TENDER DOCUMENT

TENDER No: NERO/CON/735/266 dated: 09.10.2017

FOR

Tender for Construction of Civil works Including Flooring works, Finishing works, Sanitary & water supply and misc. works in Nanotechnology Building for the Project “Extension Of Academic Complex (Phase-V) at IITG Campus, Guwahati”.

VOLUME–II

NOTICE INVITING TENDER

ADDITIONAL CONDITIONS OF CONTRACT

TECHNICAL SPECIFICATIONS

DRAWINGS
Tender for Construction of Civil works Including Flooring works, Finishing works, Sanitary & water supply and misc. works in Nanotechnology Building for the Project “Extension Of Academic Complex (Phase-V) at IITG Campus, Guwahati”.

Engineering Projects (India) Ltd. invites the online open e-Tenders sealed item rate tender in two bid system through e-tendering from the eligible contractors/firms who fulfill the eligibility criteria as per the brief particulars of scope for the work of Construction of Civil works Including Flooring works, Finishing works, Sanitary & water supply and misc. works in Nanotechnology Building for the Project “Extension Of Academic Complex (Phase-V) at IITG Campus, Guwahati”, in single stage Two Envelope system (Technical bid & Price bid) for the following works:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of Work</th>
<th>Estimated Cost</th>
<th>Earnest Money Deposit</th>
<th>Completion Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Construction of Civil works Including Flooring works, Finishing works, Sanitary &amp; water supply and misc. works in Nanotechnology Building for the Project “Extension Of Academic Complex (Phase-V) at IITG Campus, Guwahati”</td>
<td>Rs. 1,71,00,000.00 (Rupees One Crore Seventy One Lakhs only)</td>
<td>Rs. 1,71,000.00</td>
<td>06 Months</td>
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</tbody>
</table>

The brief scope of work in this tender shall include providing all labour, materials, tools and plant, transportation to site, storage and safe custody of the materials, Construction of Civil works Including Flooring works, Finishing works, Sanitary & water supply and misc. works in Nanotechnology Building for the Project “Extension Of Academic Complex (Phase-V) at IITG Campus, Guwahati” such as vitrified tiles, ceramic tiles, painting, waterproofing, GI Pipework, SDR pipework, Cisterns, Taps, Sensor operated Urinal basin etc all complete as detailed in the Bill of Quantities except those which are specifically mentioned to be excluded elsewhere in tender documents in the buildings mentioned above. Apart from above, any other services not covered above but required as per direction of EPI are deemed to be included in the scope of work. The work is to be carried out on item rate basis as per bill of quantities and tender conditions.

The detailed scope of work is given in the tender document.

Time schedule of Tender activities:

(i) Starting Date & Time for Downloading of tender documents: from 09.10.2017 (08:00 PM)

(ii) Last Date & Time for Downloading of tender documents: up to 23.10.2017 (12:00 PM)

(iii) Last Date & Time of online submission of Tenders: on or before 23.10.2017 up to 02:30 PM
(iv) Date & Time of online opening of tenders (Techno-Commercial Bid): 23.10.2017 at 03:00 PM

(v) Pre-bid meeting at 4th Floor, Hindustan Tower Block-A, Jawahar Nagar, N.H.37, Beltola, Guwahati-781022 Assam on 16.10.2017 at 4.00 PM.

The tenderers shall submit his query for the pre-bid meeting on or before 16.10.2017 by 11.00 hours to neroguwahati@gmail.com or by post to the address given at sl.no 14 below.

1.0 Contractors who fulfill the following basic qualifying requirements are eligible to participate in this tender. The joint ventures are not accepted.

a) Should have completed during last 7 (seven) years “similar works” or works comprising of similar items

Three similar works each costing minimum 40% of the estimated cost put to tender
OR
Two similar works each costing minimum 50% of the estimated cost put to tender
OR
One similar work costing minimum 80% of the estimated cost put to tender

The “similar works” shall mean “Building Works including Flooring, Painting Sanitary And Plumbing Works ”. For completion certificates mentioning only building works the tenderer shall furnish a self-attested copy (ies) of the work order (s)/agreement (s) containing the bill of quantities in respect of finishing works containing flooring, sanitary and plumbing work.

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

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.

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 can be considered only if they are supported by TDS certificates in support of value of work done by the tenderer. TDS certificate for full contract value as mentioned in the work order must match failing which the same shall not be considered.

b) Should have had average annual financial turnover of at least 30% of the estimated cost put to tender during the immediate last three consecutive financial years ending on 31.03.2016 duly supported by annual financial report (i.e. audited copies of balance sheet and profit and loss statement) or certified by Chartered Accountant along with Income Tax return for last financial year (2015-16/2016-17). Turnover means income from construction works only.

c) Should submit Sale Tax return for last quarter of financial year (2016-17).
d) Should not have incurred any loss in more than two years during the immediate last five consecutive financial years, ending **31.03.2016**, Copies of balance sheet/ Certificate from Chartered Accountant duly self attested by the tenderer shall be submitted.

e) Should have a Solvency of 40% of the estimated cost issued by a Bank. The Solvency Certificate should have been issued not earlier than one year of last date of submission of the tender.

