EXTENDING RECYCLED WATER SUPPLY INFRASTRUCTURE AND PIPING NETWORK TO RESIDENTIAL AREAS AT IIMB CAMPUS, BANNERGHATTA ROAD, BANGALORE-560076

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Subject: **Extending recycled water supply infrastructure and piping network to residential areas at campus**

This Tender Document contains all the Pages duly read and accepted by Me/Us.

e-BID NOTICE

06th June 2025

e-Bid Documents are invited from reputed firms for the work of **"Extending recycled water supply infrastructure and piping network to residential areas at campus.".** All as per the scope of work. Approximate value of the project is Rs.63,45,000/- + GST as applicable.

E.M.D (Rs.) to be submitted along with Bid Document	Period of Contract	Online Issue of Bid Document	Last Date of Submission of Tender Document and Date of Opening of Technical bid	Date of Opening of Online Price Bid
(1)	(2)	(3)	(4)	(5)
1,59,000/-	**75 Days**	06.06.2025 to 30.06.2025	Submission of Online Tender: 30.06.2025, 15.00 Hrs Opening of Online Tender (Technical Bid): 01.07.2025, 15.00 Hrs	Qualified bidders will be auto intimated by CPP Portal.
Pre-Bid Meeting			Date: 18.06.2025 Time: 14.30 hours Venue: Estate Section, IIMB	

 Signature & Seal of the Bidder

I. INSTRUCTIONS TO BIDDERS:

I.1. Bid Validity: 120 days from the date of opening of Bids.

I.2. The nature of the tender is Two Bid System i.e. Technical Bid and Price Bid. The rates are to be quoted only in the Online Closed Price Bid.

I.3. Period of Contract: Period of Contract is **Seventy five days**.

I.4. Downloading the Tender: The procedure for downloading the Tender Document and Price Bid is mentioned in this document.

I.5. Submission of Tender: Tender Document and Price Bid shall be submitted online only, in CPP Portal.

I.6. Defects Liability Period: TWELVE MONTHS from the date of completion of the work.

I.7. Downloading of Tender Document:

The bidders may download the Tender Document (Technical Bid only) from any of the below mentioned websites during the period mentioned above.

(a) IIMB Website: www.iimb.ac.in/tender_notices
(b) Central Public Procurement Portal (CPP) Portal

I.8. A) Notice Inviting Tender, any corrigenda / addenda issued, minutes of the Pre-Bid Meeting, replies given to clarifications raised by the bidders if any, form part of the Tender Document.

B) The bidder should check for any of the above uploaded in CPP Portal before submission of the Tender (Technical and Price bid). If the bidder submits the tender before the due date, he should be regularly checking the portal for any of the above uploaded, and he should download that document and keep it with him with seal and sign on the document in order to submit the same after award of work. If the revised price bid is uploaded, the bidder should download the Price Bid again, quote the rates referring to the revised price bid and upload the same again.

C) In case any bidder does not upload the revised price bid, the old price bid uploaded by him will not be considered and his tender gets rejected even though he is qualified in the Technical Bid.

I.9. Any addendum / corrigendum or additional information pertaining to tender will be uploaded on CPP Portal. The bidder should regularly visit the portal for checking the same till the last date of submission of the tender and submit the tender (online) only after checking the addendum / corrigendum / any other additional information uploaded in the websites mentioned above.

If any bidder submits the tender before the due date and any corrigendum / addendum is uploaded on the website after his submission of tender, such bidder

shall download the corrigendum / addendum and upload the scanned copy of the same typed in the letter head with seal and sign on the same, on CPP Portal.

I.10. Any information / clarifications required by the Bidder can be obtained from the Estate Section, IIMB during working hours on any working days till the date of submission of Tender Document OR at the time of pre-bid meeting.

I.11. PRE-BID MEETING:

I.11.A. Pre-Bid Meeting will be conducted before submission of the Tender. The bidders may send the clarifications to the email ids mentioned in this Tender Document and/or may attend the meeting in person. The pre-bid meeting will be conducted either offline or online as per the decision of the competent authority of IIMB. The intimation regarding the details of the pre-bid meeting will be provided in the CPP Portal.

I.11.B. Minutes of the Pre-Bid Meeting will be uploaded on CPP Portal. Minutes of the Pre-Bid Meeting forms part of the Tender. The bidder must check for the minutes of the Pre-Bid Meeting before submission of the Tender.

I.11.C. The bidders should download the minutes of the Pre-Bid Meeting, sign on the same with seal and upload it along with the other documents while submitting the Tender.

I.12. This being an item rate Contract, the rate quoted shall remain firm. The quantities shown against each item are only approximate and hence any reduction or increase thereof during the currency of the Contract shall not vitiate the Contract. In case of any increase or decrease in the quantity, payment shall be made based on the value of the work done.

I.13. The successful bidder, after award of the contract, must produce the following documents, before entering into agreement.

- **a.** Complete Tender Document with sign and seal of the authorized person
- **b.** Hard copies of all the supporting documents uploaded in CPP Portal

I.14. If any bidder leaves any cell blank or does not quote any rate or quotes as zero for any of the items, the tender submitted by such bidder shall be rejected summarily.

I.15. Site Visit by the bidder is mandatory. The bidder should visit the work site and obtain the Site Visit Certificate by IIMB and shall submit the copy of the certificate along with the tender.

I.16. ELIGIBILITY CRITERIA:

I.16.A. The bidder should have **valid GST Registration. Documentary proof shall be submitted for the same.**

I.16.B. Financial position: Average annual financial turnover for the last five financial years should be Rs.31,75,000/-**.** Documentary proof in support of the five years' financial status of the company shall be submitted.

In case any bidder submits the annual turnover documents for less than five years, i.e. 3 years only, the total of these three years will be divided by 5 and the average value arrived at will be considered as the average annual turnover of five years.

Five financial years will be considered excluding the COVID PERIOD i.e. during 2020-21 and 2021-22.

I.16.C. The bidder should submit the Solvency Certificate for the value of Rs.25,38,000/- issued by any Nationalized or Scheduled Banks only.

I.16.D. Experience: <u>The bidder should have completed either one / two / three civil works/plumbing works during the last seven years, for the values as mentioned below.</u>

Any one work for the value of Rs. 50,76,000/- excluding GST.
Any two works for the value of Rs. 31,75,000/- excluding GST.
Any three works for the value of Rs. 25,38,000/- excluding GST.

<u>Work Experience:</u> The bidder shall submit the proofs of work done in any of the organizations mentioned below.

In Central or State Govt. / Central or State Govt. Autonomous Bodies / Central or State PSUs / Central or State PWD / MES / Railways / Institutes of higher learning equivalent to IIMB / Any Reputed Private Organization – The bidder should have completed the Civil/plumbing works in any of the above-mentioned organizations.

Note: Work Completion Certificate should be attached as proof of work done. In case the Work Completion Certificates are not issued, proof of payment received from the client shall be submitted – highlighting the related payment.

I.17. Evaluation of Tenders:

The bidders who fulfil all the requirements of the Essential Criteria will be qualified for evaluation of their technical bids.

The evaluation of the tenders will be done as per the criteria detailed below:

(a) Work experience (single work / two works / three works) (work experience mentioned under Clause I.16.C will be evaluated for the value of the work done.

(b) Work experience in any one of the organizations - Central or State Govt. / Central or State Govt. Autonomous Bodies / Central or State PSUs / Central or State PWD / MES / Railways / Institutes of higher learning equivalent to IIMB / Private Organizations.

The bidder is considered as qualified in the Technical Bid subject to satisfaction of the above two parameters.

I.18. <u>Bidders should not have been carrying any adverse remarks in IIMB or other similar report from any authority.</u>

Bidders who are debarred/ blacklisted by any Central / State Government organization / DGS&D / NCCF / Kendriya Bhandar / PSU during the last three years are not allowed to participate in the tender. In case the bidder is found to be debarred or blacklisted at any point of time during the evaluation period, the tender of such bidder will become null and void and he will be declared as not qualified for opening of price bid.

The bidder shall submit a declaration in his office letterhead regarding non-blacklisting.

I.19. The accepting officer reserves the right to place order as a whole or part of any item only as deemed fit.

I.20. EARNEST MONEY DEPOSIT:

I.21.A. The bidder shall submit the EMD through online transfer to IIMB.

For online submission of EMD, the bidder shall pay the amount either through RTGS/NEFT or Bank Guarantee.

a) Through Online Transfer - For online submission of EMD, the bidder shall pay the amount through RTGS/NEFT/UPI. The bank details of IIMB for online transfer:

Bank Name	: HDFC Bank Ltd
Bank Street Address	: J.P. NAGAR BRANCH, BANGALORE
Branch Code	: 0133
IFSC CODE	: HDFC 0000133
Customer HDFC Bank a/c name	: Indian Institute of Management
Customer HDFC Bank a/c number	: 01331450000019

Note: The proof of payment including name of the bank, amount of EMD, date of transfer, UTR No. shall be submitted along with the Tender in CPP Portal (in the field provided for uploading the EMD details).

b) Through submission of Bank Guarantee - The bidder may submit the EMD through Bank Guarantee valid for 120 days.

I.21.B. Exemption from paying the EMD:

Earnest Money Deposit is compulsory for all the bidders including State Government / Statutory Bodies / Enterprises / Undertakings etc.

Bidders may note the fact that their registrations with any authority including MSME/UDYAM/NSIC do not entitle them for exemption from payment of EMD.

I.21.C. NO INTEREST WILL BE PAID ON EMD DEPOSIT.

I.21.D. Any tender not accompanied by an acceptable Earnest Money Deposit and not secured in the payment modes as indicated above shall be rejected by the IIMB as non-responsive.

I.21.E. Forfeiture of EMD:

The Earnest Money Deposit shall be forfeited -

a) If the bidder withdraws from the Tender after tender opening during the period of tender validity

b) In the case of a successful bidder, if the bidder fails within the specified time limit to:
   i) sign the Agreement within 15 days of issue of work order or
   ii) commence the work or
   iii) produce the required documents to IIMB mentioned in this document.

c) In case, the bidder, after quoting, withdraws from the tender or refuses/delays in commencing the work even after issue of work order, the EMD will be forfeited.

I.21.F. BANK DETAILS OF THE BIDDER:

The bidders are required to submit the bank details along with the Technical Bid. The bank details are required to be filled in and submitted in the company letterhead, duly attested by the authorised person of the company and the banker. The bank details should be accompanied by a cancelled cheque duly attested by the banker. **(The format of the Bidder Bank Detail Form has been given in this document vide Proforma – B).**

I.21.G. RETURN OF EMD:

Unsuccessful Bidders:

(a) Bidders not qualified in the Technical Evaluation – EMD will be returned after approval of Technical Evaluation.
(b) Bidders who are unsuccessful in e-bidding – EMD will be returned after the issue of Work Order to L1 Bidder.

