1984, and the sub-contractor further agrees to defend, indemnify and hold Owner harmless from any liability or penalty which may be imposed by the Central, State or Local authority by reason of any asserted, violation by the sub-Contractor of the Employees State Insurance Act, 1948, and also from all claims, suits or proceeding that may be brought against the Owner arising under, growing out of or by reasons of the work provided for by this contract whether brought by employees of the sub-contractor, by third parties or by Central or State Government authority or any political sub-division thereof.

The sub-contractor agrees to fill in with the Employee's State Insurance Corporation, the Declaration Forms, and all forms which may be required in respect of the sub-contractors' employees, whose aggregate remuneration is such amount as prescribed under the Employees State Insurance Act, 1948 from time to time and who are employed in the work provided for or those covered by ESI from time to time under the Agreement. The sub-contractor shall deduct and secure to deduct the employee's contribution as per the first schedule of the Employee's State Insurance Act from wages and affix the Employee's contribution Cards at wages payment intervals. The sub-contractor shall remit and secure the to remit to the State Bank of India, Employee’s State Insurance Corporation Account, the Employees contribution as required by the Act. The sub-contractor agrees to maintain all cards and records as required under the Act in respect of employees and payments. Any expenses incurred for the contributions, making contributions or maintaining records shall be to the sub-contractor's account.
The Owner shall retain such sum as may be necessary from the total contract value until the sub-contractor shall furnish satisfactory proof that all contributions as required by the Employees State Insurance Act, 1948, have been paid.

19.0 The following shall stand added to the clause no 20 of GCC:

The sub-contractor shall keep EPI indemnified against all claims, damages, compensation and expenses payable, if any, in consequence of any accident, or injury sustained by any workman or any other person employed by the sub-contractor.

20.0 The following shall stand added to Clause no 21.0 and 23.0 including their sub-clauses of the GCC:

Notwithstanding the fact that EPI may have obtained or may be in the process of obtaining a valid license under the Contract labour (Regulation and Abolition) Act 1970 and Contract Labour Act (R & A) Central Rules 1971 and amended from time to time and registration under Building and other Construction Works (Regulation of Employment and Conditions of Service) Act 1996 and Building and Other Construction Workers’ Welfare Cess Act 1996 from the relevant office of the RLC and continues to have them until the completion of work including the maintenance and defect liability period, the sub-contractor shall at all times remain bound to comply with and observe the provisions of the all laws and regulations pertaining to the deployment of contract labour. He shall also extend all assistance to EPI during inspection of the officials of such law enforcing agencies including the rectification of defects/ observations (if any) made/pointed out during the visit(s) of the officials of the said ALC/RLC under jurisdiction of whom the work site shall be covered.

21.0 The following shall stand added to the clause no 27.0 including its sub-clauses of GCC of EPI:

The sub-contractor, within 10 days of issuance of LOI (Letter of Intent) to him shall depute at least one graduate civil engineer with 5 years of post-qualification experience or two persons having diploma in civil engineering or having passed trade certificate from ITI with 8 years of post-qualification experience and adequate number of foremen.

22.0 Deleted

23.0 The following shall stand added to the clause no 31.0 of the GCC:

The sub-contractor shall take a suitable policy in compliance with the Workmen’s Compensation Act 1923 within 10 days of issuance of LOI and keep it valid till completion of works or till the time he is required to keep his workmen at the worksite whichever is later and produce a copy of the receipts of the premium paid by him in this regards as and when asked by EPI.

24.0 No secured advance shall be paid to the sub-contractor and hence clause no. 35.0 of GCC shall stand deleted.
25.0 The following shall be added to the clause no 36.0 of the GCC:

The measurement of the works as certified/recorded by the client for the portion of works executed by the sub-contractor shall be final and binding on the sub-contractor. The contractor shall remain liable to provide all assistance at the time of recording the measurements by the client.

26.0 Payment's: The clause no 37.0 of the GCC stands modified as under:

Payments as and when received by EPI from the Client for the sub-contractor’s portion of work shall be released to him within seven working days of its receipt by EPI and after making the recoveries towards facilities mentioned at clause 16.0 hereinabove and other recoveries.

All running payments shall be regarded as ‘on account’ payments only and not as payments for work actually done and completed and/or accepted by EPI or Owner and shall not preclude the recovery for bad, unsound work and imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or to be considered as an admission of the due performance under the agreement or the accruing of any claim nor shall it conclude, determine or affect in anyway the powers of EPI under these conditions or any of them as to the final settlement and adjustments of the accounts or otherwise or in any other way vary/affect the contract.

The final bill payment to the sub-contractor shall be released only after receipt of corresponding payment from client and when the sub-contractor submits all other clearances, approvals, certificates etc. as per agreement of EPI with the client for the “Works” and as per statutory requirement.

The sub-contractor shall have no claim on EPI in case the payments are delayed by the client due to any reason whatsoever.

27.0 The clause no. 43.2 shall stand amended as below:

The sub-contractor shall execute the works so as to complete the works within the stipulated completion time and submit a programme showing deployment of resources for completion of the works within the said completion time including achievement of the milestones as mentioned below:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description of Milestone</th>
<th>Time allowed in days/months (from date of start)</th>
<th>Amount to be withheld in case of non-achievement of milestone</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>25% value of works</td>
<td>30% of completion time</td>
<td>In the event of not achieving the necessary progress Rs 3.0 lakhs will be withheld by EPI</td>
</tr>
<tr>
<td>b)</td>
<td>50% value of works</td>
<td>60% of completion time</td>
<td>-do-</td>
</tr>
<tr>
<td>c)</td>
<td>75% value of works</td>
<td>75% of completion time</td>
<td>-do-</td>
</tr>
</tbody>
</table>
In case entire work is completed within the completion time (i.e. time for completion of work) including any allowed extension thereto, the recoveries made, if any, for not achieving the aforesaid progress milestones at intermediate stages shall be refunded to the contractor free of any interest.

28.0 The following shall be added to clause no 52.6 of GCC:

The field testing laboratory to be established by the sub-contractor at his cost shall be equipped with the minimum number of testing equipment as per annexure-B.

29.0 The following provisions shall supersede that of clause no 69 of GCC wherever applicable:

No claim on account of extra / substituted / variation of items etc. pertaining to the sub-contractor’s portion of work save and except what is admitted and paid by Client, shall be entertained or admitted by EPI. Any claim by the sub-contractor, if not paid by the Client, whatsoever be the reason shall not be admitted by EPI. The amount, if at all admitted and paid by the Client for the sub-contractor’s portion of work, shall be paid to him after making a provision of 10% (ten percent) towards EPI’s overhead and administrative charges. The provision of this clause shall equally apply to the decrease in the rate of item by the owner. EPI’s decision in this respect shall be final and binding on the sub-contractor. But under no circumstances sub-contractor shall suspend the work on the non-settlement of rates under this clause.

Further the quantity given in the Price Bid/ Bill of Quantity can vary up to ± 25% of the contract price without any change in the rates.

31.0 Responsibility of materials

The sub-contractor shall be responsible for obtaining all approvals from Client with regard to quality of materials & workmanship and measurements etc. for their portion of work. All such approvals shall be in the name and title of EPI. The sub-contractor shall be responsible for reconciliation of issued material with Client/EPI, if any, and the sub-contractor shall make arrangements for safe up keeping / custody of the material and final reconciliation is also to be done by the sub-contractor. In case there is any shortfall of any issued items during reconciliation, recovery at double the cost of materials prevailing at that time of recovery shall be made from the sub-contractor’s due payment.

32.0 Dealing with Owner etc

The sub-contractor will not deal directly with Client and all the correspondence in matters regarding bills, claims, interpretation of the specifications, conditions and all matters related to the contract with Client, Client’s Consultants, all other agencies including Government and Statutory bodies etc. shall be done through EPI only. The sub-contractor shall prepare and submit expeditiously all bills, claims, details, clarifications, documents, information, etc. as required by EPI/ Client for proper execution and successful completion of the “Works”.

33.0 Interpretation

Issues related to interpretation and claims, if any, related to the sub-contractor’s scope of work, arising out of contract between EPI and Client shall be referred with full justification by the sub-contractor to EPI for settlement with Client including arbitration with Client, if inescapable, and outcome of such a settlement shall be binding on the sub-contractor. EPI
at its option may associate the sub-contractor in the above process of settlement for his portion of work. The cost & expenses on arbitration with Client shall be shared by EPI and the sub-contractor in proportion of his offer and EPI's mark up towards its overheads & profits. In case the award/settlement with the Client is in favour of EPI, ninety percent of the award/settlement amount shall be shared between EPI and sub-contractor in proportion of sub-contractor's contract price with EPI and EPI's mark up towards its overheads & profits. The balance ten percent of the award/settlement amount shall be retained by EPI towards its administrative charges. In case the award/settlement is against EPI, the entire damages/counterclaims imposed, if any, shall be borne by the sub-contractor alone and the sub-contractor shall have no claim whatsoever against, EPI in such a settlement. Further, EPI shall have no liability towards any claim of the sub-contractor, which is not paid by the Client.

34.0 No claim for non-approval
In case of non-approval of sub-contractor’s association for the Project by the Client and/or by the corporate office of EPI due to any reasons whatsoever at any stage of the “Works”, the sub-contractor shall have no claim on EPI.

35.0 Inspection and responsibility
The work executed by the sub-contractor shall be subject to audit and quality control checks from Quality Control Division & Technical Audit of EPI, Client, and Inspecting Agency of the Client and Chief Technical Examiner of Central Vigilance Commission, Govt. of India. In the eventuality of any defect/ substandard works as brought out in the report or noticed otherwise at any time during execution, maintenance period etc., the same shall be made good by the sub-contractor without any cost to EPI. In case the sub-contractor fails to rectify the defect/sub-standard work within the time period stipulated by EPI, EPI shall get it rectified at the risk and cost of the sub-contractor and shall recover the amount from the dues of the sub-contractor.

36.0 Actions for false information
EPI has agreed to associate the sub-contractor on the basis of details regarding his experience profile, financial standing, credentials, fulfilment of statutory obligations, etc. by him to EPI. In case, at a later stage if it is found that the sub-contractor has submitted incorrect, false details and credentials resulting in apprehensions on the capabilities of the sub-contractor with regard to quality & timely completion of works, financial capabilities etc, EPI can terminate this order solely at its option. In this eventuality the sub-contractor shall be liable for the losses suffered by EPI and further the sub-contractor shall have no claim on EPI, whatsoever.

37.0 Non-applicability of concessions or exemptions
However, if EPI is granted some concession or exempted from certain obligations by Client, by virtue of EPI being a Public Sector Company, the same concessions / exemptions shall not be applicable to the sub-contractor. The decision of EPI in this regard including interpretation of terms & conditions shall be final & binding on the sub-contractor.

(Signature and seal of the Tenderer)
# ANNEXURE-A

## LIST OF MINIMUM TOOLS, PLANT AND MACHINERY

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>Description</th>
<th>Minimum numbers required</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Levelling Instruments/ Auto level</td>
<td>One no</td>
<td>As and when instructed</td>
</tr>
<tr>
<td>2.</td>
<td>Tile cutting machine with cutting wheels</td>
<td>Four sets</td>
<td>10 days</td>
</tr>
<tr>
<td>3.</td>
<td>DG Set 5 KVA (Minimum)</td>
<td>One no</td>
<td>10 days</td>
</tr>
<tr>
<td>4.</td>
<td>Pipe Threading Machine</td>
<td>Two nos</td>
<td>-do-</td>
</tr>
<tr>
<td>5.</td>
<td>Pipe Bending Machine (Hydraulic)</td>
<td>One no</td>
<td>-do-</td>
</tr>
<tr>
<td>6.</td>
<td>Portable Drilling Machine suitable for drilling of different sizes</td>
<td>One no</td>
<td>-do-</td>
</tr>
<tr>
<td>7.</td>
<td>Power Hacksaw</td>
<td>One no</td>
<td>-do-</td>
</tr>
<tr>
<td>8.</td>
<td>Hoisting lift for materials with winch</td>
<td>One set</td>
<td>15 days</td>
</tr>
<tr>
<td>9.</td>
<td>D-spanners, Ring spanners, box spanners etc of assorted size</td>
<td>As required</td>
<td>-do-</td>
</tr>
<tr>
<td>10.</td>
<td>Cutting, twisting and combination pliers</td>
<td>Three nos.</td>
<td>10 days</td>
</tr>
<tr>
<td>11.</td>
<td>Slide wrench, pipe wrench etc</td>
<td>-do-</td>
<td>-do-</td>
</tr>
</tbody>
</table>

**Note:**

(a) The period mentioned above shall be reckoned from the date of start of commencement of work as mentioned under this tender.