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

g) 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.

h) 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.

i) 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 before submitting their bid. Bidder has to enclose a certificate counter signed by EPI official or furnish undertaking for having visited the site.

j) 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.

k) 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.
l) 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.

m) 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 binding on the tenderer.

n) 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.

o) 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.epi.gov.in, CPP-Portal: www.eprocure.gov.in and as well as on TCIL portal http://www.tcil-india-electronic-tender.com.

Volume I: Instructions to Tenderers, General Conditions of Contract (ITT&GCC) of EPI, Addendum to Instructions to Tenderers & Special instructions to Bidders for e-
Tendering

Volume II: 
   a) Notice inviting Tender  
   b) Additional Conditions of Contract 
   c) Technical Specification (Electrical) 
   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 https://www.tcil-india-electronicbidding.com through M/s Telecommunications Consultants India Limited, New Delhi to participate in the bidding under this invitation for bids. It shall be the sole responsibility of the interested bidders to get them registered at the aforesaid portal for which they are required to contact M/s Telecommunications Consultants India Limited, New Delhi at following address to complete the registration formalities: 
   M/s Telecommunications Consultants India Limited,  
   6th Floor, TCIL Bhawan, Greater Kailash – 1, New Delhi – 110 048  
   Contact No.: 011-26241790, 98683 93717/75/92  
   Email-ID: ets_support@tcil-india.com  
They may obtain further information regarding this tender from GM (Contracts) at the address given at Clause No.14.0 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 https://www.tcil-india-electronicbidding.com (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 Telecommunications Consultants India Limited, New Delhi 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, any time from 20:00 Hrs on 09.10.2017 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 ` 10,000 plus GST as per applicable rate, 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.

6.0 E-Bids must be submitted/uploaded along with scanned copies of relevant documents mentioned at Clause no.2 of Addendum to Instruction to tenderers under Single Stage Two Envelope Bidding Procedure on the TCIL portal on or before last date & time of online bid submission. Late bids will not be accepted. Under the above procedure, only first envelope( Technical Part) shall be opened in the presence of the bidders representatives who choose to attend in person at the address given below on scheduled date & time of bid opening or may be viewed by the bidders by logging in to the portal as per features available to them. Second envelope i.e. Price part shall be opened of technically qualified bidders only.

7.0 The bid must be accompanied by a Earnest Money Deposit (EMD) of ` 1,71,000.00
(Rupees One Lakh Seventy One Thousand only). This can be either 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 certificate as per Clause No.1 (j) if bidder is claiming EMD/Tender fee exemption and Pass Phrase (both for technical and financial bid- in separately sealed envelopes) to decrypt the bid must be submitted in physical form at the address given at Clause No. 14.0 below on or before Last date and time of online bid submission. 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.

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

9.0 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.

10.0 The corrigendum or addendum, extension, cancellation of this NIT, if any, shall be hosted on the EPI"s website/PCC portal as well as on TCIL portal http://www.tcil-indialectronictender.com 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.

11.0 The intending tenderers must not be or have been in litigation with EPI for last three years or at present. In case the participating tenderer(s) are found to have suppressed information in this respect the EMD submitted by him (they) shall be forfeited by EPI and his (their) tender shall be rejected. In case such suppression is detected after acceptance of his (their) tender i.e. on award of the works the order/LOI shall be withdrawn and his securities forfeited.

12.0 The Price Bid of those bidders who are found to be prima-facie techno-commercially acceptable based on the documents submitted and confirmations of credentials & EMD’s /BG’s are received from the concerned Departments/Banks and also against fulfilment of conditions at sl. no. 10 above shall be opened 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. However, it is made clear that 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.

13.0 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.
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. 0361-2314681, Fax No.0361-2223617)

15.0 Contact details for site related quarries/ visit:
   Shri K Kalita Singh, Manager
   Engineering Projects (India) Ltd.
   IITG Campus, Guwahati.
   Phone No: +91-9435561629/8812954148

   General Manager
**BID CAPACITY**

<table>
<thead>
<tr>
<th>Name of the Work:</th>
<th>Construction of Civil works Including Flooring works, Finishing works, Sanitary &amp; water supply and misc. works in Nanotechnology Building for the Project “Extension Of Academic Complex (Phase-V) at IITG Campus, Guwahati”</th>
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<tbody>
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<td>NIT No:</td>
<td>NERO/CON/735/266</td>
</tr>
<tr>
<td>ESTIMATED COST PUT TO TENDER:</td>
<td>Rs. 1,71,00,000.00</td>
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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:

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

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**

| SIGN & STAMP OF BIDDER |  |
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**

<table>
<thead>
<tr>
<th>Sr. 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 06 months (Rs)</th>
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Balance Commitments during 06 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.

Signature of Notary Public

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 outside 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 over-loaded 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 gate 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 our 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 in to 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 effect 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 responsibilities. 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 stand added to the clause no 13 and 14 of GCC:

The rates quoted by the tenderer shall be deemed to include all taxes and duties except GST which shall be reimbursed to him subject to raising a tax invoice and filing of return and payment of tax as per the GST law, failing which EPI shall not be able to honour his claims for any payment. The tenderer should note that submission of return and display of same on GSTN portal is mandatory. All the above reimbursements shall be admitted to the extent these are admitted by the Owner.