Successful Bidder:

EMD of the successful bidder will be returned along with the first RA Bill.

I.21. SECURITY DEPOSIT:

I.22.A. 7.5% of the Gross Value of each bill will be deducted as Security Deposit from the concerned RA Bill.

I.22.B. In the event of breach of contract by the contractor, the security deposit deducted from the RA bills will be forfeited by IIMB.

I.22.C. No interest will be paid on the Security Deposit.

I.22.D. The above deposit will be held by IIMB as security for the satisfactory performance of the contract. All compensations or other sums of money payable by the bidder to IIMB under the terms and conditions of this contract may be deducted from this security deposit or from any other sums that may be due or may become due to the bidder by IIMB on any account

whatsoever, and in the event of the security deposit being reduced by reasons of any such deductions, the bidder shall within ten days thereafter make good these deductions.

I.22.E. LIEN IN RESPECT OF CLAIM IN OTHER CONTRACTS

Any Sum of money due and payable to the Contractor (including the security deposit refundable to him) under the contract may be withheld or retained by way of lien by IIMB in respect of payment of a Sum of money arising out of or under any other contract made by the Contractor with the IIMB. It is an agreed term of the contract that the sum of money so withheld or retained under this clause by the IIMB will be kept withheld or retained as such by the IIMB or till his claim arising out of the same contract or any other contract is either mutually settled or determined by the arbitration clause or by the competent court, as the case may be and that the Contractor shall have no claim for interest or damages whatsoever on this account or any other ground in respect of any sum of money withheld or retained under this clause and duly notified as such to the Contractor.

I.22. SUBMISSION OF BIDS:

The bidders should upload the soft copies of the Tender Document online in CPP Portal.

I.23.A. Submission of EMD:

The details of payment of EMD shall be uploaded in CPP Portal which are as under:

(i) UTR Number of the payment transaction
(ii) Bank Name, Date of transfer and amount of EMD paid
OR
(iii) Bank Guarantee for EMD

I.23.B. Submission of Technical Bids:

The following documents shall be signed with seal and uploaded under the field 'Mandatory Documents'.

- Documentary proof of Annual Turnover of previous 5 financial years
- Supporting documents – copies with seal and sign on every page
- Proformas – printed on Letterhead and seal and sign
- Copy of the Site Visit Certificate issued by IIMB

I.23.C. Note: If these documents are not submitted, the bidder cannot complete the process of submission in the portal and his tender will be automatically treated as non-responsive and rejected.

I.23.D. Note: If any discrepancy is found in the documents submitted / if all the required documents are not submitted / if the documents are submitted in any other format, the prescribed authority may either ask for the documents or reject the tender. The decision is at the discretion of the employer.

I.23.E. The Employer/Engineer may, at his discretion, extend the last date of submission of the Tender by amending the Tender Documents in which case

all rights and obligations of the Employer and the Bidder previously subject to the original date shall thereafter be subject to the new deadline as extended.

I.23.F. IIMB does not undertake to assign reason for rejecting any particular tender. The accepting authority also reserves the right to accept in full, or a part thereof or reject the tender or to divide the tender among more than one Bidders if deemed necessary without assigning any reason.

I.23. OPENING OF BIDS:

I.24.A. The Technical Bids will be opened as under:

a) The Technical bids will be opened on the date and time mentioned in this document. Then the bids submitted will be evaluated for technical qualification.

b) The Price Bids of the bidders who qualify in the Technical Bid will be opened.

I.24. REJECTION OF TENDERS:

I.25.A. If any alternations are made by the bidder in the Tender Documents, the Tender will be liable for rejection.

I.25.B. Any tender which proposes any alterations to any of the conditions laid down or proposes any other conditions of any description whatsoever is liable to be rejected.

I.25.C. The bidders are cautioned that not giving complete information called for in the application or not giving it in clear terms or making any changes in prescribed forms or deliberately suppressing the information may result in the application being summarily disqualified / rejected.

I.25.D. The tenders submitted without furnishing the relevant information asked for, are summarily rejected.

I.25.E. Bids found abnormally low priced on individual items and in overall are liable for rejection.

I.25.F. Conditional tenders are liable for rejection.

I.25.G. <u>Tenders not submitted in the prescribed forms are liable to be rejected.</u>

I.25.H. If the bidder deliberately gives wrong information in his tender or creates conditions favourable for acceptance of his tender, the accepting officer reserves the right to reject such tender at any stage and forfeit the earnest money. The accepting officer shall be at liberty to foreclose the contract without prejudice to any other remedies that may be available to IIMB under the contract, even after the acceptance of the tender.

I.25.I. Conditional and un-witnessed tenders, tenders containing freak rates and amounts, tenders which are incomplete or otherwise considered defective and tenders not in accordance with the tender conditions laid down by the Accepting Officer are liable to be rejected.

I.25. AWARD OF WORK:

The work will be awarded to the bidder who has quoted the lowest amount without GST in the online Price Bid.

The successful bidder will be requested to sign the work order prepared based on the quoted amount, placed on him by the accepting officer.

I.26. Bidder should provide information regarding any current litigation in case the bidder is involved. The details shall be submitted on the letterhead. If the bidder is not indulged in any litigation, he shall type 'NO LITIGATION' on the letterhead and submit with seal and sign.

I.27. In case of any discrepancy/ ambiguity regarding any detailing found in the tender document, the bidder has to address all his queries / request for clarifications to the tender inviting authority. The queries / requests should be sent only till the submission of the tender and at the time of the Pre-bid meeting. Every endeavor is made to avoid any errors which can materially affect the basis of the tender, but the successful bidder shall take upon himself the risk of any error which may be subsequently discovered and shall make no subsequent claim on account thereof. The decision of the Engineer-in-charge shall be final and binding on the bidder in this respect.

I.28. If the bidder does not have any query / request for clarification, it will be understood that he has gone through all the relevant clauses, and he is satisfied. No claims or misinterpretation of words shall be entertained after the award of work.

I.29. The rates quoted shall be for execution of finished items of works as indicated in the Bill of Quantities, which include cost of all materials, consumables, labours, plant, equipment, machineries, transportation of materials to site, loading, unloading, testing of materials and works, samples for testing, all taxes, duties, Octroi, cost of incidental charges on tools / plants, cost of labour, bidder's overheads, profit etc. to complete the item as per stipulated specifications & description in Bill of Quantities.

II. GENERAL CONDITIONS OF CONTRACT

II.1. TIME IS THE ESSENCE OF THE CONTRACT.

II.2. Definitions and Interpretation Clauses:

In this tender document the following words shall have the meanings herein assigned to them:

II.2.A. "**EMPLOYER"**, "**IIMB**" and "**ACCEPTING AUTHORITY**" shall mean "**Indian Institute of Management Bangalore**".

II.2.B. "**BIDDER**" shall mean one or more Bidder or Contractors jointly or generally engaged in the works to which these documents pertain to and shall include his / their heirs, executors and administrators.

II.2.C. "**ENGINEER**", "**ENGINEER-IN-CHARGE**", "**CONSULTANTS**", "**ARCHITECTS**" and "**CONSULTING ENGINEERS**" shall mean Engineer Representatives of IIMB and the Consultants appointed by IIMB for this specific project, including the Consultants representative.

II.2.D. "**WORKS SITE**" and "**SITE OF WORKS**" shall mean the extent of land which IIMB places at the disposal of the Bidder from time to time for the purpose of executing the contract works.

II.2.E. **"As specified" or "As directed"** or "As specified and directed as per specifications" include the entire contents of these documents and also the instructions and/or "Drawings" issued by the Engineer-in-Charge from time to time during the execution of work.

II.2.F. "**BILL of QUANTITIES**" shall also include schedule of prices, i.e., the items of work for which the bidders have to quote the unit rate only.

II.2.G. "**CONTRACT**" or "**TENDER**" shall mean the entire contents of these documents viz.,

1. Tender Notice
2. Instructions to bidders.
3. Acceptance by the Accepting Officer and Work order by Officer-in-Charge.
4. General conditions of Contract.
5. Special Conditions of Contract.
6. Technical Specifications.
7. Particular Specifications
8. Safety Conditions
9. Schedule of Quantities
10. Any correspondence that has taken place between the Bidder and IIMB from the time the tender is submitted to the acceptance is communicated.
11. Letter communicating the acceptance of the Bidder, and

II.2.H. **"SSR" Standard Schedule of Rates** shall mean the CPWD/KPWD Standard Schedule of Rates with amendments there on as approved.

II.2.I. "**EIC**" shall mean the Engineer in-charge of work.

II.2.J. "Schedule of Quantities" shall mean the probable bill of quantities.

II.2.K. "Scheduled Bank" means a bank included in the second schedule to the Reserve Bank of India Act 1934, or modification there to.

II.3. Payment: In consideration of the work done under this Agreement, IIMB agrees to pay the Contractor on the basis of work completed at the time of submission of RA bill during that period. The Contractor shall be responsible for payment of all applicable Taxes on the works contract.

II.3.A. The contractor shall promptly raise an invoice to IIMB on the completion of work as per the Tender terms before the 10th day of the month, for the works completed in the previous month.

II.3.B. The contractor should take the entry seal from Entry Gate Security. Two DC along with Invoice with seal and sign on security. In the absence of the same, such invoices will not be considered.

II.3.C. The bill should be accompanied by the statement and photos of the progress of work, the required documents, measurement sheets of the work done duly signed with seal on every page and countersigned by the Engineer in-charge and the Consultant (if appointed) and other necessary documents.

II.3.D. The bill will be checked, certified and sent to Accounts Section for processing the same for payment.

II.3.E. The payment will be made online to the bank details provided by the contractor, within thirty (30) working days after submission of the undisputed invoice (RA Bill).

II.3.F. To ensure uninterrupted payment of bills, the contractor should update his bank details, the business details regarding the changes if any.

II.3.G. On receipt of the Final payments, the Contractor shall furnish a "No Demand Certificate" to IIMB in the format prescribed by or acceptable to IIMB.

II.4. Contract Termination:

II.4.A. Termination: If the Contractor fails to perform the work set out in this Agreement within the stipulated period of time or carry out the work to the satisfaction of IIMB, IIMB shall terminate the Agreement as a whole or a part thereof at the risk and cost of the Contractor, without prior notice.

II.4.B. Consequence of Termination: In the event of termination of this Agreement, the parties agree to promptly fully deliver all the deliverables applicable conceived, created or developed prior to the date of termination.

In case of termination due to the material breach of the terms of this Agreement by the Contractor, IIMB shall get the balance work executed through a third party and recover from the Contractor all the additional costs incurred by and damage caused to IIMB in procuring such services from any other third party.

II.4.C. In case any of the information furnished by the Bidder is found to be false or any adverse points come to light subsequent to the Agreement, IIMB, at its discretion, may choose to terminate the Contract, at any time. The decision of IIMB in this regard shall be final and binding.