(b) The quantities and list of equipments indicated are tentative and can be increased/amended as per the requirement of work OR as per the direction of Engineer-in-Charge. The above equipment list is indicative and not complete. The contractor has to deploy all the required equipment to complete all the works within stipulated specifications & time period as contract documents.

(c) The sub-contractor will not be allowed to take out equipments from the site without the written permission of Engineer-in-Charge.

(Signature and seal of the Tenderer)
ANNEXURE-B

LIST OF MINIMUM TESTING EQUIPMENT

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>Description</th>
<th>Minimum numbers required</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Spirit level</td>
<td>02</td>
<td>10 days</td>
</tr>
<tr>
<td>2.</td>
<td>Thickness gauge</td>
<td>01</td>
<td>-do-</td>
</tr>
</tbody>
</table>

Note:

a) The period mentioned above shall be reckoned from the date of start of commencement of work as mentioned under this tender.

b) The quantities of equipments indicated are tentative and can be increased as per the requirement of work OR as per the direction of Engineer-in-Charge. The above equipment list is indicative and not complete. The contractor has to deploy all the required equipment to complete all the works within stipulated specifications & time period as contract documents.

c) The sub-contractor will not be allowed to take out equipments from the site without the written permission of Engineer-in-Charge.

(Signature and seal of the Tenderer)
List of Drawings

NIT No. & Date: NERO/CON/735/353 Dated 24.06.2019

Tender for: SUPPLY & FIXING OF FALSE CEILING WORKS FOR THE PROJECT EXTENSION OF ACADEMIC COMPLEX PHASE V AT IIT GUWAHATI CAMPUS, GUWAHATI

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Title of Drawing</th>
<th>Drawing No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ground Floor Plan</td>
<td>2014/IIT/NANO/AR/01</td>
</tr>
<tr>
<td>2</td>
<td>First Floor Plan</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Second Floor Plan</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Third Floor Plan</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Section</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Porch Plan</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Staircase Plan (Ground to Roof)</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: The drawings enclosed are as received from the Owner for general guidance only. The works shall be executed as per instructions of the Engineer-in-charge.
SLAB THICKNESS
180 mm.

Distribution Bar
10 @ 150 mm c/c
&
Main Bar 12 @
150 mm c/c

Projection
1.150 m.

Grid (G1)

B12

B11

B61

Duct (Typ)

Grid (G2)

Grid (F)

Grid (D)
STAIRCASE PLAN
(GROUND TO ROOF)
NANO TECH BUILDING

1st Landing (+60.30M LW)

1250

W=1250
T=300
R=150

Beam, B2(b)

(Stab Thickness = 200mm)
TECHNICAL SPECIFICATIONS (CIVIL WORKS)

SECTION - 1

1.0. GENERAL:

1.1: The works shall be carried out in conjunction with specifications, schedule of items and the construction drawings issued from time to time. The latest editions of the specifications given in Govt. of India, Central Public Works Department (CPWD) specifications Vol. I to VI with up-to-date corrections; relevant to this work, with a cross reference to relevant codes of practice published by the Bureau of Indian Standards or published by the Indian Roads Congress in respect of matters not covered by the CPWD specifications shall be followed.

1.2: In interpreting the specifications the following sequence shall be followed unless otherwise given in writing by the Engineer-in-charge:

(a) Nomenclature of items of the schedule of items.
(b) Drawings and working details.
(c) Technical Specifications given in the tender.
(d) C.P.W.D specifications Vol I to Vol VI with upto date correction slips.
(e) Relevant Indian Standard Codes with latest revisions.

In absence of the specifications in any of the above, the specifications furnished by the Engineer-in-charge based on sound engineering practices shall be final and binding.

1.3: The schedule of quantities, the structural and Architectural drawings shall be properly co-related and all these documents should be read and operated in harmonious conjunction. In case of any discrepancy in items given in the Schedule of Quantities appended with the tender and architectural drawings relating to the relevant item the former shall prevail unless otherwise given in writing by the Engineer-in-charge.

1.4: All the works shall be carried out in sound workmanship and true to line, level, plumb and as per the best practice of the trade.

1.5: All mandatory tests specified in C.P.W.D specifications shall be got done from the approved laboratories as desired by the Engineer-in-charge and all expenses viz. cost of samples, testing charges, including cartage, conveyance etc. whatsoever shall be borne by the contractor. If after any such test and in the opinion of the Engineer-in-Charge any work or portion of work is found to be defective and unsound the contractor shall pull down and re-execute the same at his own cost. Defective material/materials failing in mandatory test shall be removed from the site.

1.6: All materials to be supplied by the contractor shall be new. All packed items shall arrive at site in original packing only. Any items found defective or damaged shall be replaced by the contractor at his own expenses. The sources of materials
stated in the specifications are those from which materials are generally available. However, materials not conforming to specifications shall be rejected even if they come from the stated source. The contractor should satisfy himself that sufficient quantity of material of acceptable specification is available from the stated or other sources.

1.7: All the materials brought at site shall be stored and stacked in a proper manner. The materials requiring protection from the sun and rain shall be kept inside the temporary structures to be erected at site by the contractor. The contractor shall also follow the manufacturer’s instructions for storing and stacking the materials. The storage facilities are to be created by the contractor at his own expense.

The contractor shall consult the Engineer-in-Charge regarding collection and stacking of basic materials required for the work. They should not stack any materials in any place other than those approved by the Engineer-in-Charge within the plot area. On completion of the work the area used will be restored, properly dressed to satisfaction of the Engineer-in-Charge at no extra cost.

1.8: The contractor shall be responsible for co-coordinating the work with works of other trades sufficiently ahead of time to avoid unnecessary hold ups. Hangers, sleeves, recesses etc. shall be left in time as the work proceeds.

1.9: A site order book will be kept at the site of the work in which instructions shall be recorded by Site Engineer / Architect or their representatives. The contractor or his authorized agent shall sign the site order book to acknowledge the instructions in all events and follow the same.

1.10: The plumbing drawings issued from time to time to the contractor are diagrammatic but shall be followed as closely as actual construction work will permit. Any deviation from the drawings required as per building construction shall be made by the contractor at site with the permission of the Engineer-in-Charge. The architectural drawings shall take precedence over the services drawings as far as the civil and other trades works are concerned.

1.11: All works shall be adequately protected, to the satisfaction of the Engineer-in-charge, so that same is free from damage throughout the period of construction upto the time of handing over. Special care must be taken to prevent damage and scratching of all fittings and fixtures, Tool marks on exposed fixtures shall not be accepted. Protective paper on fixtures shall be removed with hot water only at the final completion of the work. Before handing over the possession of work, the contractor shall clean all elements of the complete installation, remove plasters, splashier, stickers, rust stains and other foreign matter and leave every part in acceptable condition and ready for use to the satisfaction of the Engineer-in-Charge/ Architect.

1.12: Rates for all items in which use of cement is involved, is inclusive of charges for curing.
SECTION - 2

The intent of this section of the specification is to define the general technical requirements of the major items of Building and site development works.

2.1 SITE CLEARANCE:

Before the work is started, the area coming under the building and upto an extent of 6m as required beyond the periphery of the building shall be cleared of shrubs, rank vegetation, grass, brushwood, trees and saplings of girth upto 30 cm measured at height of 1 M above the existing ground level including removal of roots of trees and saplings to a depth of 60cm below the ground level and all rubbish removed to a dumping ground within the project site as directed by the Engineer In-charge. Nothing extra shall be paid for the site clearance.

2.2 SETTING OUT OF REFERENCE MARKS:

A masonry pillar to serve as a bench mark shall be erected at a suitable point in the area, which shall be visible from the large area. These bench mark pillar shall be constructed as per the drawing to be issued by the Engineer In-charge and connected with the standard bench mark. Number of reference pillars shall be made with reference to the bench mark and levels recorded with the levels marked on them to indicate the correct formation level before the work is started. The contractor shall supply the labour and materials for constructing bench mark, setting out and making profiles and connecting bench mark with the standard bench mark at his own cost. The reference pillars, pegs, bamboos and the bench mark shall be maintained by the contractor at his own cost for checking profiles during execution.

2.3. EARTH WORK

2.3.1. Site levels: After site clearance and before commencement of excavation or filling the contractor shall take levels at 3 metre intervals in either direction or at lesser intervals as considered necessary at site for the entire plot. A record of these levels shall be signed jointly by the Contractor and the Engineer-in-charge. The records shall be kept by the Engineer-in-charge. The required labour and equipments for taking levels shall be supplied by the contractor at his own cost.

2.3.2. Earth work in excavation:

a) Classification of soils: The earth work shall be classified under the following categories.

i) All kinds of soils: Generally any strata such as sand, gravel, loam, clay, mud, black cotton, moorum, shingle, river or nallah bed boulders, soling of roads, paths etc. and hard core, macadam surface of any description (water bound, grouted, tarmac etc.), lime concrete, mud concrete and theirs mixtures which for excavation yields to the application of picks, shovels, jumper, sacrificers, ripper and other manual digging implements.
ii) **Ordinary rock**: Generally any rock, which can be excavated by splitting with crow bars or picks and does not require blasting, wedging or similar means for excavation such as lime stone, sand stone, hard laterite, hard conglomerate and un-reinforced cement concrete below ground level. If required light blasting may be resorted to, for loosening the materials but this will not in any way entitle the material to be classified as hard rock.

iii) **Hard rock**: Generally any rock or boulder for the excavation of which blasting is required such as quartzite, granite, basalt, reinforced cement concrete (reinforcement to the cut through but not separated from concrete) below ground level and the like.

iv) **Hard rock (blasting prohibited)**: Hard rock required blasting as described under Para (iii) above but where the blasting is prohibited for any reason and excavation has to be carried out by chiseling, wedging or any other agreed method.

b) **Protections**:

i) Excavation where directed by the Engineer-in-Charge shall be securely fenced and provided with proper caution signs, conspicuously displayed during the day and properly illuminated with red light during the night to avoid accident.

ii) The contractor shall take adequate protective measures to see that the excavation operations do not damage the adjoining structures or dislocate the services. Water supply pipes, sluice valve chambers, sewerage pipes, manholes, drainage pipes and chamber, communication cables, power supply cables etc. made within the course of excavation shall be properly supported and adequately protected so that these services remain functional.

iii. Adequate shoring and strutting shall be provided to prevent slip during foundation excavation and till completion of foundation work or underground structures.

iv) Dewatering during excavation, foundation work and backfilling to keep the foundation pit free from water shall be provided.

No extra payment on account of the above protection works shall be paid.

c) **Blasting**:

Where hard rock is encountered and blasting operations are considered necessary, the contractor shall obtain approval of the Engineer-In-charge in writing for resorting to blasting operations. It will be the responsibility of the contractor to carry on the blasting operation with proper licenses from the competent authority and following all statutory rules.

The contractor shall be responsible for any damages arising out of accident to workman, public or property due to storage, transportation and use of explosive
during blasting operations.

The contractor shall be responsible for safe and proper custody and accounting the explosive materials.

For details the Explosive Act and Rules as amended up to date shall be referred.

d) Backfilling in foundation trenches:

Only selected earth from excavation shall be allowed for backfilling. The backfilling shall be done after dewatering the pit and laying the selected earth in layers of 20 cm and compacting to 90% proctor density. Backfilling when not allowed by the excavated soil partly or fully shall be done with approved quality Brahmaputra sand or hill sand and laid in layers of 20 cm and compacted up to 90% proctor density. Back filling in foundation trenches either with selected excavated soil or imported soil shall not be paid.

e) Disposal of excavated earth:

All surplus earth available from excavation during execution and not utilized in back filling shall be disposed off within the IIT Campus at a suitable location to be shown by the Engineer-in-Charge.

This surplus earth may be allowed to be utilized for site development work outside the peripheral foundation line of the building and laid in 20cm thick layers and compacted to the required density. In such case the area to be filled up shall be prefixed by the Engineer-in-Charge and the levels of such work done shall be measured before filling is done over such layers by imported soil. Only selected approved soil from excavation shall be allowed inside the building area for filling. Such site development work done by surplus excavated earth shall not be paid.

f) Measurements:

Measurements of excavation for foundation work including backfilling in foundation trenches:

Measurements shall be taken on the vertical lines with 300mm tolerance all around the finished concrete/brickwork/masonry work for foundation and that for plinth beams/walls 150mm around the finished surfaces. No extra payment shall be made on account of removal of slipped earth and backfilling thereof, dewatering, shoring and strutting etc.