16.0 The clause no 9.0 of GCC of EPI shall stand amended as under:

*Within 10 (ten) days from the date of issue of letter of Intent or within such extended time as may be granted by EPI in writing, the Contractor shall submit to EPI a Security Deposit cum Performance Bank Guarantee in the form appended, from any Nationalised bank / Scheduled Bank equivalent to 5% (five percent only) of the Contract Value for the due and proper execution of the contract. This bank guarantee shall remain valid up to 90 (ninety) days after completion of works.*

In case the Contractor fails to submit the Security Deposit cum Performance Guarantee of the requisite amount within the stipulated period or extended period, letter of intent will stand withdrawn and EMD of Contractor shall be forfeited.
17.0 Clause no. 76.0 of GCC shall stand amended as below:

**ARBITRATION:**

76.1 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 shall appoint another umpire to replace him.
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 dispute! 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 ARBITRATION BETWEEN CENTRAL PUBLIC SECTOR ENTERPRISES INTER SE / GOVERNMENT OF INDIA DEPARTMENTS / MINISTRIES

i) In the event of any dispute or difference relating to the interpretation and application of the provisions of the contract, such dispute or difference shall be referred by either party to the arbitration as per the instructions (Office Memorandum / Circulars) issued by Govt. of India from time to time with regard to arbitration between one Government Department and another one Government Department and a Public Sector Enterprise and Public Sector Enterprise inter se.

ii) Subject to any amendment that may be carried out by the Government of India from time to time, the procedure to be followed in the arbitration shall be as is contained in D.O. No. F.No.4(1)/2013-DPE (PMA)/FTS-1835 dated 11.04.2017 of Department of Public Enterprises, Ministry of Heavy Industries and Public Enterprises, Govt. of India or any modification issued in this regard.
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 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 The clause no 28.3 of the GCC stands modified as under:

The sub-contractor shall bear the cost of construction or maintenance of the facilities as mentioned under this clause proportionate to his value of the works/sub-contract awarded to him provided, however, that the cost of construction of the office shall not exceed Rs. 45,000/- (Rupees Forty Five Thousand only) and amount not exceeding Rs. 5,000/- per month till completion of work for maintenance of facilities i.e. stationary, letter head, visiting card, one post paid mobile connection, internet connection. Further the sub-contractor has
to bear the proportionate cost of the Project sign board (type and format given at Annexure-3).

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 Rs3.0 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.

30.0 Recovery for delay in completion:

In case the project execution is delayed beyond the contractual scheduled completion period due to reason attributable to the sub-contractor, the staff and site office expenses of EPI for extended period shall be paid by him to EPI at the
rate of Rs. 10,000/- per month. This shall be in addition to the facilities provided by the sub-contractor to EPI and the other recoveries, if applicable as per clause no 72 (including its sub clauses) of GCC and Penalties etc. if any, levied by Client for the works pertaining to the sub-contractor’s scope of work. The decision of EPI in this regard shall be final & binding on the party.

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/substandard 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>Hydraulic Pressure Testing machine</td>
<td>01</td>
<td>As and when required</td>
</tr>
<tr>
<td>2.</td>
<td>Spirit level</td>
<td>02</td>
<td>10 days</td>
</tr>
<tr>
<td>3.</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)
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 up-to-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 up to 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, splasher, 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/walls150mm 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
evacuated 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 contact 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 550-650 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 water proof 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, putted 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 tapers 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 $M_{20}$, $M_{25}$, $M_{30}$ 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 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>60 cms dia</td>
</tr>
<tr>
<td>63mm</td>
<td>60 cms dia</td>
</tr>
<tr>
<td>40mm</td>
<td>45 cms dia</td>
</tr>
<tr>
<td>20mm</td>
<td>45 cms dia</td>
</tr>
<tr>
<td>12.5mm</td>
<td>45 cms dia</td>
</tr>
<tr>
<td>10mm</td>
<td>45 cms dia</td>
</tr>
<tr>
<td>4.75mm</td>
<td>45 cms dia</td>
</tr>
<tr>
<td>2.36mm</td>
<td>45 cms dia</td>
</tr>
<tr>
<td>2 Sieve set (for aggregate 20 mm down)</td>
<td></td>
</tr>
<tr>
<td>40mm</td>
<td>45 cms dia</td>
</tr>
<tr>
<td>20mm</td>
<td>45 cms dia</td>
</tr>
<tr>
<td>16mm</td>
<td>45 cms dia</td>
</tr>
<tr>
<td>12.5mm</td>
<td>45 cms dia</td>
</tr>
<tr>
<td>10mm</td>
<td>45 cms dia</td>
</tr>
<tr>
<td>4.75mm</td>
<td>45 cms 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- 2Nos.
(xiv) Sink 1 No.
(xv) Litre : Measures
(xvi) 2Lit 2 Nos.
(xvii) 4Lit 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.