II.4.D. Termination of Contract for Death:

Without prejudice to any of the rights or remedies under this contract, if the Bidder dies or attains legal disability, the Accepting Officer shall have the option of terminating the contract without any compensation to the Bidder. IIMB shall have the right to get the work completed by itself, or through any other contractors or agency at the cost and risk of the contractors or his successors in interest.

II.4.E. Termination for Insolvency:

IIMB may at any time terminate the Contract by giving written notice to the Supplier, if the Supplier becomes bankrupt or otherwise insolvent. In this event, termination will be without compensation to the Supplier, provided that such termination will not prejudice or affect any right of action or remedy, which has accrued or will accrue thereafter to IIMB.

II.4.F. Termination for Convenience:

II.4.F.i) IIMB, by written notice sent to the contractor, may terminate the Contract, in whole or in part, at any time for its convenience. The notice of termination shall specify that termination is for IIMB's convenience, the extent to which performance of the contractor under the Contract is terminated, and the date upon which such termination becomes effective.

II.5. <u>Arbitration</u>:

Except where otherwise provided for in the contract, all question and disputes relating to the meaning of the specifications, designs, drawing and instruction herein before mentioned and as to quality of workmanship or materials used on the work or as to any other question, claim, right matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or the conditions or otherwise concerning the works, or 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 arbitration of the Director if the Director is unable or unwilling to act, to the sole arbitration of some other person appointed by the Director willing to act as such arbitrator. The arbitrator to whom the matter is originally referred being transferred or vacating his Office or being unable to act for any reason such Director / aforesaid at the time of such transfer, vacation of Office or inability to act, shall appoint another person to act as arbitrator in accordance with the terms of the contract. Such person shall be entitled to proceed with reference from the stage at which it was left by his predecessor.

II.5.A. Subject to as aforesaid the provision of the Arbitration & Conciliation Act or any statutory modification or re-enactment thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this Clause.

II.5.B. It is a term of the contract that the party involving arbitration shall specify the dispute or dispute to be referred to arbitration under the Clause together with the amount or amounts claimed in respect of each dispute.

II.5.C. The arbitrator(s) may from time to time with consent of the parties enlarge the time, for making and publishing the award.

II.5.D. The work under the contract shall, if reasonably possible, continue during the arbitration proceedings and no payment due or payable to the Bidder shall be withheld on account of such proceedings.

II.5.E. The arbitrator shall be deemed to have entered on the reference on the date he issues notice to both parties / fixing date of the first hearing.

II.5.F. The arbitrator shall give a separate award in respect of each dispute or difference referred to him.

II.5.G. The venue of arbitrator shall be a place as may be fixed by the arbitrator in his sole discretion.

II.5.H. The award of the arbitrator shall be final, conclusive and binding on both the parties to this contract.

II.6. During the defects liability period / maintenance period, the bidder shall be responsible to make good, free of cost, all defects or damages which occur due to defective workmanship / use of substandard materials. If the bidder fails to make good such defects or damages even after intimation to him within a reasonable time, IIMB shall get the same rectified as deemed fit at the contractors' risk and cost, and the expenditure incurred by IIMB shall be deducted from the Security Deposit before releasing the same.

II.7. Several documents forming the contract are to be taken as mutually explanatory to one another. Detailed drawings and figured dimensions in the drawings shall be followed, not scaling the drawing.

II.8. However, the Engineer-in-charge shall be the sole deciding authority with regard to the intention of the document and his decision in this respect shall be final and binding to the Bidder.

II.9. The bidder shall not increase his quoted rates if the accepting officer negotiates for reduction of rates. Such negotiations shall not amount to cancellation or withdrawal of the original offer and the rates originally quoted shall be valid for a period of 120 days from the date of opening of the Financial Bid.

II.10. Canvassing in any form in connection with the tenders is strictly prohibited and the tenders submitted by the bidders who resort to canvassing will be liable to be rejected.

II.11. Whenever the Engineer-in-charge of the work feels it necessary and advises the bidder for production of bills for any materials whatsoever procured / purchased by the bidder for use and incorporation in the work, the bidder shall produce such bills in proof of such purchase / procurement from bonafide dealers/manufacturers. Such a demand for production of bill can be made by the Engineer-in-charge even after use and incorporation of such materials in the work, after clearance by the Engineer-in-charge for the quality of the materials. In the event of such a demand by the Engineer-in-charge for production of bills, the bidder shall not use and incorporate such materials in the work without the prior clearance in writing from the Engineer-in-charge. In case, the bidder fails to produce the bills or uses / incorporates the materials in the work against which bills are advised to be produced, without prior clearance of Engineer-in-charge, no payment against any work under the contract executed by the bidder shall be made.

II.12. The bidder must obtain for himself on his own responsibility and at his own expenses all the information which may be necessary for the purpose of making a tender and for entering into contract and must examine the entire tender document, inspect the site of the work and acquaint himself with all the information about scope and specifications of the work to be done, all his obligations under the contract, local, hydrological and climatic conditions, local and statutory/ Govt. rules and regulations, all other local conditions, means of access to the work, security requirements, restrictions in entry to the Project site, conditions of site of work, nature of the work and all matters pertaining thereto.

II.13. Access to the site will be given during the tender period by appointment on application to the authority issuing the tender. The bidder shall ascertain the location, size and condition of the areas available for his use as working areas and all other information affecting this tender.

II.14.IIMB shall not be responsible and shall not reimburse any expenses which may be incurred, or losses to person or property suffered by any bidder in connection with visits and examination of the site and in the preparation of his tender for submission.

II.15. The bidders must note that information, if any, as regards to the site and local conditions, as contained in these tender documents has been given merely to assist the bidders and is not deemed to be complete.

II.16. The bidders should note and bear in mind that IIMB shall bear no responsibility for the lack of acquaintance of the site and other conditions or any information relating thereto, on its part. The consequences of the lack of any knowledge, as aforesaid, on the part of the bidders shall be at their risk and cost and no charges or claims whatsoever consequent upon the lack of any information, knowledge or understanding shall be entertained or payable by IIMB either during tender stage or during the construction period.

II.17. Only those tenders fully completed in all respects, with the necessary information duly filled-in, signed and sealed on every page, together with all the documents and received by the time and date specified hereunder/hereafter will be considered.

II.18. All information supporting the tender shall be in English and all entries are to be typewritten. There shall be no over-writing or erasure. All corrections should be attested by the bidder with his dated initials as many times as the corrections occur.

II.19. Bidder are required to sign with stamp on every page of the bid document including the drawings attached thereto and any common set of deviations / corrigendum / addendum issued by IIMB. All corrections in the bid documents must also be signed by the bidder.

II.20. The offer of the bidder shall remain valid for acceptance for a period of **120 (One hundred twenty) days** counted from the date of opening the Bid.

II.21. The rates to be quoted in tender shall be given in Indian Rupees.

II.22. The successful bidder to whom the Work Order will be issued by IIMB, shall have to

a) Enter into an Agreement with IIMB - within 15 days of receipt of Work Order.

b) The bidder shall bear all expenses which he may be required to incur for the above.

II.23. The rate quoted for similar items of work in various parts shall be consistent. If there is any variation, the lowest rate quoted shall take precedence and shall be made applicable for all the parts. The same will be binding on the bidder. Bidder shall have no claim whatsoever on this account.

II.24. Any error in description, quantity or rate in Part "B" (Bill of Quantities) or any omission therefrom shall not vitiate the contract nor release the bidder from the execution of the whole or any part of the works comprised therein in respect of rates, specifications or from any of his obligations under the contract.

II.25. If the tendered rate of any item(s) against which no rate /amount /empty /not applicable /blank /not quoted is entered by the bidder, such tender shall be liable to be summarily rejected.

II.26. In the event of a tender being submitted by a partnership firm, the tender must be signed separately and legibly by each partner or member of the firm, or, in their absence, a person holding Power of Attorney on behalf of the firm concerned. In the latter case, a copy of the power of attorney duly attested by a Gazetted Officer must accompany the tender and certified true copy (attested

only by Gazetted Officer) of the partnership deed must be enclosed along with the tender submitted by the partnership firm.

II.27. On acceptance of the tender, the name of the accredited representative of the bidder who would be responsible for taking instructions from the Engineer-in-Charge shall be communicated by the bidder.

II.28. While quoting their rates, the bidders are advised to take into account all factors of any fluctuations in the market rates, etc. No claims will be entertained on this account after acceptance of the tender or during the currency of the contract. Item rate tender containing percentage below / above will be summarily rejected.

II.29. Before Bidding, the bidders are advised to inspect the site of work and its environments and be well acquainted with the actual working and other prevalent conditions, position of materials and labour, specifications and all other documents which form part of the agreement to be entered into.

II.30.IIMB reserves absolute right to appropriate, deduct, set-off or retain/withhold any amount payable to the bidder under any head of account including earnest money under this contract or any other contract or any other transactions against any sum, which in the opinion of IIMB is due to IIMB under any contract, deal or transaction whatsoever.

II.31. All compensations or other sums of money payable by the bidder under the terms of this contract may be deducted / recovered / adjusted from his security deposit or from any sum which may be due to or become due to bidder by Institute or any accounts whatsoever.

II.32. <u>Final Measurement</u>:

The final measurement must invariably be proceeded by a thorough re-measurement of the whole of the work performed which will be made by the Company's authorized representative at which the Bidder or his accredited agent must be present. Should he not attend to this, the measurements will proceed without him, and he will be precluded from making any protest.

II.33.<u>Office Accommodation for Bidder's Staff</u>:

The Bidder shall at his cost provide, fit up and maintain in an approved portion proper office accommodation for his representative and Contractors staff, which offices shall be open at all reasonable hours to receive instructions, notices or communications and clear away on completion and make good all work disturbed.

II.34.Security And Protection:

II.34.A. The Bidder shall at his cost, provide any necessary temporary enclosures, gates, entrances etc., for the protection of the work and materials and for altering and adopting same as may be required and removing at completion of the works and making good all works disturbed.

II.34.B. During inclement weather the Bidder shall suspend concreting or plastering for such time as the Engineer-in-Charge may direct and shall protect such work in the course of execution from damage by approved measures.

II.34.C. Should the work be suspended by reason of rain, strike, lockouts or any other cause, the Bidder shall at his cost take all precautions necessary for the protection of the work and shall make good any damage arising from any of these causes.

II.34.D. The Bidder shall at his expense cover up and protect from any cause, all new work and supply all temporary doors protection to windows, and any other requisite protection for the whole work executed, whether by himself or special tradesmen or sub-Contractors, and any damage caused must be made good by the Bidder at his own expense.

II.34.E. All fences, trees, shrubs, grass, lawn and other surfaces about the buildings or approaches thereto, which are required to be maintained are to be kept free from damage due to operations in connection with the work, at Contractors expense.