2.3.3 Earth work in filling:

a) Removal of top vegetation: The top vegetation including grass with roots, trees and saplings of girth up to 30 cm measured at height of 1 M above the existing ground level including removal of roots of trees and saplings to a depth of 60 cm below the ground level and all rubbish shall be removed to a dumping ground within the project site as directed by the Engineer In-charge. Decomposed organic
soil shall be removed to the extent, which may not cause perceptible settlement to the filled formation. Nothing extra shall be paid for the site clearance.

b) Types of soil for filling: All filling work for site development & in plinth shall be done by the approved quality Brahmaputra sand or hill sand.

For site filling with excavated earth, the clause no.2.3.2(e) shall be followed.

c) Mode of filling and compaction control:

i) Where cutting and filling are involved in hill slope the cutting for site preparation will be done up to the proposed formation level or to such levels as required as per drawing and all excavated soils shall be removed as given under clause .2.3.2(e) above. Filling works shall be done in layers not more than 20cm thick along with the progress of the sub-structure work and compacted by mechanical compactor to achieve minimum 90% proctor density.

Measurements for earth work in excavation for site preparation:

The original site levels shall be recorded as given under para 2.3.1 above. The final levels after excavations is complete to the proposed formation level, shall be taken jointly again by the contractor and the Engineer-in-charge in the same sections where original levels were taken and the final profile drawn and volume computed.

ii) Where only filling is involved the filling work within the building area shall be taken up after completion of the sub-structure of the building up to existing ground level. The disposal of the excavated earth shall be done as per clause no. .2.3.2(e) The filling work shall follow the sub-structure work up to the formation level. The filling works shall be done in layers not more than 20cm thick along with the progress of the sub-structure work and compacted by mechanical compactor .The filling work within the building area shall mean the area covered within the outer foundation lines of building peripheral columns.

The filling work for site development beyond the peripheral foundation line shall be taken up in such a manner that it would not create any hindrance in the progress of sub-structure work and the filling work inside the building and in layers not more than 20cm thick and compacted by mechanical compactor to achieve minimum 90% proctor density.

Filling works for site development may be allowed to be done with the selected earth available from foundation excavation. In such case, the area to be filled up will be prefixed by the Engineer-in-charge and the level of the filling work done shall be determined before filling with imported e soil is done over that layer. Contractor shall not be entitled for payment of such filling work done with excavated soil from foundation trenches. All filling works shall be done in layers not more than 20cm and compacted by mechanical compactor.
d) **Mode of measurement:**

The measurement shall be given after quantity is worked out in profile with respect to spot levels at a grid of 3m taken before and after the filling work. No allowance for settlement of ground below fill will be considered.

2.4. **ANTI TERMITE TREATMENT:**

2.4.1: General: Chemical treatment of soils for the protection of buildings from attack of subterranean termites shall be done as per IS : 6613 (Part - II) 1981. Treatment shall be got done only from the approved specialised agencies. Graduated containers shall be used for dilution and spraying of chemical shall be done using hand operated pressure pumps. Proper check should be kept to ensure the specified quantity of chemical is used for required area during the operation.

2.4.2: Materials: Heptachlor emulsifiable concentrate, Chlorpyriphos emulsifiable concentrate or any other approved quality chemicals shall be used with percentage concentration as specified by the manufacturer.

2.4.3: Scope: This work shall cover treatments for masonry foundations and basements, RCC foundations and basements, top surface of plinth filling, at junctions of walls and floors, soil along external perimeter of building, expansion joints, walls retaining soil above floor levels, soils surrounding pipes, wastes and conduits and any other places that are in contact with soil and liable to be attacked by the termites. Treatment of all the above areas shall be done following the procedure as prescribed in the CPWD specification volume-I.

2.4.4: **Measurements:** The measurements for all the operations described above shall be the plinth area of the building at ground floor level. Nothing extra shall be measured for payment

2.5. **BRICK WORKS:**

2.5.1. **Bricks:**

a) Bricks shall be the best quality locally available, well burnt but not over burnt, free from salt Peter action and generally conform to specification for brick class designation 75, crushing strength shall not be less than 75 kg/cm². Bricks shall not absorb water more than 20% of their own dry weight after 24 hours immersion in cold water, rectangular faces with parallel sides, and sharp, straight and right angled edges, have a fine compact and uniform texture. The bricks shall be free from cracks, chips, flaws, stones or lumps of any kind and shall not show efflorescence either dry or subsequent to soaking in water. They shall not have any part un-burnt.

b) The size of brick shall conform to the sizes as specified. Bricks of one standard size shall be used in the whole work unless specially permitted by the Engineer in-charge.

c) After immersion in water, absorption by weight shall not be exceed 20% of dry
weight of the brick when tested according to IS: 1077. Unless otherwise specified the load to crush the brick when tested according to IS: 1077 shall not be less than 75 Kg/Sqcm.

d) Prior approval of Engineer in-charge shall be obtained from time to time for the brands of bricks to be used in the work after compliance with the above specifications and tests.

2.5.2 Mortar: Only specified mortar as per BOQ shall be used for brick work as per the relevant items.

2.5.3 Construction details:

a) Soaking: All bricks shall be immersed in water for 24 hours before being used into work so that they will be saturated and will not absorb water from the mortar.

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

c) Laying: The bricks shall be laid in mortar to line, level and shapes shown on the plan, slightly pressed and thoroughly bedded in mortar and all joints shall be properly flushed and packed with mortar so that they will be completely filled with mortar and no hollows left anywhere. Bricks shall be handled carefully so as not to damage their edges. They should not be thrown from any height to the ground but should be put down gently. All course shall be laid truly horizontal and all vertical joints shall be made truly vertical. Vertical joints on one course and the next below should not come over one another and shall not normally be nearer than quarter of a brick length. For battered faces beading shall be at right angles to the face. Fixtures, plugs, frames etc. if any, shall be built in at place shown in the plans while laying the courses only and not later by removal of bricks already laid.

Care shall be taken during construction to see that edges of bricks at quins, sills, heads etc., are not damaged.

The verticality of the walls and horizontality of the courses shall be checked very often only by plumb bob and spirit level respectively.

d) Bond: Unless otherwise specified, brick work shall be done in English Bond. All walls, coming in contract with reinforced concrete columns, beams etc., should be properly bounded by inserting reinforcements. Extra labour shall be included in the rates (reinforcements will be measured and paid separately against reinforcement item provided in the BOQ).

e) Joints: Joints shall not exceed 10 mm thickness and this thickness shall be uniform throughout. The joints shall be raked out not less than 10 mm deep when the mortar is green where pointing is to be done. When the brick surface are to be plastered, the joints shall be raked to a depth of 5 mm when the mortar is green,
so as to provide good key to plaster.

f) Curing: All brick works shall be kept well cured at least for 14 days after laying.

g) Half Brick work: Half brick work of 115mm thick shall be provided with reinforcement of two numbers 6mm dia. approved quality M.S. bars at every third course as per technical specification/item. Reinforcement provided shall be paid separately.

h) Measurements:
Brickwork with 230mm thick shall be measured in cubic metre. Any extra work over the specified dimension will be ignored unless otherwise specifically mentioned in the drawing.

Wall of half brick thickness or less shall be measured separately and paid in sqm, half brick thickness shall be taken as 115mm. Brick wall beyond half brick thickness shall be measured in cum. When a fraction of half brick occurs due to architectural reasons or otherwise as per the requirements of the owner the same shall be measured as half brick work provided such fraction is more than 2 cm. Fraction up to 2 cm thickness shall be made up in mortar and paid for as per specified thickness under brick work.

2.6 AUTOCLAVED AERATED CONCRETE BLOCKS (AAC):
All the AAC blocks should conform to IS: 2185 (Part-3)-1984. Compressive strength should not be less than 3N/mm². Normal dry density of the blocks shall be 550-550 Kg/cum. The manufacturer’s certificate of conforming to the relevant IS code should be submitted.

2.6.1 STORAGE OF MATERIAL
AAC blocks should be stored in dry and leveled area. The blocks should be stock piled on planks of supports, free from contact with the ground and covered to protect against rain, snow fall etc.

2.6.2 MORTARS
Cement and sand Mortars as specified in the item shall be used. Fine material such as fly ash etc. may also be used in place of sand.

The choice of masonry mortar is governed by several considerations, such as type of masonry, situation of use, degree of exposure to weather, strength requirements etc.

According to IS 6041-1985 the AAC blocks should be embedded with a mortar, the strength of which should be relatively lower than that of mix used in making of blocks, in order to avoid the formation of cracks. Cement sand mortar of 1:6 with suitable plasticizer should be used. Mixes stronger than this are reported to be undesirable. The fly ash composite mortars also go very well with AAC blocks. All mortars should be prepared in accordance with IS: 2250-1981.
2.6.3 SOAKING AND WETTING OF BLOCKS

These blocks need not be soaked in water as is the practice of brick masonry. The blocks are required to be moistened on the top and side surface where the joining mortar is to be laid.

2.6.4 LAYING OF MORTAR

The mortar shall not be spread so much ahead of the actual laying of the units that it tends to stiffen and lose its plasticity, thereby resulting in poor bond. Consistency as per requirement of site must be maintained at the point of laying over bed. Mortar joint shall be struck off flush with wall surface and when the mortar starts stiffening, it shall be compressed lightly.

2.6.5 LAYING BLOCK MASONRY

The laying block may be started either at the corners first or it may be started from one end and proceed to the other end. The first course of the cellular block masonry shall be laid with great care, making sure that it is properly aligned, leveled and plumbed, as this may assist the mason in laying succeeding courses to obtain a straight and truly vertical wall. The design of wall should be such that the cutting of blocks is minimized.

2.6.6 CHASES

Chasing in AAC block wall masonry should be as per the previous made in IS 1905 (1987)

i) Chases, recesses & holes are permitted in AAC masonry if this does not impair the strength and stability of the wall. This should be carefully planned otherwise excessive chasing may give rise to loss of strength.

ii) In such masonry, all chases, recesses & holes should be considered in structural design and details in building plans.

iii) As far as possible, services should be planned with the help of vertical chased & use of horizontal chases should be avoided.

iv) The cutting of chases, recesses etc. should be done without damage to the surrounding masonry. It is desirable to use sharp tools for cutting which depend upon rotary motion.
2.6.7 RENDERING

(a) Plastering

The exterior surface of all cellular concrete walls should preferably be made waterproof by treating the walls with different types/thicknesses of renderings depending upon the intensity of rain fall, nature of exposure etc. The surface should be sound, as even as possible, free from dust and loose particles and not saturated with water, excessively damped or contaminated in any way. External rendering on walls should be avoided during rain. If necessary, the same should be applied with proper precaution on material and rainy environment.

The rendering should be applied in accordance with IS: 2402 – 1963. The render mix should be of 1:6 (1 cement: 6 sand with plasticizer) or 1:2.5:5(Cement: Fly ash: Fine sand) (1.1 FM) of uniform workable consistency. Each coat should be between 8 and 13 mm thick depending upon conditions of usage and exposures to sun/rain. The second coat should be weaker than the first. This can be done by altering the mix proportions or reducing the thickness. Mix proportion and thickness of rendering depends upon the intensity of rainfall and nature of exposure.

In the localities of heavy rainfall in India, the maximum external rendering should be laid in two coats in maximum allowable thickness of 13-15 mm. First coat of 15 mm thick of specified mortar, depending upon the grade of aerated concrete block units, should be applied and second coat of 5-10 mm thickness and leaner than the first coat may be applied after the first coat has set. Surface of first coat has to be roughened to receive the second coat. In moderate rainfall areas, rendering should be of at least one coat of 5-10 mm.

Internal surface of the walls may be plastered with one coat of 6-12 mm thick mortar. Gypsum based plaster of 6-7 mm is also ideal on internal walls.

While plastering a groove or chicken mesh should be provided at the junction of two non-similar materials e.g. junction of RCC Column with AAC blocks masonry.

(b) Painting

Interior painting of AAC block masonry walls should be done if the wall is plastered. The method employed is same as that for any other plastered walls. Generally, the wall first be rubbed down, puttied and given at least two coats in order to obtain smoother surface.

All other structural requirements like placing of joint reinforcement, nominal mabd beam, chasing etc. is to be considered in accordance with the recommendations laid down in IS-Codes 6041 & 1905.

Apart from cement paints, a number of breathing plastic paints (e.g. acrylic emulsion paints) can also be applied to AAC. For exterior painting of plastered walls, any standard paint as per Architect’s recommendation can be applied.
2.6.8  FIXING OF NAILS AND SCREWS/RAWL PLUGS ETC.

Due to its porous structure and lack of course aggregate particle; AAC material can easily be nailed. Cut nails are tapered aluminum or galvanized nails rectangular in cross section. They are available in length from 70 mm to 180 mm. They form an excellent bond when driven into AAC block masonry and recommended for fixing boards, timber battens for cladding and fitting and light weight door/frames. When there is a risk of timber splitting, pre-drilling is recommended.