II.35. The Bidder shall work in coordination with the departmental staff of IIMB for the execution of the work.

II.36. Bids shall be deemed to be under consideration immediately after they are opened and until the official intimation of award of contract is made by IIMB to the successful Bidder. If necessary, IIMB will obtain clarification on the offers by requesting such information from any or all the Bidders, in writing as may be considered necessary, from time to time. Bidder will not be permitted to change the subject matter of their offer after the Tenders have been opened.

II.37. Under no circumstances will a father and his sons or other close relations who have business dealing with one another be allowed to tender for the same Contract as separate competitors. A breach of this condition will render both the parties disqualified from Bidding for the Contract.

II.38. If the bidder desires to entrust his affairs to any person, a power of attorney duly authenticated by a Magistrate / Notary / Court / Judge in favour of such person, shall be submitted to IIMB, acceptance of which shall be at the discretion of the Accepting Officer.

II.39. The bidder shall make all arrangements for execution of the agreement at his own cost, using IIMB standard format on appropriate stamp paper and execute the same within 15 days from acceptance of Tender. Value of the stamp paper will be informed in the Work Order issued to the successful bidder.

II.40.IIMB will employ other contractors or agencies to execute various other parallel activities relating to the work. The successful Bidder or bidder for this contract shall work in close co-ordination with any other bidder, sub-bidder or agencies engaged by IIMB at site.

II.41. This Tender notice will form part of the Contract Document and must be returned, duly signed along with the Tender Proposal.

II.42. Whenever, the Engineer-in-charge of the work feels it necessary and advises the bidder for production of bills for any materials whatsoever procured / purchased by the bidder for use and incorporation in the work, the bidder shall

produce such bills in proof of such purchase / procurement from bonafide dealers/manufacturers. Such a demand for production of bill can be made by the Engineer-in-charge even after use and incorporation of such materials in the work, after clearance by the Engineer-in-charge for the quality of the materials. In the event of such a demand by the Engineer-in-charge for production of bills, the bidder shall not use and incorporate such materials in the work without the prior clearance in writing from the Engineer-in-charge. In case, the bidder fails to produce the bills or uses / incorporates the materials in the work against which bills are advised to be produced, without prior clearance of Engineer-in-charge, no payment against any work under the contract executed by the bidder shall be made.

II.43. All notices, reference communications and complaints under this contract shall be made by sending email ids mentioned in this document.

II.44. Labour Laws to be compiled by the bidder:

II.44.A. **The Bidder shall also comply with the provisions of the Child Labour (Prohibition and Regulation) Act, 1986**.

III. SPECIAL CONDITIONS OF CONTRACT

III.1. The Bidder shall deploy required No. of Technical Personnel for the smooth execution of the contract.

III.2. Tender Drawings are only indicative. These are subject to change during construction. Bidder shall have no claim whatsoever in this account.

III.3. The Bidder shall obtain the requisite License/permit on electrical, mechanical, water supply, sanitary works etc., as per requirement at site and as directed by the Engineer-In-charge.

III.4. The quality test as stipulated in the tender document or elsewhere deemed necessary by the Engineer-in-charge as per IS Code shall be carried out at own cost of Bidder**.**

III.5. <u>Site Visit:</u>

The Bidder/s shall visit the site to acquaint himself / themselves with the site conditions and study the drawings and specifications in detail prior to Bidding and no claims will be entertained on the ground of ignorance or otherwise of the conditions under which the work shall have to be executed. No cost incurred towards site visit like travelling expenses and accommodation expenses can be claimed. Such expenses are entirely the responsibility of the bidder.

III.6. <u>Site Supervision:</u>

The Bidder shall either himself supervise the execution of the contract or shall appoint competent and experienced Engineers on his own for supervision of the work. Where the Bidder is not a qualified Engineer or even if he is so qualified but in the opinion of the Accepting Authority, cannot give full attention to the works, the Bidder shall at his own expense employ adequate Engineers, as indicated in manpower deployment schedule, to supervise the work and to receive instructions from the Engineer-in-Charge.

The bidder shall nominate the technical manpower proposed to be deployed for the project especially experienced in interior works.

Such nominated technical staff will be interviewed and approved by IIMB engineer in charge prior to commencement of work.

In case such staff found not up to the expectations, the contractor shall make an alternate arrangement for technical competency to the full satisfaction of the engineer in charge.

III.7. <u>Setting out of the buildings:</u>

The setting out of the building shall be done by the Bidder himself. All measurements shall comply with the dimensions noted on the drawings. The Bidder shall construct centre line pillars wherever necessary at his own cost and

the setting out shall be got checked, approved and certified by the Engineer-in-Charge before execution of work.

III.8. Provisions of Embedding Electric Conduit etc.:

Provisions shall be made during the progress of work for embedding electric conduit etc., wherever necessary as directed. Opening shall be left for service lines, machine foundations as required and as per instructions of the Engineer-in-Charge.

III.9. Damage to Service Lines etc.:

Care shall be taken in execution of work so as not to damage service line etc., coming in the way of construction. If any damage is caused to the line, the cost of replacing or repairs shall be borne by the Bidder.

III.10. Work Schedule:

The work schedule shall be submitted on the enclosed activity schedule along with the equipment & manpower mobilization schedule envisaged for timely completion of work within the stipulated time for completion of work.

III.11. Provision of Machine, Transport etc.:

Bidder shall provide himself with requisite number of welding sets, hoisting equipment, transport vehicles etc., required for the complete satisfactory execution of work. The Bidder shall furnish list of specific equipment to be mobilized by him, of acceptance of contract as agreed / directed by the Engineer-in-charge.

III.12. Materials supplied by the Bidder:

The Bidder shall furnish in accordance with Technical specifications enclosed with this tender.

III.13. Cement:

III.13.A. Cement required for the work when specified in the contract shall be Contractors own supply. The cement shall be of approved INDIAN MANUFACTURE Co., conforming in all respects with the latest Indian Standard specification for Cement including latest amendments as stated in technical conditions and shall be ISI marked.

III.13.B. Prior to commencing the work, the Bidder shall inform the Engineer the brand of cement and the manufacturer's name he proposes to use and if required, shall produce certificates from the firm from whom he obtains the cement. The Engineer reserves the right to reject cement of any brand which has not established itself as a high-grade Portland cement.

III.13.C. All rejected cement not conforming to technical specifications shall be removed by the Bidder from the work spot immediately at his own RISK AND COST.

III.14. Other materials:

All other materials required for the work shall also be supplied by the Bidder. These shall conform to appropriate Indian Standard Specification and procured from approved manufacturer.

III.15. Sufficiency of Priced Bill of Quantities and Tender:

On the acceptance of his tender, the Bidder shall forthwith satisfy himself as to the correctness and sufficiency of his tender for the works as well as prices stated in the bill of quantities and the schedule of prices and within seven days of the acceptance of his tender he shall sign the acceptance, which shall be construed and taken as an acknowledgement on his part of his complete satisfaction and acquiescence in the sufficiency of the prices. The amount of the tender shall be the sum at which the Bidder agrees to execute the whole of the works set forth in the bill of quantities.

III.16. Sub-Letting or Sub-Contracting by the Bidder:

III.16.A. The Bidder shall not sub-contract the whole of the works. Except where otherwise provided in the contract, the Bidder shall not subcontract any part of the works without the prior consent of the Engineer in writing. Any such consent shall not relieve the contract from any of his liability or obligation under the contract and he shall be responsible for the acts, defaults and neglects of any sub-bidder, his representative, servants or workmen as fully as if they were the acts, defaults or neglects of the bidder.

III.16.B. Provided that the bidder shall not be required to obtain such consent for

i. The provision of labour, or
ii. The purchase of materials which are in accordance with the specifications / standards specified in the contract, or
iii. The subcontracting of any part of the works for which the sub-bidder is named in the contract
iv. The purchase of plants and equipment for execution of the works
v. The hiring of plants and equipment for execution of the works

Any breach of the above conditions shall entitle IIMB / Engineer to rescind the contract.

Provided always that execution of specific works by petty contractors, or on place work basis, under the personal supervision of the bidder, shall not be deemed to be sub-contracting under this clause.

III.17. Tendered or Agreed Rate:

The Bidder shall agree not to petition for revision of rates tendered by him under any circumstances at any stage of the work, either during execution or when the final claims/Bills are settled.

In the event of any error in the description or in the quantity in Schedule 'B' or any omission there from shall not vitiate the Bidder or release the Bidder from the execution of whole or any part of contract comprised therein according to the drawings and specifications, or from any of his obligations under the contract.

The Bidder shall satisfy himself or shall be deemed to have satisfied himself as to the nature of subsoil, the dimensions, levels, character and nature of all roads, existing drains, sewers, water, gas or other mains, electric cables and other things as regards any connection they may have with the works of the subject of the contract, and he shall also inspect the site works and surroundings, the means of access thereto and agree there from and he shall generally obtain his own information on all matters and things which can in any way influence his Tender. No claims for extra works or otherwise will be allowed in consequence of any misunderstanding, error, incorrect information on these points, or if any other inaccuracies in reference thereto, which may appear on the drawings or in the specification nor shall the contract be nullified in consequence of any such misunderstanding, error, incorrect information or inaccuracies.

III.18. Engineer's Order to Commence Works and as to Non-Delivery of Site:

The Bidder having signed the contract, the Accepting authority will forthwith give him notice to commence the works and the Bidder shall upon receipt of such notice commence the works and carry them on at such point or points and in such portions as the Engineer may direct.

IIMB shall, with Engineer's written order to commence the works, give to the Bidder the use of so much of the site of works as may, in the opinion of the Accepting authority, be required in order to enable the Bidder to commence and continue to construction of the works, and shall from time to time consider proper in that behalf, but the non-delivery in manner aforesaid of the use of such site, or any portion thereof, shall not vitiate or effect the contract, nor any provision contained in the specification, not entitle the Contractors to any increased allowance in respect of the money.

III.19. Setting out Works Notice:

The Bidder shall set out the whole of the works & be responsible for the correctness of the position, levels & dimensions of several works, according to the drawings & written instructions of the Engineer. If at any time during the progress of the works any error shall appear or arise in the position, levels or dimensions of the several works, the Bidder, on being required to do by the Engineer, shall at his own expense remove & amend the work to the satisfaction of the Engineer, notwithstanding that he may have been assisted by the Engineer in setting out the same. The Bidder shall observe, perform & comply with the requirements of all statutes & bye-law & shall also serve notices on the

authorities having control of the road surfaces before the same are broken up & he shall likewise serve notice on the owners of sewers, drains, water, gas or other mains, electric cables & other things which may be in way affected by the execution of the contract works.

III.20. Criticalities:

a. Existing service lines such as cables, water supply, drainage and internet lines to be taken care of while digging and estate authorities to be informed in advance while taking up such works.
b. Residents should be informed while working at individual residences.
c. Garden should be taken care while working at individual residences.
d. Access to the premises is as per the directions of engineer in charge.
e. There will be restrictions for workers movement and stacking of materials will be at designated places as instructed at site.
f. The debris collected during the work execution needs to be cleared from the site from time to time.
g. Suitable barricading to be provided around material stacking area as instructed by engineer in charge.
h. All safety and security precautions to be ensured.

III.21. Night Work:

Night work will be permitted subject to obtaining prior approval from IIMB. However, no additional payment will be made for night work.

III.22. Materials Tools Etc., Brought On To Works Become The Property Of IIMB During Continuation Of Contract:

All materials, tools, implementations and other things brought by the Bidder upon the Company's works shall thereupon become and shall continue to be the absolute property of IIMB and be considered in its possession, the Bidder having only the right to use the same for the purpose of the contract. After the work has been completed and all obligations under the contract duly fulfilled, IIMB shall return to the Bidder the tools, implements and surplus or waste materials then remain upon the company's works to be removed by him forthwith and cleared away. Nevertheless, IIMB shall not at any time be liable for the loss of any of the said materials, tools, implements or other things, but the whole of this liability shall fall upon the Bidder, the same as if they had remained in his possession.

III.23. Power to vary Works:

IIMB shall have full power and authority from time to time, and at all times to order works additional to the contract, and to make and issue such further drawings and to give such further instructions and directions as may appear necessary or proper for the guidance of the Bidder and the good and sufficient execution of the contract, the bidder will have to "obey and be bound by the said further drawings, instructions and directions according to the true intent and meaning thereof, and as fully and effectually as though they had accompanied, or has been mentioned or referred to in the original drawings and specification". IIMB shall also have power to vary or alter the levels or positions of any of the

works, the subject of this contract, or may order any of the works contemplated thereby to be omitted with or without the substitution of any other works in lieu thereof, or may order any work or any portion of the work executed or partly executed, to be removed, changed or altered and, if needed other works shall be substituted in lieu thereof, and the difference of expense occasioned by any such increase, diminution or alteration so ordered and directed shall be added to, or deducted from the amount of the contract, agreeably at the prices for similar work set forth in the bill of quantities or failing which as a derivative to similar works in the schedule of prices attached thereto, and in the absence of such similar work being scheduled, then such work shall be carried out at the rates entered in SSR applicable at IIMB and plus percentage which the total tendered amount bears to the estimated cost of the entire work put to tender.

IIMB shall in no case become liable to the payment of any charge in respect any such conditions, alterations or deviations, unless the instructions for the performance of the same shall have been given in writing and signed by the Engineer nor unless such instructions distinctly state that the matter thereof is to be the subject of an extra or varied charges, in the work order hereinafter set forth: or unless the claim thereafter shall be made in writing, signed by the Bidder and be made within the week in which the work is executed and the materials used, and before the same shall have been placed out of view, or beyond check or measurement; nor unless the value of any altered or varied works or of any further works, shall wherever practicable, have been determined and settled before such altered or varied or further works shall have been commenced. Such value in case of dispute, shall be ascertained by the Engineer, who shall determine in all cases whether such previous determinations and settlements were practicable or not, and in all cases when he shall consider the same to have been practicable, the Bidder shall not be entitled to make any claim in respect of such altered, or varied or further works. It shall in the opinion of the Engineer, in any special instance become necessary to execute any additional or substituted work, either wholly or in part "By the day" the claim therefore shall not to be recognized unless the Bidder shall have delivered to the Chief Manager (Infrastructure) within one week day, and so on from day to day a true and exact list of the names, occupations, time and wages of the several workmen engaged during the previous day, on any and every such work in respect of whom a change "By the day" is intended to be made in the next succeeding weekly claim work in respect of whom a change "By the day" shall be made unless, in the opinion of the Engineer, it is impracticable or unreasonable to determine the value of the amount of work in manner otherwise provided for in these General Conditions.

III.24. Works to be executed in Approved Manner:

The works, the subject of the contract, specified and provided for, or that may be necessary to be done to form and complete any part thereof, shall be executed and completed in the best and most substantial manner, with materials of the best and most approved quality of their respective kinds, agreeable to the particulars contained in or implied by the specification, or as referred to and represented by the drawings and memorandum thereon/or as referred to by any of the said further drawings, instructions and directions, and shall be to the full satisfaction of the Engineer. The Engineer shall have full liberty at all reasonable times to inspect and examine the works, materials and workmanship which to him, may appear defective, unfit or improper for the several purposes to which they are applied, or intended to be applied, or are not in accordance with the specifications of the said drawings, memoranda instructions or directions

respectively and every such time reject any or all of such works, materials and workmanship.

III.25. Works To Be Carried With An Expedition Failing Which IIMB May Employ Contractors Without Vitiating The Contract:

The Bidder shall commence to carry out the works with due diligence, and as much expedition as the Engineer in charge may reasonably expect, having regard to the specified time of completion of the whole of the works. In case the Bidder fail to do so or neglect to provide proper and sufficient materials or to employ a sufficient number of workmen to execute the works then IIMB shall have full power, without vitiating contract, to take the works wholly or in part, to engage or employ any other person or workmen, and to procure all requisite materials and implements for the due execution and completion of the said works and the costs and charges incurred by IIMB in doing so shall be ascertained by the Accepting Officer and be competent to deduct the amount of such costs and charges along with overheads out of any sum or sums due or to become due from IIMB to the bidder under this or any other contract.

III.26. Emergency Powers:

In the event of any accident or failure occurring in or on the works which in the opinion of the Engineer, requires immediate attention either during the construction or during the period of maintenance, IIMB may, by their own or other workmen make necessary repairs at the expense of the Contractors.

III.27. Openings To Be Made For Examination Of Works:

Should the Engineer require it for his more perfect satisfaction, the Bidder, shall at any period during the continuance of the contract pull down any part of the works, and make such openings, and to such extent, through any part of the works as the Engineer in charge may direct, and the Bidder shall make such works good again to his satisfaction. Should the works be found faulty in any respect the whole of the expenses thereby incurred shall be defrayed by the Bidder, but of otherwise, by IIMB.

III.28. Precaution Against Injury To Property Adjacent To Works In Progress:

The Bidder shall take special care, by the erection of temporary fences, and by every other means which circumstances may render necessary to prevent all injury and damage to or trespass upon the lands, roads, fences or property adjacent to the site of works, and he shall confine the passage of his workmen to existing public roads and footpaths. He shall likewise pay and satisfy all claims whatsoever and from whomsoever, for temporary occupation, way leaves, damages, trespass or otherwise, in reference to the said lands, roads, fences and property adjacent, and bear IIMB harmless from any and all such claims. If any greater extent of lands than the site or works be required by the Bidder for his operations, he shall obtain and occupy the same at his own cost and charge.

III.29. Precautions Against Accidents Or Injury:

The Bidder shall, at his own expense, share, protect, support, alter, restore, make good and maintain, as may be necessary, all buildings, water and gas pipes,

sewage, drains, electrical cables and other things, which may be disturbed, exposed or injured during the execution of the works, or in consequences of the execution of the works and shall also provide for the continuous use of all buildings, pipes, sewers, drains, electric cables and other things, the use of which may be liable to interruption during the progress of the works. The Bidder shall at his own expense restore all such buildings, water and gas pipes, sewage, drains, electric cables and other things to the satisfaction of the owners thereof, and he shall likewise, at his own expense, construct and maintain such works as may be necessary for the due permanent support of all such buildings, pipes, sewage, drains, electric cables and any extra timbering which may be temporarily required, and all labour in fixing and removing the same and shall at his own expenses provide other things not within the construction of the works, and keep indemnified, IIMB and its officers from and against all actions, suits, claims, penalties, liabilities, costs, expenses and demands whatsoever, by reasons of on account of damages to such buildings, pipes, sewage, drains, electric cables and other things whether caused by the execution of the contract works or the insufficiency of the aforesaid permanent support. IIMB may deduct the expenses thereby incurred or to which IIMB or its officers may thereby be put or be liable, or which may be incidental thereto, from the amounts of any sum or sums due or to become due to the Bidder or may recover the same by action at law or otherwise from the Bidder, and IIMB may compromise any such action, suits, or other proceedings, or such items as it shall see fit and the Bidder shall thereupon forthwith pay IIMB the sum or sums paid by IIMB upon the occasion thereof and shall in every case pay such sum or sums and shall fully indemnify IIMB according to the present stipulation.

III.30. Extension Of Time:

If the Bidder shall desire an extension of time for the completion of the work on the ground of his having being unavoidably hindered in its execution in consequence of altered, additional or substituted work, or any other ground, he shall apply in writing to the Engineer in charge within seven days of the hindrance on account of which he desires such extension as aforesaid and the Accepting Authority shall, if in his opinion (which shall be final) reasonable grounds be shown therefore, authorize such extension of time, if any, as may, in his opinion be necessary or proper.

III.31. Rejected Material:

All rejected material will at once be removed from the site by the Bidder to such distance as may be desired.

III.32. Scope Of Completion:

Completion includes completion of all works in accordance with plans and specifications, removal of all yard mess accumulated during construction, levelling and cleaning up the site and generally cleaning the whole building or works.

On intimation from the Bidder about the completion, the works will be inspected by the Engineer-in-charge and a completion certificate will be issued.

III.33. Sign Board And Hoardings:

The Bidder shall not affix to place any placards or advertisement of any description or permit the same to be affixed or place in or upon any hoarding, gantry, building/structure other than that approved by the EIC.

III.34. Scientific And Measuring Instruments:

Total station, Theodolite, leveling instruments, prismatic compass / chain, steel and metallic tapes and all other surveying and material testing instruments found necessary on the works shall be provided by the Bidder at his expense for the due performance of this contract as instructed by the Engineer-in-Charge.

III.35. Measurements Of All Concealed Items To Be Recorded Prior To Covering Up:

Measurements of all items of work including extra items if any, such as, work in foundations including excavations, plinth filling, masonry concrete etc., steel in all RCC works, pipe to be encased etc., shall be got recorded from the authorized Engineer-in-Charge by the Bidder before they are covered up. Immediately the work is ready for measurements, Bidder will give specific notice to Engineer-in-Charge on site for recorded the measurements.

If the Engineer fails to record the measurements the Bidder will refer the matter to the Chief Manager (Infrastructure) for instructions, but in no case shall he cover up the work without the permissions.

Before commencing the work, it shall be obligatory for the bidder to obtain, at his own cost, insurance cover under the following requirements.

i) Liability for death or injury to any person or loss to any property (other than the work) arisen out the performance of the Contract.
ii) Any other insurance cover as may be required by the law of the land like workmen insurance etc.