Direct Screwing is possible to screw no. 12 or no. 14 wood plugs directly into AAC blocks and walls. A few tapes with a hammer will create a pilot hole for the screw, which then can be screwed into AAC walls with a screw driver.

Screws with plugs are the most common method of fixing into AAC block masonry is that of using wood screws with rawl plugs. Plugs vary considerably in design but generally depend on friction in order to withstand load. Various cross-sections of plugs are advocated by different manufacturers. Anchor system of FISHERS & HILTI other standard manufacturers are ideal for use in ACC masonry.

2.6.9  DOORS & WINDOW FIXING

Door and window frames shall be attached to the AAC masonry either by conventional method or by plastic anchors of Hilti/Fisher makes. The number of nails to give adequate stability will depend on dimension of the frame.

2.6.10 Measurement: Measurement will be taken on the finished work and unit shall be as given in the bill of quantities.

2.7.  CONCRETE (PLAIN AND REINFORCED)

2.7.1  Scope: This specification establishes the materials, mixing, placing, curing, etc. of all types of cast-in-situ and pre-cast concrete used in foundation under-ground and over-ground structures, floors, etc., Any special requirement as shown or noted in the drawings shall supersede over the provisions of this specification.

2.7.2  Materials:

a) Cement: Cement shall be OPC/Slag Cement/Portland Pozzolana cement from reputed manufacturers of cement, having an annual production of at least one million tons and conforming to relevant IS codes. The cement shall be stored in a dry waterproof go down. As and when desired by the Engineer-in-charge the contractor shall be required to produce the test certificate from the approved test house at his own cost. The mandatory tests of cement shall be carried out by the contractor at his own cost in IITG Laboratory.
b) Fine Aggregate: For all concrete work, it shall be coarse sand conforming to the grading as given below: (zone I or II only applicable to concrete). Quality of sand shall be got approved by the Engineer-in-charge before bulk purchase. Silt content shall not exceed 4% by weight. The grading of fine aggregate shall be as follows:

<table>
<thead>
<tr>
<th>IS Sieve Designation</th>
<th>Percentage Passing by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grading Zone I</td>
</tr>
<tr>
<td>10 mm</td>
<td>100</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>90-100</td>
</tr>
<tr>
<td>2.36 mm</td>
<td>60-95</td>
</tr>
<tr>
<td>1.18 mm</td>
<td>30-70</td>
</tr>
<tr>
<td>600 micron</td>
<td>15-34</td>
</tr>
<tr>
<td>300 micron</td>
<td>5-20</td>
</tr>
<tr>
<td>150 micron</td>
<td>0-10</td>
</tr>
</tbody>
</table>
c) **Coarse aggregate:** For concrete it shall be broken/crushed stone graded coarse aggregate. Coarse aggregate up to 20 mm size. Grading shall be within the limit as given below:

<table>
<thead>
<tr>
<th>IS Sieve Designation</th>
<th>Percentage passing for graded aggregate of nominal size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40 mm</td>
</tr>
<tr>
<td>80 mm</td>
<td>100</td>
</tr>
<tr>
<td>63 mm</td>
<td>-</td>
</tr>
<tr>
<td>40 mm</td>
<td>95-100</td>
</tr>
<tr>
<td>20 mm</td>
<td>30-70</td>
</tr>
<tr>
<td>10 mm</td>
<td>10-35</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>0-5</td>
</tr>
<tr>
<td>2.36 mm</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: If directed by Engineer-in-charge, the aggregate (fine as well as coarse) shall be washed to remove all dust, dirt, clay particles etc., at contractor’s expenses.

d) Water: Water to be used in concrete, masonry work, plasters shall be clean, fresh and non-saline. Sample of water shall be got tested before use according to relevant IS code if required by Engineer-in-charge.

### 2.7.3 Grade of Concrete:

Whenever grade of concrete is mentioned as M₂₀, M₂₅, M₃₀ etc., as per items only design mix concrete shall be used. The mix shall be designed to produce the required grade of concrete having required workability and characteristic strength as per IS: 456. As long as a quality of materials do not change a mix design done earlier shall be considered adequate for later work. However, in case the quality of materials changes, the Engineer-in-charge may ask for a new design mix. The concrete mix design will be carried out by the contractor at his own cost in IITG Laboratory. While designing the mix durability requirements as given in IS:456 shall be taken into account.

Proportioning of the mix shall mean the process of determining the proportions of various ingredients to be used to produce concrete of required strength, workability, durability and other properties.
The Engineer-in-charge shall verify the strength of the concrete mix, before giving his sanction of its use. However, this does not absolve the contractor of his responsibility as regards achieving the prescribed strength of the mix. If during the execution of the work, cube tests show lower strength than required, the Engineer-in-charge shall order fresh trial mixes to be made by the contractor. No claim to alter the rates of concrete work shall be entertained due to such changes in mix variations. Any variation in cement consumption shall be taken into consideration for material reconciliation only. Preliminary mix designs shall be established well ahead of start of work. The design mix shall conform to the guidelines of IS: 10262.

a) **Mixing**: All concrete for reinforced cement concrete shall be mixed in an Automatic Concrete Batching plant as described in special conditions of contract. Wherever designation of concrete is given as M-20 or M-25, etc, only design mix shall be used.

b) **Placing**: Placing of concrete in all structural members shall be done with the help of Concrete Pump(s) of required capacities or any other method approved by Engineer in Charge.

c) **Consolidation**: Concrete for all reinforced concrete works in footings, columns, beams, slabs and the like shall be deposited and well consolidated by vibrating, using portable mechanical vibrators. Concrete in other items such as in chajjas, lintels, shelves etc., shall be laid and well consolidated by beating and tamping. Care shall be taken to ensure that concrete is not over vibrated so as to cause segregation and bleeding.

d) **Finish to concrete work**:

   (i) All concrete while being poured against form work shall be worked with vibrators, rods, trowels as required so that good quality concrete is obtained.

   (ii) All exposed surface of RCC lintels, beams, columns etc. shall be plastered to match with adjoining plastered face of walls after suitably hacking the concrete surface.

   (iii) All soffits of RCC slabs, loft slab, cupboard slab, shelves and working platform in kitchen etc. and other exposed surfaces of RCC work not continuous to brick work shall be plastered with cement to give an even and smooth surface.
2.8.4 **Curing:** Concrete shall be cured by keeping it continuously moist for the specified period of time to ensure complete hydration of cement and its hardening. Freshly placed concrete should be immediately covered by plastics after finishing preventing loss of water through evaporation. Wet curing shall be started after 8 hours of placement of concrete and in hot weather after 4 hours. The water used for curing shall be of the same quality as that used for making of concrete. Curing shall be assured by use of an ample water supply under pressure in pipes, with all necessary appliances such hose, sprinklers etc. A layer of sacking, canvas, hessian, or other approved material, which will hold moisture for long period and prevent loss of moisture from the concrete, shall be used as covering. Type of covering which would stain, disfigure, or damage the concrete, during and after the curing period shall not be used. Only approved covering shall be used for curing. Exposed surfaces of concrete shall be maintained continuously in damp or wet condition for at least the first 14 days after placing of concrete.

The contractor shall have all equipment and materials required for curing on hand and ready to use before concrete is placed.

For curing the concrete in pavements, floor, flat roofs or other level surfaces, ponding method of curing is preferred after the expiry of first 24 hours during which (i.e. first 24 hours) the concrete shall be cured by use of wet sacking, canvas hessian, etc. The minimum water depth of 25mm for ponding shall be maintained. The method of containing the ponded water shall be approved by the Engineer-in-charge. The ponded areas shall be kept continuously filled with water, and leaks, if any, shall be promptly repaired.

Alternatively, membrane curing may be used in lieu of moist curing with the permission of the Engineer-in-charge. Such compounds shall be applied to all exposed surfaces of the concrete by spraying or brushing as soon as possible after the concrete has set. Minimum film thickness of such curing compounds shall be as per the recommendation of the manufacturer so as to obtain as efficiency of 90% as specified by BS: 8110. This film of curing compound shall be fully removed from the concrete surface after the curing period specified earlier. The Engineer-in-charge may not allow curing by curing compounds for those surfaces where use of curing compound may be detrimental to future finishes according to him.

2.7.5. **Sampling and testing of concrete:**

a) Samples from fresh concrete shall be taken as per IS- 1199-1959 (method of sampling of concrete) and cubes shall be made, cured and tested in accordance with IS: 516-1959 (method of test for strength of concrete). For testing cement concrete the contractor shall arrange for all the tools / moulds for making necessary cubes and shall bear all the charges for making the cubes, curing and testing through an approved laboratory.
Further, the contractor shall make available laboratory equipment as listed below. A temporary room of adequate size not less than 10 sqm to have these facilities shall also be constructed by the contractor at his expense. After completion of work the contractor shall remove the equipment, dismantle the room and clear the site:-

<table>
<thead>
<tr>
<th>Aggregate Size</th>
<th>Size of Sieves</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Sieve set (for aggregate 40 mm down)</td>
<td></td>
</tr>
<tr>
<td>80mm</td>
<td>60cms dia</td>
</tr>
<tr>
<td>63mm</td>
<td>60cms dia</td>
</tr>
<tr>
<td>40mm</td>
<td>45cms dia</td>
</tr>
<tr>
<td>20mm</td>
<td>45cms dia</td>
</tr>
<tr>
<td>12.5mm</td>
<td>45cms dia</td>
</tr>
<tr>
<td>10mm</td>
<td>45cms dia</td>
</tr>
<tr>
<td>4.75mm</td>
<td>45cms dia</td>
</tr>
<tr>
<td>2.36mm</td>
<td>45cms dia</td>
</tr>
<tr>
<td>2 Sieve set (for aggregate 20 mm down)</td>
<td></td>
</tr>
<tr>
<td>40mm</td>
<td>45cms dia</td>
</tr>
<tr>
<td>20mm</td>
<td>45cms dia</td>
</tr>
<tr>
<td>16mm</td>
<td>45cms dia</td>
</tr>
<tr>
<td>12.5mm</td>
<td>45cms dia</td>
</tr>
<tr>
<td>10mm</td>
<td>45cms dia</td>
</tr>
<tr>
<td>4.75mm</td>
<td>45cms dia</td>
</tr>
<tr>
<td>600 micron</td>
<td>20 cms dia</td>
</tr>
<tr>
<td>300 micron</td>
<td>20 cms dia</td>
</tr>
<tr>
<td>150 micron</td>
<td>20 cms dia</td>
</tr>
<tr>
<td>75 micron</td>
<td>20 cms dia</td>
</tr>
</tbody>
</table>

(iii) Electronic Weighting machines
(iv) Physical balance of capacity 200 gms with weight box (accuracy 0.5 gm.)
(v) Counter scale of 20 kg. Capacity.
(vi) Weights

<table>
<thead>
<tr>
<th>Sl.no.</th>
<th>Weight</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5 kg</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2 kg</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>500 gm</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>200 gm</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>100 gm</td>
<td>2</td>
</tr>
</tbody>
</table>
(vii) Slump cones 2 Nos.
(viii) 15 cm moulds 18 Nos.
(ix) Electric/ Kerosene heater 1 No.
(x) Pans etc. As directed by the Engineer-in-charge.
(xi) Vicat apparatus with needles, test tubes, breakers, thick glass plates etc.
(xii) Measuring cylinders 1000 ml., 500 ml.
(xiii) Wash bottles Capacity 500 ml- 2 Nos.
(xiv) Sink 1 No.
(xv) Litre : Measures
(xvi) 2 Lit 2 Nos.
(xvii) 4 Lit 1 No.
(xviii) 0.5 Lit 1 No.
(xix) Compressive test machine of suitable capacity 1 No.

b) Compressive strength: 7 days compressive strength test may be carried out in addition to 28 days compressive strength test for a quicker idea of the quality of concrete. In all cases the 28 days, compressive strength alone shall be the criteria for acceptance or rejection of the concrete.

c) Test Specimen: Three test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for such purposes as to determine the strength of concrete at 7 days or to check the testing error.

d) Test strength of samples: The test strength of the sample shall be the average of the strength of three specimens. The individual variation shall not be more than +/- 15 percent of the average.

e) Cement boiling test: Accelerated compressive test as per IS-9013/78 shall be carried out to determine the quality of cement received at site in each consignment. This shall be done as per details below. The test result shall be recorded, signed and kept in a register with the Engineer-in-charge.

f) Prepare 9 cubes with cement concrete mix proposed to be used for the job. Keep the same water cement ratio that will actually be used. Slump could be a good indication.
g) After the cubes are cast, 3 moulds containing the cubes to be tested by accelerated curing method must be covered on the top with a machined plate. The plate should be of the same size as cube mould plates.

h) After 24 hours of casting, the three cubes shall be boiled with the top plates on. In the field, these could be boiled in a drum with at least 75mm water standing over the cube moulds. The boiling must be uniform and constant for exactly 3 and 1/2 hours. Thereafter, the cubes must be taken out of the boiling water, de-mould and cooled for 1 hour and tested. Exact timings are extremely important and must be followed. The anticipated 28 days compressive strength can be calculated from the regression equation given below:

\[ Y = 8.2 + 1.609A \]

where \( Y \) = the predicted 28 days cube result in N/mm\(^2\)

\( A \) = accelerated cube result in N/mm\(^2\)

2.7.6. Bearing Plaster : This shall consist of cement plaster 1:3 (1 cement : 3 fine sand) 20mm thick finished with a coat of neat cement laid on top of walls as bearing for RCC lintels, beams and slabs. When dry, a thick coat of lime wash shall be given before starting shuttering. The shuttering shall be started after minimum one day of bearing plaster so that it is set.

In respect of projected balconies, projected slabs at roof level and projected verandah, the payment of the RCC work shall be made under item, of RCC slabs, the payment for centering and shuttering of such items shall similarly be paid under the item of Centering and Shuttering of RCC slab nothing extra shall be paid for the side shuttering at the edges of these projected balconies and projected verandahs. All exposed edge shall however, be finished as per specification and nothing extra shall be paid for this.

In the item of RCC walls, railing and roofs etc. nothing extra shall be paid for making designs as per patterns given by Architects or thickness of sections.

The rates for railing are inclusive of all the labour and the materials including execution as given description of the item, portion of railings, which is embedded in the masonry, or RCC shall not be taken for measurements.

The compaction of the Pre-cast concrete shall be done by vibrating table or external vibrator, as approved by the Engineer-in-charge. The rate quoted for the item shall include the element both for form work and mechanical vibration.
2.7.7 **Measurement**
Measurement will be taken on the concrete surface in cubic metre.

2.8. **FORM WORK**

2.8.1. **Materials and design**

a) The form work shall be made of sufficiently rigid steel and/or ply board. Joints of the shuttering must not allow loss of liquid from concrete. In shuttering the joints shall be perfectly closed and lined with craft paper or other types of approved materials. The form work shall be constructed as to remain sufficiently rigid during placing of the concrete. All shuttering and framing must be adequately stayed and braced to the satisfaction of the Engineer in-charge for properly supporting the concrete during the period of hardening. The forms shall have sufficient strength and rigidity to hold concrete and withstand the pressure, lines and levels. The surface of all forms in contact with concrete shall be clean, rigid, watertight and smooth. Suitable devices shall be used to hold corners, adjacent ends and edged of panels of other forms together in accurate alignment.

b) The form work shall conform to the shape, lines and dimensions to suit the R.C.C members as shown on drawing. Form work shall be adequately designed to support the full weight of workers, fresh placed concrete without yielding to settlement or deflection and to ensure good and truly aligned concrete finish in accordance with the construction drawings. A camber in all direction of 6 mm for every 5 metre span in all slab and beam centering shall be given to allow for unavoidable sagging due to compression or other causes.

c) The form shall be so designed that the sides of the beams shall be first removed leaving the soffit of beams and supporting props in position. Props shall be designed to allow accurate adjustment & to permit of their being removed without jarring the concrete.

d) Temporary opening shall be provided at the base of columns forms and at other points where necessary for facilities of cleaning and observations immediately before concrete is deposited.

2.8.2 **Vertical shuttering:** The vertical shuttering shall be carried down to such solid surface as is sufficiently strong to afford adequate support and shall remain in position until the newly constructed work is able to support itself. Props of approved quality shall be used. Tubular steel props shall be preferable. In case timber props and bullies are allowed to use these shall be of minimum 10 cm diameter and shall be straight and adequately strong. The spacing of such struts shall be designed to carry loads imposed on it without undue deflection of the members supported by the props and shall be approved by the Engineer in-charge. Any alterations suggested by the Engineer-in-charge shall be carried out at Contractor’s expenses. Bracing shall be provided as directed without extra cost.
However for shuttering height exceeding 4.0M or depth of concreting exceeding 0.60 M, the proper shall be tubular steel props duly clamped in a rigid manner at stage or in absence of steel props solid wooden bullies of minimum 150 mm diameter straight and sufficiently strong and duly braced as approved by the Engineer-in-charge.

2.8.3 **Water tightness of shuttering:** The Contractor shall ensure that the forms are checked for water tightness just before concreting operation starts and shall make good any deficiencies. If instructed by the Engineer in-charge building paper or any other approved materials will have to be used without any extra charge for the same.

2.8.4 **Cleaning and treatment of forms:** All rubbish, particularly wood chipping, shaving and saw dust, shall be removed from the interior of the forms before the concrete is placed and the form work in contact with the concrete shall be cleaned and thoroughly wetted. Interior of all moulds and boxes must be thoroughly washed out with hose pipe or otherwise so as to be perfectly cleaned and free from all extraneous matter before deposition of concrete. Prior approval of the form work should be taken from Engineer in-charge before placing reinforcement on the form work.

2.8.5 **Stripping:** Form shall be left in place until their removal is authorized by the Engineer in-charge and shall then be removed with care so as to avoid injury to concrete. Under no circumstances shall form be struck until the concrete reaches as strength of at least twice the stress to which the concrete may be subjected at the time of striking.

2.8.6 **Stripping time:** Stripping time shall be as follows:

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>Stripping time</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Vertical formwork to columns, walls, beams</td>
<td>48 hours</td>
</tr>
<tr>
<td>b) Soffit formwork to beams (Props to be re-fixed immediately after removal of formwork)</td>
<td>14 days</td>
</tr>
<tr>
<td>c) Props to slabs:</td>
<td></td>
</tr>
<tr>
<td>i) Spanning up to 4.5 m</td>
<td>14 days</td>
</tr>
<tr>
<td>ii) Spanning over 4.5 m</td>
<td>21 days</td>
</tr>
<tr>
<td>d) Props to beams and arches</td>
<td></td>
</tr>
<tr>
<td>i) Spanning up to 6 m</td>
<td>21 days</td>
</tr>
<tr>
<td>ii) Spanning over 6 m</td>
<td>28 days</td>
</tr>
</tbody>
</table>

2.8.7 **Formwork in Lifts for Continuous Surface:**

Where forms for continuous surface are placed in successive units, (as for example in columns or R.C.C walls) the forms shall fit tightly over the completed surface so as to prevent leakage of mortar from the concrete and to maintain accurate alignment of the surface.
2.8.8. **Removal of Form Work:**

Form work shall be removed in such a manner as would not cause any shock or vibration that would damage the concrete surface shall be exposed to ascertain that the concrete has sufficiently hardened.

a) Where the shape of the element is such that form work has re-entrant angles, the framework shall be removed as soon as possible after the concrete has set, to avoid shrinkage cracking occurring due to the restraint imposed.

2.8.9. **Measurement:** Measurements shall be taken of the area of shuttering in contact with the concrete surface. Dimensions of the form work shall be measured correct to a cm. to be issued by EPI, as mentioned at ACC.

2.9 **STEEL REINFORCEMENT:**

2.9.1 Only steel conforming to Fe500D grade of IS 1786:2008 as per item shall only be used. As and when desired by the Engineer-in-charge the contractor shall be required to produce the test certificate from the approved test house at his own cost. The mandatory tests of reinforcement shall be carried out by the contractor at his own cost in IITG Laboratory.

2.9.2 **Cleaning of reinforcement:** Before steel reinforcement is placed in position, the surface of the reinforcement shall be cleaned out of rust, dust, grease and any other objectionable deleterious substances.

2.9.3 **Bar bending schedule of reinforcement:** On receipt of structural drawing, Contractor shall prepare bar bending schedule of reinforcement and shall obtain approval of the Engineer in-charge.

2.9.4 **Placing and security:** Reinforcement bars shall be accurately placed and secured in position by 20 gauge soft black annealed steel wire and firmly supported or wedged by pre-cast concrete blocks of suitable thickness at sufficiently close intervals so that they will not sag between the supports or get displaced during the placing of concrete or any other operation of the work. At intersection point binding of reinforcement point shall be in both the direction. Contractor shall maintain reinforcement in its correct position without displacement and correct specified cover.

2.9.5 **Welding:** Welding of bars shall not be carried out unless specifically authorized in writing by Engineer in-charge as per I.S. Code of Practice in place of splicing. However, no extra payment shall be allowed for the same.

2.9.6 **Inspection of reinforcement:** No concreting shall be commenced until Engineer in-charge has inspected the reinforcement in position and until his approval has been obtained. A notice of at least 72 hours shall be given to the Engineer in-charge by the contractor for inspection of reinforcement. If in the opinion of the Engineer in-charge, any materials are not in accordance with the specification or the reinforcement is incorrectly
spaced, bent or otherwise defective, the contractor shall immediately remove such materials from the site and replace with new material and rectify any other defects in accordance with the instruction of the Engineer in-charge and to his satisfaction.

2.9.7 **Cover for reinforcement:** To be followed as per IS Code of practice if not specified.

2.9.8 **Net measurement:** Reinforcements shall be placed as shown on the structural drawings and payment will be made on the net measurements in accordance with the drawing and taken at the site. Only such laps, dowels, chairs and pins in reinforcement as approved by the Engineer in-charge or shown in drawings shall be paid for. The contractor shall allow in the quoted rates for all wastage, which will not be paid separately.

2.10. **CEMENT PLASTER (INTERNAL & EXTERNAL)**

2.10.1 **Preparation of Surface:** The walls to be plastered shall have all joints raked out to a depth of 10 mm, if not already done. R.C.C. surface shall be properly hacked to get good key to the plaster. All dust and oily matter, if any, shall be brushed and cleaned and surface to be plastered shall be kept wet for 6 hours before plastering is commenced.

2.10.2 **Proportion of Mortar:** It shall be as specified in the items in the BOQ.

2.10.3 **Application of Plaster:** The mortar shall be applied evenly with force on the surface to be plastered. The mortar surface shall be finished at once by being rubbed over with a trowel till the cement appears on the surface. All corners, angles and junctions shall be truly vertical and horizontal as the case may be, carefully and neatly finished. Rounding of corners and junctions where required shall be done without extra charge. The mortar shall adhere to the surface intimately when set and there should be no hollow sound when struck. The thickness of plaster shall be minimum 6 mm/ 12 mm/ 15 mm as specified in the items.

2.10.4 When neat cement finish is specified over the plaster surface, a coat of pure Portland cement slurry, 1.5 mm thick shall be applied and well rubbed to the plaster surface while the plaster surface is still fresh.

2.10.5 When no finish is specified, the plastered surface shall be rubbed well to an even plane with a wooden float for external surface and finished smooth with a steel trowel for internal surface.
2.11. **WOOD WORK:**

2.11.1 Timber as specified to be used for wood work shall be kiln seasoned, chemically vacuum pressure treated as per the relevant items in the schedule of quantities will be of required variety obtained from approved sources. Timber samples shall be approved by the Engineer-in-charge before quantities are brought to site in bulk.

Shutters of paneled doors, glazed & mosquito proof windows shall be machine made with kiln seasoned, chemically vacuum pressure treated timber frames as per relevant BIS code & specification of item and with panels of required thickness of phenol bonded particle board pre-laminated in both sides as per nomenclature of item.

2.11.3 Permissible tolerance on wood work shall be as under:-

a) Door frames = 2mm + 3mm  
b) Door shutters.  
   i) On width and height = + 3mm.  
   ii) On thickness of = + 1.2mm.

2.11.4 The samples of species to be used shall be got approved by the contractor from the Engineer-in-charge before bulk purchase. Approved samples shall be kept with the Engineer-in-charge If so desired.

2.11.5 Transparent glass conforming to IS 1761-1960 shall be used. Thickness of glass shall be as specified in the item. Glazing for toilets shall be opaque type.

2.11.6 **Test:** As and when desired by the Engineer-in-Charge the contractor shall be required to produce the test certificate from the approved test house at his own cost.

2.12. **HARDWARE**

2.12.1 Mongery shall be provided to all doors and windows, shutters with necessary matching screws of suitable size etc.

2.12.2 Fittings and fixtures to all doors and windows etc. shall be of anodized aluminium mat finished ISI marked of make and of approved quality.

2.12.3 M.S. butt hinges for doors shall be ISI marked heavy quality in steel of size 100 x 65 x 2.12 mm for doors with mild steel pin and shall be oxidized finished. These shall be fixed with machine screws with steel frame as specified.