III.36. Damage To Persons and Property

The Bidder shall be responsible for all injury to persons, animals or things and for all structural and decorative item, damages to property which may arise from the operation or neglect of himself or of any nominated sub-bidder or any employees, of either, whether sub injury or damage arises from carelessness, accident or any other cause whatsoever in any way connected with the carrying out of his contract and hold it harmless in respect of all and any expenses arising from any much injury or damage to persons or property as aforesaid and also in respect of injury or damage under any Act of any legislature or otherwise and also in respect of any award of compensation or damage consequent upon such claim.

III.37. Damage & Loss to Private Property & Injury To Workmen

The Bidder shall at his own expense reinstate and make good to the satisfaction of the Engineer-in-Charge, in respect of any such injury (including claim resulting

in death), loss or damage to any person whosoever or property including all claims which may arise under the Workmen's Compensation Act or otherwise.

III.38. Attention:

1. The Bidder shall visit the site prior to tender, as no claims will be allowed on the ground of ignorance of the conditions under which work shall be executed.
2. Time will be the essence of the contract and the Bidder is to complete the whole of work in the time stated in the tender, subject to the schedule of conditions.
3. The Bidder is to provide at all times during the progress of work and the maintenance period proper means of access, with ladders, gangways etc., and the necessary attendants to move and adopt as directed for inspection of their representatives. No separate rate will be allowed.
4. The Bidder is to keep all persons under his control and within the boundaries of the site, and he will be held responsible for the care of the works generally until their completion including all works executed and materials deposited on the sites by himself or suppliers, together with all risks arising from weather, carelessness of apprentices, damage or loss by thefts or by any other cause and is to allow for all necessary watching and protective lighting.

III.39. Details of Work of similar nature of the advertised tender value in the qualifying period i.e. current year and five previous financial years, are to be provided. Interested Bidders should provide description of work, organization for which the said work has been executed, approximate value of contract at the time of award, payment received in the qualifying period, date of award and date of scheduled completion of work, date of actual start, actual completion and final value of contract should also be given. Supporting documents and certificates from the organizations for which the Bidders have worked should be enclosed. The authorized signatory of the organization should sign the certificates submitted by the Bidder. Certificate from only those organizations, institutions or bodies will be considered which execute work in public view and maintain verifiable records. As such, the organization or bodies, from which certificates will be considered, are as follows:

a. Government Departments, PSUs and other Government Institutions
b. Public Limited Company
c. Private Limited Company
d. Government Recognized Institutions
e. Cooperative Societies registered with "Registrar of Cooperative Societies"
f. Sole Proprietary Firms/Partnership Firms registered with "Registrar of Firms"

All certificates should be on the official Letterhead of the Organization, bearing contact address, telephone number, email address, etc. Further, the certificate from sources listed at (b) to (f) should invariably be accompanied with the proof of the organization's registration with, or recognition by Government, without which such certificate shall not be considered as adequate proof for the purpose of this Tender.

III.40. The Bidder shall keep the offer open for a period of 120 (One Hundred and twenty) days from the date of opening of the Financial Bid, during this period, the Bidder shall not withdraw his offer. This period is subject to being extended further, if required, by mutual agreement of IIMB and the Bidder, in writing, from time to time. It is understood that the Bidder is being permitted to Tender in consideration of stipulation on his part that after submitting the Tender, he will not resile from his offer or modify the terms and conditions thereof in a manner that is not acceptable to IIMB. If the Bidder fails to observe or comply with the forgoing stipulation or fail to undertake the Contract after the acceptance of his Tender, the entire amount deposited as EMD for the due performance of the stipulation and keep the offer open for the specified period, shall be forfeited by IIMB. If the tender is accepted, the amount of all EMD will be held by IIMB as initial Security Deposit (SD) for due and faithful fulfillment of the Contract. The EMD of unsuccessful Bidders shall be returned to them within reasonable time, but IIMB shall not be responsible for any loss or depreciation to the EMD for the due performance of the stipulation and to keep the offer open for the period stipulated in the Tender documents while in its possession, nor will it be liable to pay any interest thereon.

III.41. Local Conditions

III.41.A. Each Bidder shall acquaint himself with the local conditions and factors which would have any effect on the performance of the contract and the cost of item of works. IIMB shall not entertain any request for clarification from the Bidder regarding such local conditions. No request for change of price or time schedule for completion of work shall be entertained after the acceptance of offer by IIMB. The Bidder can visit the place of proposed work to understand the site conditions and correct appreciation of volume of work to be done.

III.41.B. The Bidder shall work in coordination with the departmental staff of IIMB for the execution of the work.

III.41.C. In case any of the information furnished by the Bidder is found to be false or any adverse points come to light subsequent to the Agreement, IIMB, at its discretion, may choose to terminate the Contract, at any time. The decision of IIMB in this regard shall be final and binding.

III.42. Interested Bidders shall submit their offer as per the conditions set forth in the Tender document, which includes the stipulations contained in the GCC, SCC, Specifications, etc. or the latest correction slips, as amended from time to time, if applicable, which shall form part of the Contract.

III.43. Acceptance of Tender

III.43.A. IIMB may accept the Tender wholly or in part or reject any tender without assigning any reason whatsoever and may not accept the lowest or any tender. The Bidder shall not demand any explanation for the rejection of his tender. Acceptance of tender will be communicated by a formal acceptance letter (by registered post) directly to the Bidder.

III.43.B. If the Bidder deliberately gives wrong information in his Tender and thereby creates circumstances for the acceptance of his Tender, IIMB reserves the right to reject such Tenders at any stage.

III.43.C. The Successful Bidder shall execute a Contract with IIMB, for carrying out the Work. The address of the Contractor as given in the agreement will be deemed as their business address and all correspondence sent to that address by IIMB shall be deemed delivered to the Contractors in the ordinary course by post.

III.43.D. IIMB does not undertake to assign reason for declining any particular tender. The accepting authority also reserves the right to accept in full, or a part thereof or reject the tender or to divide the tender among more than one Bidders if deemed necessary without assigning any reason.

III.44. Adequate Safety Precautions shall be taken by the Contractor to ensure the Safety of the workmen engaged by him.

III.45. PROGRESSIVE EXECUTION:

The Bidder/s shall agree to execute the work progressively in co-ordination with the concerned Officers of IIMB and as directed by the Engineer-in-Charge.

III.46. DEVIATIONS AND AMENDMENTS:

Bidder shall execute all the works referred to in the tender documents upon the terms and conditions contained or referred to therein and as detailed in the Schedule and also carry out such deviation as may be ordered.

III.47. PRICING OF DEVIATION:

The following order of precedence for pricing deviations are binding on the Contractors.

a) Deviations will be priced at Schedule rates where the item is already included in Schedule.

b) In respect of items not included in Schedule but where similar items are found in Schedule at rates directly from Schedule items where such a direct derivation is possible.

c) Where the rate cannot directly be derived from the Schedule the same will be worked out with reference to Schedule and standard schedule of rates (with the percentage of application over and above the same as approved.)

d) Where it is not possible to derive the rate from the standard schedule of rates, the same will be based on the actual cost to the Bidder plus a profit of 10%. In this case the Bidder must produce satisfactory evidence / vouchers as proof of expenditure.

III.48. TIME AND EXTENSION FOR DELAY:

The time allowed to execution of the Works as specified in the Schedule "A" or the extended time in accordance with these conditions shall be the essence of the Contract. The execution of the works shall commence from such time period as mentioned in schedule "A" or from the date of handing over of the side whichever is later. If the Bidder commits default in commencing the execution of the work as aforesaid. Government shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the earnest money & performance guarantee absolutely.

As soon as possible after the Contract is concluded, the Bidder shall submit a Time and Progress Chart for each milestone and get it approved by the Department. The Chart shall be prepared in direct relation to the time stated in the Contract document for completion of items of the works. It shall indicate the forecast of the dates of commencement and completion of between the Engineer-in-Charge and the Bidder within the limitations of time imposed various trades of section of the work and may be amended as necessary by agreement between the Engineer-in-Charge and the Bidder with the limitation of the imposed in the Contract documents, and further to ensure good progress during the execution of the work, the bidder shall in all cases in which the –in which the time allowed to any work, exceeds one month(save for special jobs for which a separate program has been agreed upon)complete the work as per mile stone given in Schedule "A".

III.49. If the works be delayed:

i. Force majeure, or
ii. Abnormal bad weather, or
iii. Serious loss or damage by the, or
iv. Civil commotion, local commotion of workmen, strike or lookout, affecting any of the trades employed or the work, or
v. Delay on the part of other contractors or tradesmen engaged by /Engineer-in-Charge in executing work not forming part of the Contract, or
vi. Non-availability of stores, which are the responsibility of Government to supply/or
vii. Non-availability or break down of tools and Plant to be supplied or supplied by Government or
viii. Any other cause which, in the absolute discretion of the Engineer-in-Charge is beyond the Bidder's control.

Then upon the happening of any such event causing delay, the Bidder shall immediately give notice thereof in writing to the Engineer-in Charge but shall nevertheless use constantly his best and endeavors to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the Engineer-in-Charge to proceed with the works.

Request to rescheduling of milestones and extension of time, to be eligible to consideration, shall be made by the Bidder in writing within fourteen days of the happening of the event causing delay on the prescribed form. The Bidder may also, if practicable, indicate in such a request the period of which extension is desired.

In any such case the Engineer-in-Charge may give a fair and reasonable extension of time and reschedule the milestones to completion of work. Such extension shall be communicated to the Bidder by the Engineer-in-Charge in writing, within 3 months of the date of receipt of such request. Non application by the bidder to extension of time shall not be a bar for giving fair and reasonable extension by the Engineer-in-Charge and this shall be binding on the bidder.

In such case the Accepting Officer may grant fair and reasonable extension in the completion dates of individual items or work for which the separate period of completion is mentioned in the contract documents or work order as applicable. Upon the happening of any such event causing delay, the Bidder shall immediately give notice thereof in writing to Engineer-in-Charge but shall nevertheless use constantly his best endeavor to prevent or make good the delay and shall do all that may reasonably be required to the satisfaction of the Engineer-in-Charge to proceed with the works extension of time as granted above shall be communicated to the Bidder by the Engineer-in-Charge in writing and shall be final and binding.

No claims in respect of compensation or otherwise, however, arising as a result of extension granted shall be admitted.