2.12.4 All fittings shall be ISI marked for the categories where marked fitting are manufactured.

2.12.5 Other fittings as provided in the different items of work and as required by the owner shall be provided as per the requirement of the owner.
2.12.6 One sample piece of each fitting shall be produced for approval of Project Engineer. The bulk supply order shall be placed by the contractor only after approval is accorded by Project Engineer.

2.12.7 Hardware/Fittings of door and window shutters shall be as per items and drawings.

2.13. STEEL/ALUMINIUM WORK:

Steel work in door frame made of MS angle and MS flat welded built-up section with provision for fixing hinges and MS flat lugs for fixing with masonry/RCC etc., complete shall be carried out as per drawing. MS flat hooks for bolting arrangement for sliding and tower bolts, curtain brackets and cleats shall also be welded to the MS frame as per drawing. All steel work shall be painted with a priming coat of approved steel primer.

All works shall be carried out to proper line and specifications. All welding of steel work shall be tested for the quality of weld as laid down in IS 8222-1970 before erection. Wherever it appears shall mean continuous fillet welding unless otherwise directed by Engineer-in-Charge or shown in the drawing. Machine girding at shop shall be done over the weld to remove the excess deposit and scales.

2.13.1. Aluminium doors windows and ventilators:

Aluminium doors, windows and ventilators wherever proposed shall be supplied and fixed with following specifications unless otherwise specified in relevant item and nothing extra shall be paid beyond the quoted rate.

2.13.2. All aluminium extruded sections (as per IS: 733 - 1983) are to be provided of Hindalco/ Bhoruka/ Indal or approved equivalent sections as per drawings and as directed.

2.13.3. All sections shall be anodized in natural mat finished of 15 Microns unless otherwise mentioned.

2.13.4. Shipping Tolerance will be + 10%. Sections will be as per tolerances given in relevant I.S. specifications and will also be applicable for bend, flatness, twist angularity etc.

2.13.5. Fabrications shall be got done through specialized firm in their workshop and covered with polyethylene paper till completion and handing over the possession.

2.13.6. Sliding windows shall withstand the arduous duties of applications in 2, 3 or 4 track or combine unit.

2.13.7. Sliding shutters are to be joined by special cleats, rollers mounted on ball bearing are to be fitted to obtain smooth operation. Shutters shall move within robust frames with grooves for weather strips to exclude wind, water or dust ingress.
2.13.8. Total sliding systems is to be secured by spring operated flush latch.

2.13.9. All glass pans shall be fixed using gaskets of ethylene - propylene or PVC (EPDM).

2.13.10. All doors and windows are to be provided with all required fittings in anodized aluminium as stated in item without additional cost unless otherwise directed. Samples of doors, windows and ventilators shall be brought to site and fitted in a position for approval of the Engineer-in-charge before bulk purchase and manufacture.

2.13.11 The windows in southern & western sides shall have double glazing hermetically sealed as per item of work.

2.13.12. Measurement

Unit of measurement shall be given in the B.O.Q.

2.14. ROOF TILES

2.14.1 General

Well burnt machine made clay Tiles of approved design and manufacturer shall be laid on sloped roof with following specifications.

a) The tiles shall be machine made and of approved quality, well and uniformly burnt, free form cracks, twist, flaws and any imperfections in shape or size. They shall be uniform in colour and must give a clear ringing sound when struck. The dry tiles on immersion in water for one hour shall not absorb more than 1/6 of its dry weight.

Sample of the tiles proposed to be used should be got approved from the Engineer-in-charge in advance before supply is made. Tiles not confirming to the above specifications and to the approved sample shall be rejected.

Some samples of approved tiles are in the Office of the Engineering Section, IITG and can be seen during office hour before submitting tenders.

2.14.2 Laying

Tiling shall consist of a layer of flat trough shaped laid on RCC roof terrace edges.

a) The flat tiles must lap accurately one over the other. The moulded notch at the lower and of each flat tile must fit completely into the head of the tiles next below it.

b) All the lines of the tiles shall be straight in both directions.

c) All ridges, hips and eaves tiles shall be laid in cement mortar 1:4 (1 cement : 4 coarse sand).
d) The valleys shall be formed in proper manner with cutting the tiles in its proper shape & neatly and shall be set in cement mortar 1:4 for half the length.

e) Tiles, ridges & hips which are to be set in cement mortar, shall be soaked in water for two hours before laying and shall be kept wet for seven days after they are laid. Laying operation shall include all scaffolding work involved at all heights.

Roof tiles of equivalent specifications shape and design may also be allowed to be used after getting fully satisfied regarding its specifications, shape and design by the Engineer-in-charge and the Architect.

2.14.3: Rate: Rate should include supply and fixing of tiles including ridge, valley etc.

2.14.3 Measurement

Measurement for payment will be taken in sqm on the finished work. No separate payment shall be made for ridge, valley, etc.

2.15 WATER PROOFING OF ROOF, TERRACE AND SUNKEN FLOOR:

2.15.1 Roof

A protective water proofing layer with polymer base polyurethane coating of approved brand and shade over the machine made clay tiles shall be provided as per manufacturer’s specifications and as directed by the Engineer-in-Charge. Surface to be treated should be absolutely free from dust, loose particles, oils, and grease before application. Rate quoted should cover the entire operations. And measurement for payment shall be taken once on the finished surface and paid under the relevant item of BOQ.

2.15.2 Terrace and Sunken floors:

Water proofing treatment of the sunken floors, terraces and sloping roofs will be done with approved polymer modified cementitious composite (PMCC) slurry and fibre glass cloth as per manufacturer’s specifications and as directed by Engineer-in-Charge. Work shall be done in the following steps.

a) Cleaning the roof surface and parapet wall from dust, dirt, cement slurry etc. by means of wire brush, dust removing brush, scraper etc.

b) Wetting the surface prior to application of ‘PMCC’ without free water standing.

c) Application of 1st coat of acrylic polymer modified cementitious slurry coating over the mother roof slab surface and to be taken to the vertical parapet walls and turned down the exterior surface of the parapet walls.
d) Laying fibre glass cloth over the PMCC applied surface upto 300 mm height of vertical walls when the first coating is still green and allowed to air cure at least 4 (four) hours.

e) Application of one coat of PMCC Brush Topping coat over the treated surface and allowed for air cure for at least 4 (four) hours and water cure for next two days.

f) The treated surface shall be covered by laying a protective layer of 12 mm plaster of cement mortar 1:4 (1 cement: 4 coarse sand) with approved water proofing compound as per manufacturer's specifications. Normal curing of the roof should be done prior to allowing traffic.

The rate for the item should include all the operations. Measurement shall be taken once on the finished surfaces.

2.16. FLOORING: The flooring shall be laid as per specifications of items of B.O.Q and detailed specifications. The rate of items of flooring is inclusive of providing sunken flooring in bath rooms, kitchen etc. and nothing extra on this account is admissible.

2.16.1. Cement Concrete Flooring: Cement concrete flooring shall in general conform to IS: 2571. Cement concrete flooring shall consist of a sub base (laid on the compacted earth or sand or sand fill in case of ground floor only) a base course laid on the sub-base and then finishing layer of flooring. The bed for flooring shall be prepared either level or sloped as per drawings and as instructed by Engineer-in Charge.

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

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

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

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

When the base course is to be laid on hardened base, the sub-base be roughened by steel wire brushing and cleaned. Before laying the base course, neat cement slurry shall be brushed into the prepared surface.
Cement concrete shall be placed in position and beaten with trowel and finished smooth. Beating shall cease as soon as surface is found covered with cream of mortar. Necessary slope shall be provided.

2.16.2. Curing:

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

2.16.3 Pre-cast Hydraulically Pressed Plain Cement Tiles Flooring:

Cement concrete tile shall conform to IS: 1237 and shall be of approved shade, with 10mm down size stone aggregates and shall be of specified thickness and approved shade. Cement shall be of light shade and all tiles required for the work shall be made from the same lot of cement to maintain uniform shade.

Pigments when used with mortar or for grounding shall conform to Table -1 of IS:2114. Cement mortar shall be of specified mix and thickness.

Workmanship shall in general conform to IS: 1443. The base on which tiles are to be laid shall be cleaned of all dust, dirt and properly wetted without allowing water pools. Cement mortar of specified thickness shall then be spread over base for two rows of tiles and 3-5 meters in length. The mortar shall be laid in slope as per requirements and thickness of mortar shall not be less than 10mm at any place. The top of the mortar shall be kept tough so that cement slurry can be absorbed. Laying shall be from centre & proceed outwards in the two directions at 90°. Cut tiles of uniform sizes shall be laid along periphery, if necessary. Neat cement slurry @ 4.4 kg of cement per sqm shall be spread over the mortar bed for laying 20 tiles at a time. The tiles shall then be fixed in this grout one after the other, each tile being gently tapped and properly bedded in line and level. The joints shall not exceed 1.5mm in width. After the day’s work, the excess cement slurry on top and the joints shall be cleaned with broom stick and washed before the slurry sets hard. Next day, the joints shall be filled with the cement grout of the same shade as the matrix.

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

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

Grinding shall be commence after 14 days when the tiles and the joints are properly set. Grinding shall be done by machines except for skirting and small areas, First grinding shall be done with carborundum stones of 48 to 60 grade grit fitted the machine. Water shall be properly used during grinding. When the chips show up and the floor has been uniformly rubbed, it shall be cleaned with water baring all pin holes. It shall then be covered with a thin coat of grey/ white cement mixed with pigments to match with colour of the flooring. This grout shall be kept moist for a week. Thereafter the second grinding shall be started with carborundum stone of 120 grit. Grinding and curing shall follow again. Final grinding shall be with carborundum of grade 220 to 350 grit using water in abundance. The floor
shall be washed clean with water, oxalic acid powder shall then be dusted at 33 gms/ sqm. on the surface rubbed with machine fitted hessian bobs or rubbed hard with woolen rags. The floor shall then be washed clean and dried with a soft cloth or linen. If any tile is disturbed or damaged, it shall be refitted or replaced proper jointed and polished.

2.16.4 Pre-cast hydraulically pressed terrazzo tile flooring:
Terrazzo tiles shall be of specified thickness and shade shall generally conform in all respect to IS-1237. Pigments, Cement Mortar, Workmanship, Curing, Grinding and Polishing shall be followed as given for Pre-cast Hydraulically Pressed Plain Cement Tiles Flooring.

2.16.5 Glazed Tiles work:
Glazed tiles shall conform to relevant IS codes and shall be of specified shade, size, and of approved manufacturer. Pigments, cement mortar, shall be as specified as in PCC tiles. The tiles shall be laid over coating of specified adhesive (as per approved manufacturer’s specification) laid on base floor/wall plaster. The joints of the tiles shall be flush pointed with cement paste (white cement and pigment conforming to IS-2114, Table -1) matching the shade of colours.

Curing shall be as specified as in PCC tiles

2.16.6 Kota Stone Flooring:
The slabs shall be of selected quality and shade, hard sound, dense homogenous in texture, free from cracks, decay weathering and flacks. These shall be machine cut to size of 550x550mm unless otherwise specified. For kitchen slab where specified the stone slab shall be for full width of kitchen slab and length of minimum 1800mm. Kota stone slabs in treads and risers of stair cases shall be in single piece. In the floors where dimensions are not in the multiple of 550mm equal borders shall be left on opposite sides and shall be made up with matching size of kota stone slab. No extra payment shall be made for such extra border work.

The slabs shall have the top (exposed) face polished before being bought to site. Before starting the work, the contractor shall get the samples of slabs approved by the Engineer-in-Charge.

Each slab shall be machine cut to the required size and shape and fine chisel dressed at all edges to full depth and machine rubbed to smooth surface finish. All angles and edges of the slabs shall be True Square and free from chippings giving a plane and smooth surface.

Cement mortar 1:6 (1 cement: 6 coarse cement sand by volume) of specified thickness shall be laid over the base after making it rough and cleaning thoroughly. The mortar shall be laid for flooring one slab at a time over the base slab thoroughly washed, cleaned and kept moist.
The slab shall be washed clean before laying. It shall be laid over cement mortar bedding on top, pressed, and tapped gently to bring it in level. It shall be then lifted and laid aside. Top surface of the mortar then shall be connected by adding fresh mortar at hollow or and depressions. The mortar then shall be allowed to harden and cement slurry of honey like consistency @ 4.4 kg of cement per sq. shall be spread over the mortar. The edged of the slabs shall be buttered with white cement with or without pigment grout to match the shade of the slabs. The slabs shall then be gently placed in position and tapped with wooden mallets till it is properly bedded on level. The joints shall be as fine as possible. Surface cement on the surface of the slab shall be removed. The slabs in flooring shall continue for not less than 10mm under the plaster/ skirting. The finished surface shall be true to levels and slope as instructed by the Engineer-in-Charge.

The slabs shall be laid in patterns as per drawings and size shall not be less than 31mm x 310mm. Cut uniform size may be used along periphery as required.

The floor shall be cured for a minimum period of 7 days by wetting. Unevenness at the meeting edges of slabs shall be removed by fine chiseling polishing etc. shall be done in accordance with what has been specified for Pre-cast Hydraulically Pressed Plain Cement Tiles Flooring except that cement slurry shall not be applied on the surface before each polishing.
3.1 The intent of this section of the specification is to define the general technical requirements of the major items of Sanitary and water supply works.

3.2. GLAZED STONeware PIPES

3.2.1 Specifications

Wherever specified for drainage/ sewer lines, glazed stoneware pipes shall be used. These pipes shall be of first class approved quality, straight, free from any roughness inside or outside and conforming to IS: 651-1980.

3.2.2 Laying

The pipes shall be laid on a bed of 15 cm thick cement concrete 1:5:10 mix or as specified in items with sockets leading uphill and should rest on solid and even foundations for the full length of the barrel. Socket holes shall be formed in the foundation sufficiently deep to allow the pipe jointer room to work right round the pipes and as short as possible to admit the socket and allow the joint to be made.

If the bottom of the trench consists of rock or very hard ground that cannot be easily excavated to a smooth surface, the pipes shall be laid on concrete cradles to ensure even bearing.

The pipes with their crown level at 1.2m depth and less from finished ground level shall be surrounded with 15 cm thick cement concrete 1:5:10 mix or as specified in items all around. Pipes laid at a depth greater than 1.2 m at crown shall be laid in concrete at the side upto the level of the centre of the pipe and slopped up from the edges to meet the pipe tangentially.

3.2.3 Jointing

The spigot of each pipe shall be slipped home well into the socket of the pipe previously laid and adjusted in correct position.

The opening of the socket shall then be filled with a stiff mixture of cement mortar 1:1 (1 cement : 1 fine sand). The jointing material shall be properly cured. When the socket is thus filled a fillet shall be formed round the joint with a trowel forming an angle of 45° with the barrel of the pipe.
3.3 CAST IRON PIPES

3.3.1 Specifications
Wherever specified the cast iron pipes for drainage shall be either vertically cast type conforming to IS:1537-1976 or centrifugally spun type conforming to IS: 15536-1976 or as specified in the item of works.

Generally all drainage lines passing under buildings floors, road with heavy traffic and in exposed position above ground or like situations shall be in cast iron.

3.3.2 Laying and Jointing
All excavation work for laying cast iron drainage pipes shall be done as described in section B.2.2. Jointing pipes shall be done as described in sub-section B4.2.2 hereunder after.

3.4. EXTERNAL WATER SUPPLY

3.4.1 Galvanised Iron pipes and fittings:

a) Specifications

Where specified G.I. pipes for water supply inside and outside the buildings shall be genuine galvanised steel tubes conforming to IS: 1239-1968 of specified grade.

All fittings shall be malleable iron galvanised fittings conforming to IS: 1239( Part II) - 1968. All fittings shall have manufacturers trade mark stamped on it. Fittings in G.I. pipelines shall include elbows, tees bends reducers, nipples, union buses, G.I. clamps of approved design, G.I flanges with 3mm rubber insertion, nuts, bolts, washers etc.

b) Laying and Fixing

Screwed G.I pipes shall be joined with screwed socket joints, using screwed fittings. After cutting and threading white lead with PTFE tapes shall be used while tightening. Other pipe jointing compound may be permitted if approved before starting the work. All pipes shall be fixed with G.I holder bat clamps clear of the wall. If pipes are fixed in chases they shall be fixed in position by iron hooks. All piping shall be kept plugged at the end of day’s work.

Pipe laid underground shall be painted with two coats of anticorrosive bitumastic paint and covered with fine sand 150 mm all around. The pipes in chases shall also be painted with bitumastic paint.

c) Depth of cover for underground water pipes

The cover for the mains shall be at least 90 cm under vehicular areas and 75 cm in pedestrian areas and 30cm to 60cm at other places as directed.
3.5 **NON RETURN VALVES**

The valves shall be of best quality and shall generally conform to IS : 778 - 1971.

3.6 **VALVE CHAMBER**

Valve chamber shall be provided at suitable location as directed.

3.7 **SOIL, WASTE AND VENT PIPES**

3.7.1. **Specifications**

Cast iron pipes & fittings shall conform to IS: 1729 - 1979 or IS: 3989 - 1970 (or as revised) and shall be used for soil, waste and vent pipes. Pipes and fittings with irregular bore, blow holes and other manufacturing defects shall not be allowed to used for work.

3.7.2 **Jointing**

The spigot of the pipe shall be placed inside the socket & gasket caulked home to leave the depth for lead as specified in the table below. Molten pig lead shall then be poured into the joint filling the same in one pouring. While filling horizontal pipe joints with molten pig lead, care shall be taken against flow of any molten material outside the joint by putting 25mm thick plug of suitable material at the face of the bottom half of the joint. This plug shall be removed and joints checked. The lead shall be caulked by proper tools to make it even all around. The pig lead shall conform to IS : 782 - 1978.

The depth of lead required for joints in various sizes of cast iron pipes are

<table>
<thead>
<tr>
<th>Nominal Dia (mm)</th>
<th>Depth of lead (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>75</td>
<td>25</td>
</tr>
<tr>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>150</td>
<td>38</td>
</tr>
</tbody>
</table>

3.7.3 **Holder bat Clamps**

All pipes shall be fixed clear off the wall with M.S. holder bat clamps. Holder bat clamps shall be of a standard design fabricated from M.S. galvanized flat 32x1.5mm thick and 12mm dia M.S. bar and 6mm nuts and bolts. Holder bat clamps shall be fixed in cement concrete (1:2:4) blocks 100x100x100mm. Walls shall be plastered before fixing the pipe on the surface. The clamps shall be welded with extension pieces to increase their clearance from wall as per drawing.
3.8. TRAPS

3.8.1 General

The entry of foul air to the building should be prevented by suitable traps, properly sited.

Traps should always be of a self-cleansing pattern. A trap which is not an integral part of an appliance should be directly attached to its outlet, and the pipe bore should be uniform through and have a smooth surface.

Traps for use in domestic waste installations and all other traps should be conveniently accessible and provided with cleaning eyes or other means of cleaning.

The size of the trap shall be as per the internal diameter of waste pipe of the appliances to which it is attached. Minimum internal diameter for various waste appliances are as given following table:

<table>
<thead>
<tr>
<th>Item</th>
<th>Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking fountains</td>
<td>25</td>
</tr>
<tr>
<td>Wash basins</td>
<td>30</td>
</tr>
<tr>
<td>Bidets</td>
<td>30</td>
</tr>
<tr>
<td>Domestic sinks and baths</td>
<td>40</td>
</tr>
<tr>
<td>Shower bath trays</td>
<td>40</td>
</tr>
<tr>
<td>Domestic bath tubes</td>
<td>50</td>
</tr>
<tr>
<td>Hotel and Canteen sinks</td>
<td>50</td>
</tr>
<tr>
<td>Urinals:</td>
<td></td>
</tr>
<tr>
<td>Stall urinals (with not more than 1.20 m of channel drainage)</td>
<td>50</td>
</tr>
<tr>
<td>Lipase urinals</td>
<td>40</td>
</tr>
<tr>
<td>Floor traps (outlet diameter)</td>
<td>75</td>
</tr>
</tbody>
</table>
3.8.2 Floor Traps

Floor taps shall be cast iron deep seal type P or S traps with a minimum seal of 65mm. They shall be with or without vent. All traps shall be set in cement concrete block 1:2:4 mix without any extra additional cost.

Urinal traps shall be provided with C.P. brass domical grating. Traps shall be provided with suitable extension pieces where required, with chromium plated grating to flush with the floor without any extra cost.

3.9 INSTALLATION OF SOIL, WASTE AND VENTILATION PIPE WORK

3.9.1 Gradient

The gradient of a horizontal branch should not be flattered than 1 in 50 and not steeper than 1 in 10.

3.9.2 Layout

The pipe work in branch connections should always be arranged to allow free drainage of the system. Connections to main or branch pipes should be so arranged as to prevent cross flow from one appliance to another. Connections should be made with an easy sweep in the direction of flow.

3.9.3 Joint

All joints in pipe work and all pipe work to appliances should be made in such a manner as to be air-tight and water tight and to remain so during use.

3.9.4 Bends

Bends should be of long radius where practicable. In the case of bends in the bottom most pipes, they should necessarily be of long radius and should preferably be made of $135^0$ (1/8) bends.

3.9.5 Access

Ample provision should be made for access to all work and embedding of joint in wall should be avoided as far as possible. All tee and cross pieces shall be with access doors. Where instructed by the Engineer-in-Charge, the bends with access doors shall also be provided. The bottom most pipes of every soil and waste stack shall be provided with an access piece at a height not more than 30 cm finished ground/ floor level.
3.9.6 Soil pipes

Soil pipes, whether inside or outside the building shall not be connected with any rain water pipe and there shall not be any trap in such soil pipe or between it and any drain with which it is connected.

3.9.7 Ventilating pipe

Ventilating pipes should be so installed that water cannot be retained in them. They should be fixed vertically. Whenever possible, horizontal runs should be avoided. Ventilating pipe shall be carried to such a height and in such a position so as to offer by means of the open end of such pipe or vent shift, a safe outlet for foul air with the least possible nuisance.

3.9.8 Concrete Encasing

All soil and waste pipes below ground floor and in wall chases (but not in open ducts) shall be supported and covered with 75 mm cement concrete 1:3:6 in bed and all around. Encasement of such pipes shall be done after testing of pipes.

3.9.9 Painting

All pipes in ducts, under floor and in exposed position shall be pointed with minimum three coats of paint of approved shade and quality. No extra payment shall be made for painting work.

3.10 INTERNAL WATER SUPPLY INSTALLATION

3.10.1 Pipes and fittings

a) Specifications

All pipes for water supply (both hot and cold) inside the building shall be 3 layered PPR (Poly Propylene Random Co-Polymer) pipes of approved brands.

For fittings and other details clause B4.2.2 shall apply.

a) Laying & Fixing

b) In general, laying and fixing shall be carried out as per clause 4.2.2. However, exposed pipes on wall shall be fixed with standard pattern holder bat clamps of required shape and size so as to fit tightly on pipes when tightened with screwed bolts. These clamps shall be either embedded in brick work in cement mortar 1:3 (1 cement : 3 coarse sand) or fixed on angle frames fixed in walls or suspended from
ceilings. The clamps shall be spaced at regular intervals in straight length as per following table :-

<table>
<thead>
<tr>
<th>Dia of Pipe (mm)</th>
<th>Horizontal Length (M)</th>
<th>Vertical Length (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>20</td>
<td>2.5</td>
<td>3</td>
</tr>
<tr>
<td>25</td>
<td>2.5</td>
<td>3</td>
</tr>
<tr>
<td>32</td>
<td>2.5</td>
<td>3</td>
</tr>
<tr>
<td>40</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>50</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>65</td>
<td>3.5</td>
<td>5</td>
</tr>
<tr>
<td>80</td>
<td>3.5</td>
<td>5</td>
</tr>
</tbody>
</table>

3.10.2 Water Fittings

a) General

All C.P brass or gunmetal water fittings as provided in the item shall be of heavy quality and approved manufacture and pattern. A sample of the fittings shall be got approved from the Engineer-in-charge before bulk purchase and all fittings shall be provided according to the approved sample.

Each fitting shall have the manufacturer’s stamp on it.

b) Full Way Gate Valves:

The full way gate valves shall be of heavy gunmetal conforming to IS : 778 - 1964.

c) Mixing Taps

Combination taps, mixing valves or blenders for mixing hot and cold water and discharging the mixture through a single outlet shall be conforming to IS : 1701 - 1960 and approved make.

d) Ball Valves

The ball valves shall be of high pressure or low pressure type and shall be of the size as specified. The body of the ball valve shall be capable of withstanding a pressure of 14 kg/sqcm. A high pressure ball valve with the float immersed to not more than half of its volume shall remain closed against a test pressure of 10.5 kg/sqcm and a low pressure valves against a test pressure of 3.5 Kg/sqcm. The ball valves shall conform to IS : 1703 - 1977.
3.10.3 Fittings for Overhead Tanks

a) General
Each overhead water storage tank shall be provided with sockets for inlet, outlet, overflow, scour, etc. All openings shall be fixed mosquito proof brass grating of approved design.

b) Outlets.
The outlet pipe shall be fixed 50 to 75mm above the bottom of the tank and provided with copper gauge stainers.

c) Wash Out (Scour)
The wash out of draining pipe shall be made flush with the bottom of the tank at its lowest point.

d) Overflow
The overflow pipe shall be one size higher than the inlet pipe. The level of the overflow pipe shall be set below the inlet pipe at 25mm or diameter of the overflow pipe whichever is more.