III.50. FORCE MAJEURE:

If, at any time during the currency of the contract, the performance of any obligation (in whole or in part) by IIMB or the Bidder shall be prevented or delayed by reason of any war, hostilities, invasion, acts of public or foreign enemies, rebellion, revolution, insurrection, civil commotion, sabotage, large scale arson, floods, earth quake or any other act of God, large scale epidemics, nuclear accidents, any other catastrophic unforeseeable circumstances, quarantine restrictions, any statutory, rules, regulations, order or requisitions issued by a Government department or competent authority (hereinafter referred to as "event") then, provided notice of the happening of such an event is given by either party to the other within 21 days of the occurrence thereof.

a. Neither party by reason of such event be entitled to terminate the contract or have claim for damages against the other in respect of such non-performance or delay in performance, if not covered under insurance.

b. The obligations under the contract shall be resumed as soon as practicable after the event has come to an end or ceased to exit.

c. In case of doubt or dispute, whether a particular occurrence should be considered an "event" as defined under this, clause the decision of the Engineer shall be final and binding.

d. If the bidder is foreclosed under this clause, the Bidder shall be paid fully for the work done under the contract, but not for any defective work or work done which has been destroyed or damaged before its measurement. The Engineer shall have the option to take over any plant and material lying at site, at rates provided for in the contract, failing that, as per rates which are determined to be fair and reasonable by the Engineer.

If no notice is issued by either party regarding the event within 21 days of occurrence, the said event shall be deemed not to have occurred and the contract will continue to have effect as such.

III.51. PENALTY FOR DELAY IN EXECUTION:

In case of failure on the part of Bidder to complete the work and clear the site on or before the time stipulated in the contract or the extended date / period of completion, the Bidder shall, without prejudice to any other right or remedy of IIMB per week on unfinished work/balance work up to a maximum of **10 %** of the value of work order.

The amount of compensation may be adjusted or set off against any sum payable to the Bidder under this or any other contract with IIMB.

If the bidder makes good the shortfall on works within the stipulated time or extended time of completion, penalty may be refunded on receiving written application from the bidder.

III.52. CANCELLATION OF CONTRACT FOR BIDDER DEFAULT:

If the Bidder:

a) Makes default in commencing the work within a reasonable time from date of handing over of the site and continues in the state after a reasonable notice from EIC.

b) In the opinion of the Engineer-in-Charge at any time, whether before or after the date or extended date for completion, makes default in proceeding with the work, with due diligence and continues in that state after a reasonable notice from Engineer-in-Charge.

c) Fails to comply with any of the terms and conditions of the contract before or after reasonable notice in writing, orders properly issued thereunder, or

d) Fails to complete the work, work order and items of work with individual dates for completion and clear the site on or before the date of completion.

The Accepting Officer may, without prejudice to any other right or remedy which shall have accrued or shall accrue thereafter to IIMB, cancel the contract as a whole or in part thereof or only such work order or items of work in default from the contract. Whenever the Accepting Officer exercises his authority to cancel the contract as a whole or in part under this condition, he may get completed the work at the Contractors risk and cost, provided always that in the event of the cost, of completion (as certified by Engineer-in-Charge which is final and conclusive) being less than the contract cost, the advantage shall accrue to the IIMB. If the cost of completion exceeds the money due to the Bidder under this contract, the Bidder shall either pay the excess amount ordered by Engineer-in-Charge or the same shall be recovered from the Bidder by other means.

In case IIMB completes the work or any part thereof under provisions of this condition the cost of such completion to be taken into account for determining the excess cost to be charged to the Bidder under this condition, it shall consist of the cost of materials purchased / and / or labour provided by IIMB which on

addition of such percentage to cover superintendence and establishment charges as may be decided by the Engineer-in-Charge whose decision shall be final and conclusive.

III.53. FORECLOSURE OF CONTRACT FOR ADMINISTRATIVE REASONS:

IIMB reserves the right to terminate the contract at any time after acceptance of the tender if IIMB decide to abandon or reduce the scope of work for any reason whatsoever and hence not required the whole or any part of the works to be carried out, the Engineer-in-Charge shall give notice in writing to that effect to the Contractors. The compensation if any payable for such foreclosure of work will be discussed mutually between IIMB and Bidder and settled after taking into consideration the loss suffered by the Bidder on account of the foreclosure of the contract. The Bidder shall have no claim to any payment of compensation or otherwise whatsoever on account of any profit or advantages which he might have derived consequent on foreclosure of the whole or part of the works. IIMB shall have the option to take over the Contractors materials or any part thereof, either brought to the site or to which the Bidder is legally bound to accept the delivery from the suppliers.

The amount of compensation payable to the Bidder due to foreclosure will be decided by the competent authority of IIMB.

III.54. ENCLOSURES:

General Conditions, Special Conditions of contract, Tender Notice, Instructions to Bidders together with Technical Specifications, BOQ will form part of the contract. Should there be any discrepancy between the provision in the Bill of Quantities & drawings the former shall be deemed to take precedence there over.

III.55. MODIFICATION OF SPECIFICATIONS:

No modifications or changes of specification in the Bill of Quantities will normally be accepted & such specification and rates are liable to be rejected.

III.56. RUNNING ACCOUNT REMITTANCE: (R A R)

Payment in respect of work done will be based on certificate from Engineer-in-charge as to the value of work done. This certificate should be supported by a bill from the bidder indicating the quantities of work done and rates adopted for evaluation of the work or percentage of work.

Memorandum of Payment:

a. Total value of work done ----------
b. Deduct total value of the work done upto previous bills ---
c. Deduct for Income Tax ---------- 2%
d. Deduct for Labour welfare cess ---------- 1%
e. Deduct for Material advance paid if any. ----------
f. Deduct for Mobilisation advance with interest, if any. ------
g. Deduction of Electricity & water charges supplied, if any---
h. Any other dues recoverable by IIMB from the Bidder under the present or any other contract.

During the progress of work for each contract the bidder shall prefer claims giving details of work done, rate and value to the Engineer-in-charge. These claims are called RAR bills and RAR payments will be normally made once in a calendar month. These bills will be checked by the Engineer-in-Charge with reference to either the percentage of the value of work done or on the basis of actual measurements wherever available and recommend payment of the bill with due adjustment for recoveries and RAR payment (including material advance) effected.

III.57. PRE-FINAL RAR'S:

A pre-final RAR is raised only when the work is completed and the complete measurement is recorded in the MB's by the Engineer-in-charge duly accepted by the bidder. Pre-final RAR will be sent to accounts department by the Engineer-in-charge only after the check measurements and endorsement in the MB's.

III.58. FINAL BILL:

On completion of the work, the complete measurements are recorded in measurement books and accepted by the bidder. There upon a final bill shall be submitted by the bidder within ONE MONTH from the date of completion of the work, so as to ensure payment being made before the expiry of six months from the date of completion of work. A 'NO DEMAND CERTIFICATE 'against IIMB under the contract.

III.59. ADHOC PAYMENTS:

If payment for final bill could not be arranged within 6 months from the date of the completion of the contract for reasons other than undue delay in submitting the final bill by the bidder, the Accounts Department of the Division will make an adhoc payment against the final bill, based on the recommendations I\of the Engineer-in-charge. The following guidelines may be adopted while making such adhoc payment.

a) Such payment should normally exceed 95 % of the final bill value.

b) All conditions of the contract and recoveries to be affected should have been taken care of in the final bill.

c) If a bidder has no other contract concurrently running in the Division. Adhoc payment need not be made. Instead, the final bill should be expedited and paid at least within six months from the date of completion of the contract.

III.60. MEASUREMENTS OF WORK DONE:

Engineer-in-Charge shall, except as otherwise provided, ascertain and determine by measure the value in accordance with the contract of work done.

All measurement of all terms having financial value shall be entered in Measurement book and / or level field book so that complete record is obtained of all works performed under the contract.

All measurements and levels shall be take jointly by the Engineer-in-Charge or his authorize representative and by the bidder or his authorized representative from time to time during the progress of the work and such measurements shall be signed and dated by the Engineer-in-Charge and the bidder or their representative in token of their acceptance. If the bidder objects to any of the measurements recorded, a note shall be made to that effect with reason and signed by both the parties.

If for any reason the bidder or his authorized representative is not available and the work of recording measurements is suspended by the Engineer-in-Charge on his representative, the Engineer-in-Charge and the Department shall not entertain any claim from bidder for any loss or damages on his account. If the bidder or his authorize representative does not remain present at the time of such measurements after the bidder or his authorized representative has been given a notice in writing three (3) days in advance or fails to countersign or to record objection within a week from the date of the measurement, then such measurements recorded in his absence by the Engineer-in-Charge or his representative shall be deemed to be accepted by the Bidder.

The bidder shall without extra charge, provide all assistance with every appliance, labour and other things necessary to measurements and recording levels.

Except where any general or detailed description of the work expressly shows to the contrary measurements shall be taken in accordance with the procedure set forth in the specifications notwithstanding any provision in the relevant standard method of measurement issued by the Bureau of Indian Standards and if for any item no such standard is available, than mutually agreed method shall be followed:

The bidder shall give, not less than seven days' notice to the Engineer-in-Charge or his authorized representative in-charge of the work before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or his authorized representative in -charge of the work who shall within the aforesaid period of seven days inspect the work and if any work shall be covered up and placed beyond the reach of measurement without such notice having been given to the Engineer-in-Charge's consent being obtained in writing the same shall be uncovered at the Bidder's expense, or in default thereof no payment or allowance shall be made to such work or the materials with which the same was executed.

Engineer-in-charge or his authorized representative may cause either themselves or through another officer of the department to check the measurements recorded jointly or otherwise as aforesaid and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.

It is also a term of his contract that recording of measurement of any term of work in the measurement book and/or its payment in the interim, on account or final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the bidder from liabilities from any over measurement defects noticed till completion of the defects liability period.

III.61. COMPUTERIZED MEASUREMENT BOOK

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

All such measurements and levels recorded by the bidder or his authorized representative from time to time, during the progress of the work, shall be got checked by the bidder from the Engineer-in-Charge or his authorized representative as per interval or program fixed in consultation with Engineer-in-Charge or his authorized representative. After the necessary corrections made by the Engineer-in-Charge, the measurement sheets shall be returned to the bidder for incorporating the corrections and for resubmission to the Engineer-in-Charge for the dated signatures by the Engineer-in-Charge and the bidder or their representatives in token of their acceptance.

Whenever bill is due for payment, the bidder would initially submit draft computerized measurement sheets and these measurements would be got checked in his draft computerized measurements, and submit to the department a computerized measurement book, duly bound, and with its pages numbered. The Engineer-in-Charge and/or his authorized representative would thereafter check this MB, and record the necessary certificates for their checks.

The final, fair, computerized measurement book given by the bidder, duly bound, with its pages numbered, should be 100% correct, and no cutting or over-writing in the measurements would thereafter be allowed. If at all any error is notice, the bidder shall have to submit a fresh computerized MB with its pages duly numbered and bound, after getting the earlier MB cancelled by the department. The bidder shall submit two spare copies of such computerized MB's for the purpose of reference and record by the various officers of the department.

The bidder shall also submit to the department separately his computerized Abstract of Cost and the bill based on these measurements, duly bound, and its pages numbered along with two spare copies of the "bill. Thereafter, this bill will be processed by the Office and allotted a number as per the computerized record I the same way as done for the measurement book meant for measurements.