3.11 SANITARY FIXTURES & FITTINGS

3.11.1 Workmanship
All sanitary ware shall be fixed in a neat workmanship like manner, true to level and plumb. Manufacturer’s instructions shall be followed closely regarding installation and commissioning.

3.11.2 Sanitary ware
All porcelain sanitary ware shall be of approved make. All fittings shall be of first class quality, free from warps, cracks and glazing defects. All sanitary ware, fitting and fixtures shall be as shown in drawings and as described in details in schedule of items.

3.11.3 Fixing
All fixtures shall be fixed with chromium plated brass screws with washers wherever necessary

3.11.4 Painting
The high level cast iron flushing cisterns and G.I. flush pipes shall be painted with one coat of red oxide and three coats of paint of approved shade and quality. All supporting brackets for cisterns, wash basin and sinks shall also be painted, as directed by the Engineer-in-charge.
3.11.5 Protection

Fixtures shall be protected throughout the progress of the work from damage. Special care shall be taken to prevent damage and scratching of chromium plated fittings. Tool marks on chromium fixtures, etc shall not be accepted. Protective paper on fixtures shall be removed with hot water only at the final completion of work.

3.12 TESTING & COMMISSIONING

3.12.1 General

The Contractor shall be responsible for testing and commissioning the entire services installation described in these specifications and will demonstrate the operation of the systems to the entire satisfaction of the Engineer-in-charge.

3.12.2 Method of Testing

The tests on various services shall be carried out as described herein. The carrying out and recording of tests shall be agreed with the Engineer-in-charge.

a) Water for Testing

Water for testing shall be obtained by the Contractor from an approved source. It shall be free from bacterial contamination, silt, grit, sand etc. After testing to the required pressure, the Contractor shall satisfactorily dispose off all water, or it may be reused provided it is clean and is not contaminated.

b) Test Records

The Contractor shall be responsible for the keeping of all records of tests and on completion shall provide records and reports of the tests in triplicate. All test records shall clearly identify the item of the test and must be signed jointly by the Engineer-in-charge and the contractor.

c) Unsatisfactory works

If the tests reveal unsatisfactory materials, installation or adjustment the Contractor shall at his own expense carry out such alterations or replacement as may be necessary to rectify the defective work. The Contractor shall then repeat the tests as necessary to establish the satisfactory nature of the alterations or replacement.

d) Testing at site

The contractor shall provide at site all the necessary instruments, plant, equipment, materials, water, electricity & labour necessary for carrying out the specified tests. All tests shall be carried out as required to meet the construction programme and the Contractor shall include for all necessary isolation and other works as may required for testing the whole or parts of the installation. The Contractor shall also be responsible for re-testing, if necessary, until satisfactory tests are achieved.
### 3.12.3 Test Records:

<table>
<thead>
<tr>
<th>Pipe Line</th>
<th>Test Pressure</th>
<th>Period</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water mains, Fire Mains &amp; Water Services</td>
<td>5 Kg/sq.cm or maximum working pressure plus 50% whichever is greater.</td>
<td>2 hours</td>
<td>Hydraulic pressure test.</td>
</tr>
<tr>
<td>Underground Drainage</td>
<td>1.5 meters head of water at highest point</td>
<td>30 min.</td>
<td>Hydraulic test.</td>
</tr>
</tbody>
</table>
| Foul Drainage above ground    | i) Not more than 4.5m head in any section of pipe.  
   ii) 7.5mm water gauge | 2 hours  
   3 min. | Hydraulic test  
   Air test |

### 3.12.4 Testing of Various Services

**a) Water Services**

Before the pipes for water supply are painted or covered they shall be tested to a hydraulic pressure of 5 Kg/Sq cm or maximum working pressure plus 50% whichever is greater. Pressure shall be maintained for at least 2 hours without appreciable drop in pressure. In addition to the sectional testing of water supply pipes, the contractor shall test the entire installation on completion of the job to the entire satisfaction of the Engineer-in-charge. The contractor shall rectify all leakages restore damage done to the building and furniture at his own cost.

**b) Underground Drainage**

The sewer and drain lines shall be tested for water fight-ness and straightness as described below

**i) Water Test:**

Pipes and joints shall be subjected to a test pressure of at least 1.5 head of water at the highest point of the section under test. The test shall be carried out by suitably plugging the low end of the drain & filling the system with water. A knuckle bend shall be temporarily joined in at the top end and a sufficient length of vertical pipe joined to it so as to provide the required head or top end may be plugged with a connection to a hose ending in a funnel which could be raised or lowered till the required head is obtained & fixed suitably for observation.
ii) **Test for Straightness and Obstruction**

c) Sewer lines shall be tested for straightness:

i) by inserting at the high end of the sewer or drain a smooth ball of diameter 13mm less than the pipe bore. In the absence of obstructions, such as yarn or mortar projecting through the joints, the ball should roll down the invert of the pipe and emerge at the lowest end.

ii) by means of mirror at one end of the line and lamp at the other. If the pipeline is straight, this will be apparent. The mirror will also indicate obstruction in the barrel.

d) **Above Ground Foul Drainage**

All soil, waste and vent pipes shall be tested by filling up the whole or with water. All openings for connections etc. shall be suitably plugged. The total head shall however not exceed 4.5 meters. Contractor shall remove and replace all pipes having holes, crack, etc. All leaking joints and access doors shall be replaced or remade to the entire satisfaction of the Engineer-in-charge. Water shall be retained in stack for a minimum period of 2 hours. After all plumbing fixtures are installed, contractor shall apply the smoke test to the entire stack to the satisfaction the Engineer-in-charge.

e) **Sanitary fixtures & Fittings**

When the installation has been completed to the satisfaction of the Engineer-in-charge, it shall be tested in the following manner:

i) The entire system shall be slowly filled with water allowing any trapped air to escape.

ii) When all outlets are closed, the system shall be checked for water tightness.

iii) Each outlet shall then be checked for rate of flow and correct operation.

iv) Waste outlets of wash basins, sinks shall be plugged and the basin and sink bowls shall be filled up to overflow level. Plug shall be removed and waste pipe and trap shall be checked for overflow.

f) Flushing out and sterilization of pipe work and tracks

It is essential that all internal water services, external mains and tanks are thoroughly flushed out prior to being put into service and that drinking and domestic water services mains and tanks are sterilized in accordance with Clause 133 of IS: 2065/1972-code of Practice, for Water Supply in Buildings.
The contractor shall be responsible for making any temporary pipe work connections required.

Following completion of sterilization of every part of the drinking and domestic water system, the contractor is to ensure that satisfactory bacteriological samples are obtained and tested at an approved laboratory and the results approved by the Engineer-in-charge prior to completion of the contract and handing over to the client.

3.12.6 “As Fitted” Drawings and operation & maintenance Manual

a) ‘As Fitted’ Drawings

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

i) Position of all sanitary fixtures.

ii) Runs of all piping and diameters on all floors and vertical stacks.

iii) Position of control valves, access panels and all other plant and equipments.

iii) Levels of all manholes.

b) Operation & Maintenance Manuals

The contractor shall hand over to the Engineer-in-charge all operation and maintenance manuals of the plant and equipment supplied and installed by the Contractor. Only manufacturer’s catalogues, wiring diagrams and installation drawings, relevant to particular, items of equipment concerned shall be submitted. General catalogues will not be acceptable.
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Materials</th>
<th>Manufactures/ Brand names</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Aluminum extruded sections for doors and windows</td>
<td>HINDALCO, INDAL, BHORUKA, Jindal, or equivalent by weight</td>
</tr>
<tr>
<td>2.</td>
<td>Anodized aluminum fittings for doors and windows</td>
<td>Crown, Alans, Classic, Argent, Bharat, IPSA</td>
</tr>
<tr>
<td>3.</td>
<td>Mild steel butt hinges, Piano hinges</td>
<td>JOLLY, GARG, AMIT, ASI SUPREME, L.P. WATCHMAN</td>
</tr>
</tbody>
</table>
2) Ambika Timber Works, Village Binka Distt, Bankura  
3) Tinsukia Carving Industries, Tinsukia.  
4) JOINERY Wood Products Pvt. Ltd., Mamorani, Digboi Road, Makum Jn., Assam, PIN- 786170. |
<p>| 5.     | Pre-laminated particle board exterior grade-confirming to I.S: 12823-1990        | Nova pan, Kit ply, Ancholam, Greenlam, Nepal Board, Archid                                |
|        | b) Poly-urethane based paint                                                     |                                                                                          |
|        | c) Acrylic paint                                                                  |                                                                                          |
| 9.     | Glass panes / sheets                                                             | Modifloat, Triveni, Hindustan,ASI Pelington, Tata float, Saint Gobain                     |
| 10.    | Ceramic tiles                                                                    | Asian, Kajaria, Somany, H &amp; R Johnson, Bell, Diamond, Orient, NITCO,                     |
| 11.    | Flush Door                                                                       | Kit ply, Century, Green, Archid, Merino, Austin                                           |</p>
<table>
<thead>
<tr>
<th></th>
<th>Item Description</th>
<th>Brands/Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.</td>
<td>Vitrified, Ceramic tiles</td>
<td>Kajaria, Somany, H&amp;R Jonshon, Oreva, Orient, Asian, NITCO</td>
</tr>
<tr>
<td>13.</td>
<td>Water proofing treatment of roofs and other places</td>
<td>Lloyd, Pidilite, Roffe, CICO, Sika, &amp; FOSROC Chemicals, Degussa,</td>
</tr>
<tr>
<td>14.</td>
<td>Stainless steel kitchen sinks</td>
<td>Hindustan, Parry ware, COBRA, PRINCE, AMC, Nirali</td>
</tr>
<tr>
<td>15.</td>
<td>Toilet fittings, Sanitary wares, Flushing cistern, Plastic WC seats etc.</td>
<td>Parry ware, Hindustan sanitary ware, CERA, Somany.</td>
</tr>
<tr>
<td></td>
<td>C. P. brass fittings: stop cock, bib cock, pillar cock, concealed stop cock, angle valve etc.</td>
<td>Parryware, , Hindware, Jaquar, Crabtree, Roca, Somany.</td>
</tr>
<tr>
<td></td>
<td>G.I. pipes</td>
<td>TATA, JINDAL</td>
</tr>
<tr>
<td></td>
<td>G.I fittings</td>
<td>R, Unik, AA.</td>
</tr>
<tr>
<td></td>
<td>PP-R pipes &amp; Fittings</td>
<td>SFMC, WETFLOW, FINOLEX, Vectus, Kisan, Prince, Supreme, Fusion,</td>
</tr>
<tr>
<td>16.</td>
<td>a) Gun metal valves of all type</td>
<td>LEADER, JOLOTO, L&amp;K, Jaiswal Neco, R.I.F, ALC, L&amp;K</td>
</tr>
<tr>
<td></td>
<td>b) C.I. Soil waste, Vent, Rain Water Pipes &amp; its fittings</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>P.V.C lugs and pipes</td>
<td>Finolex, Prince, Supreme, Kisan</td>
</tr>
<tr>
<td>18.</td>
<td>White Cement</td>
<td>J.K., BIRLA</td>
</tr>
<tr>
<td>19.</td>
<td>Block Boards &amp; Plywood</td>
<td>Green, AnchorL, Kitply, Century, ,Archid, Austin</td>
</tr>
<tr>
<td>21.</td>
<td>Pre-cast Mosaic tiles &amp; P.C. Tiles</td>
<td>MODERN, NITCO, HERO TILE.</td>
</tr>
<tr>
<td>22.</td>
<td>UPVC Doors &amp; Windows</td>
<td>WINDA/REHAU/FEPOSTA/VEKA/DIMEX/A LUPLAST</td>
</tr>
<tr>
<td>23.</td>
<td>Pressed Steel Door frame</td>
<td>Behar Bobbins, AGEW Steels, Purbanchal Industries.</td>
</tr>
<tr>
<td>24.</td>
<td>Autoclaved Aerated Concrete Blocks</td>
<td>BILTECH-ACE, MAGICRETE, AEROCON, ECOCARE, ECOLITE, ULTRATECH</td>
</tr>
</tbody>
</table>

**NOTE:** Samples of all items shall be got approved from Engineer-in-Charge before bulk purchase.