The bidder shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for checking of measurements/levels by the Engineer-in-Charge or his representative.

Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications notwithstanding any provision in the relevant Standard Method of measurement or any general or local custom. In case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the Bureau of Indian Standards and if for any item no such standard is available then a mutually agreed method shall be followed.

The bidder shall give not less than seven days' notice to the Engineer-in-Chare or has authorized representative in charge of the work before covering up or otherwise placing beyond the reach of checking the measurement of any work in order that the same may be checked and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of checking measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or his authorized representative in- charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of checking measurements without such notice having been given or the Engineer-in-Charge's consent being obtained in writing the same shall be uncovered at the Bidder's expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.

Engineer-in-Charge or his authorized representative may cause either themselves or through another officer of the department to check the measurements recorded by bidder and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.

It is also a term of this contract that checking the measurements of any item of work in the measurement book and/or its payment in the interim, on account of final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the bidder from liabilities from any over measurement or defects noticed till completion of the defects liability period.

III.62. DEFECTS LIABILITY (MAINTENANCE) PERIOD:

The normal period of maintenance for all work will be **Twelve Months** from actual completion of work and for special items of work such as Tarfelting, Anti-termite treatment etc., as mentioned in the body of the specification. During this period the Bidder will be responsible for rectifying all defects noticed and attributable to defective workmanship in respect of the work executed by him. As soon as any defects come to the notice, Engineer-in-Charge shall request the Bidder in writing to rectify the defects noticed.

III.63. DEFECT LIABILITY DEPOSIT / SECURITY DEPOSIT:

The Security Deposit will be refunded only after the Completion of the defects liability / maintenance period after inspection by the Engineer-in-Charge.

The above deposit will be held by IIMB as security for the satisfactory performance of the contract. All compensations or other sums or money payable by the bidder to IIMB under the terms and conditions of this contract may be deducted from this security deposit or from any other sums that may be due, or may become due to the bidder by IIMB on any account whatsoever, and in the event of the security deposit being reduced by reasons of any such deductions, the bidder shall within ten days thereafter make good these deductions.

III.64. RECOVERY FOR ANY OVER PAYMENT MADE:

Should there be any over payments made inadvertently to the Bidder on this account or in any other contract, IIMB shall recover such amount from the Bidder either by deducting the amount from any sums that may due or may become due to the Bidder by IIMB on any account whatsoever from this or any other contract or from the security-cum-earnest money deposit made by the Bidder.

III.65. DISMANTLED MATERIALS:

Materials obtained from demolition / dismantling work, shall remain with the Bidder at his own risk till such time the Bidder removes them to the IIMB. Should the Bidder fail to remove such dismantled materials to IIMB within 10 days from the date of completion, the Engineer-in-Charge will be entitled to remove them at risk and cost of the Bidder in all respects.

III.66. INSURANCE AND INDEMNITIES:

Insurance of Works:

Bidder shall provide for adequate cover to his employees as per provisions of Workmen's Compensation Act. The Bidder shall ensure that his insurance includes for all liabilities, which should cover material and building damage, workmen's compensation, third party liabilities etc. All the above-mentioned insurance can be covered by CAR Policy for the Contract Value. The Bidder should produce evidence of insurance coverage for all above before submitting invoices for payment. Such insurance shall be affected with an insurer and in the terms approved by IIMB.

If the Bidder has a blanket insurance policy for all his works and the policy covers all the items to be insured under this Contract, the Bidder may assign such policy/ policies in favour of IIMB, in lieu of taking out fresh policies in the name of IIMB.

Insurance against accident or injury to Workers: IIMB shall not be liable for or in respect of any damage or compensation payable at law in respect or in consequence of any accident or injury to any workmen or other person or any Sub-Bidder. The Bidder shall indemnify and keep indemnified IIMB against all such damages and compensation, and against all liability, claims, proceeding, costs, charges and expenses whatsoever in respect thereof or in relation thereto

III.67. ARBITRATION:

Except where otherwise provided for in the contract, all question and disputes relating to the meaning of the specifications, designs, drawing and instruction herein before mentioned and as to quality of workmanship or materials used on the work or as to any other question, claim, right matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or the conditions or otherwise concerning the works, or 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 arbitration of the Director if the Director is unable or unwilling to act, to the sole arbitration of some other person appointed by the Director willing to act as such arbitrator. The arbitrator to whom the matter is originally referred being transferred or vacating his Office or being unable to act for any reason such Director / aforesaid at the time of such transfer, vacation of Office or inability to act, shall appoint another person to act as arbitrator in accordance with the terms of the contract. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor.

a. Subject to as aforesaid the provision of the Arbitration & Conciliation Act or any statutory modification or re-enactment thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this Clause.

b. It is a term of the contract that the party involving arbitration shall specify the dispute or dispute to be referred to arbitration under the Clause together with the amount or amounts claimed in respect of each dispute.

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

d. The work under the contract shall, if reasonably possible, continue during the arbitration proceedings and no payment due or payable to the Bidder shall be withheld on account of such proceedings.

e. The arbitrator shall be deemed to have entered on the reference on the date he issues notice to both parties / fixing date of the first hearing.

f. The arbitrator shall give a separate award in respect of each dispute or difference referred to him.

g. The venue of arbitrator shall be a place as may be fixed by the arbitrator in his sole discretion.

h. The award of the arbitrator shall be final, conclusive and binding on both the parties to this contract.

III.68. WORKMEN'S COMPENSATION ACT AND OTHER LABOUR ACT:

The Bidder shall employ labour, in sufficient number to maintain the required rate of progress and of quality to ensure workmanship of the degree required by the specification and to the satisfaction of the EIC. The Bidder shall remain liable for the payment of all wages or other money to his work people or employees under the Payment of Wages Act, Employer liability Act, workmen's compensation Act, ESI Act or any other Act or enactment relating there to and rules framed there under from time to time. The Bidder shall engage labour only on and during the hours of working day unless he obtains the prior written approval of the Engineer to do otherwise. If such approval is given no liability in respect of any excess cost arising there from shall be incurred by the IIMB.

III.69. FAIR WAGE:

The Bidder shall pay wages not less than fair wages to labourers, workmen engaged by him on the work fair wage means wage for the various categories of labour workmen fixed from time to time by the Labour Authorities of the area.

The Bidder shall ascertain the minimum fair wage prevailing in the area before submitting tender.

III.70. The Bidder shall also comply with the requirements of act regarding the employment of the Child Labour.

III.71. INTERPRETATION:

a) In interpreting the conditions of contract, singular also means plural, male also means female or neuter and the other way around. Headings have no significance. Words have their normal meaning under the language of the contract (English) unless specifically defined. The EIC or his nominee will provide instructions clarifying queries about the conditions of contract.

b) If sectional completion is specified in the contract data, references in the conditions of contract to the works, the completion date, and the intended completion date apply to any section of the work (other than references to the completion date and intended completion date for the whole of the works).

III.72. TERMINATION OF CONTRACT FOR DEATH:

Without prejudice to any of the rights or remedies under this contract, if the Bidder dies or attains legal disability, the Accepting Officer shall have the option of terminating the contract without any compensation to the Bidder. IIMB shall have the right to get the work completed by itself, or through any other contractors or agency at the cost and risk of the contractors or his successors in interest.

III.73. RESPONSIBILTY OF BIDDER AGAINST RISKS:

During currency of the contract it shall be the responsibility of the Bidder to safeguard all materials (tools, tackles, plant, equipment etc. either issued by IIMB or brought by the Bidder), against all losses, damages, on account of thefts shortages, fire or any reasons whatsoever and IIMB shall not be responsible for loss, damages etc. as aforesaid. The Bidder shall solely be responsible for protecting and securing such property.

III.74. INSPECTION OF WORK:

a) The Engineer-in-Charge shall have power at any time to inspect and examine any part of the works either at the manufacturing plant or at the site of execution and the Bidder shall give such facilities as may be required to be given for such inspection and examination.

b) Should the Engineer-in-Charge consider, at any time during the construction or reconstruction or prior to the expiration of the maintenance period, that any work has been executed with unsound imperfect or unskillful workmanship or of a quality inferior to that contracted for, or not otherwise in accordance with the contract (in respect whereof the decision of the Engineer-in-Charge shall be final binding and conclusive), the Bidder shall on demand in writing from the Engineer-in-Charge specifying the fault, notwithstanding that the same may have been inadvertently passed, certified and paid for, forthwith rectify or remove and reconstruct the work so specified, in whole or in part as the case may require, at his own expense to the entire satisfaction of the

Engineer-in-charge, and in the event of his failing to do so within a period to be specified by the Engineer-in-Charge in its demand aforesaid, IIMB may carry out the work by other means at the risk and expense in all respects of the Bidder. However, the liability of the Bidder under this conditions shall not extend beyond the maintenance period except as regards workmanship which the EIC shall have previously given notice to the Bidder to rectify.

III.75. APPROVAL OF WORKS BY STAGES:

All work consisting of more than one process shall be subject to examination and approval at each stage by the Engineer-in-Charge or his nominee thereof and the Bidder shall give due notice in writing to the Engineer-in-Charge when such stage is ready. In default of such notice being received, the Engineer-in-Charge shall be entitled to disallow the work or any part thereof at any time he may choose and in the event of any dispute, the decision of the Engineer-in-Charge thereon shall be final and conclusive.

If any work is so disallowed, the same shall be redone by the Bidder at his cost to the satisfaction of the Engineer-in-charge. Also in the event of failure of the Bidder to give notice, he shall uncover any part of the works and/or make openings in or through the same as the Engineer-in-charge may direct for his verification and shall make good such part to the satisfaction of the Engineer-in-charge at the Bidder's expense.

IV. PRICE BID:

E-Bids are invited through the electronic tendering process and the Tender Document can be downloaded from the e-Tender Central Public Procurement Portal (CPPP) of Government of India, https://eprocure.gov.in/eprocure/app. The submission of e-Bids will be only through the e-Tender portal https://eprocure.gov.in/eprocure/app Bids will not be accepted in any other form.

The prospective bidders should adhere to deadlines specified in Tender Details Screen corresponding to this Tender on E-Tender portal https://eprocure.gov.in/eprocure/app.

General Instructions to Bidders:

1) For participation in e-procurement all bidders need to enroll themselves on the CPP Portal (https://eprocure.gov.in/eprocure/app). Only enrolled/registered bidders with the said portal shall be allowed to participate in the e-tendering process.

2) Tender Documents may be downloaded from Central Public Procurement Portal https://eprocure.gov.in/eprocure/app. Aspiring Bidders who have not enrolled/ registered in e-procurement should enroll/ register before participating through the website https://eprocure.gov.in/eprocure/app. The portal enrolment is free of cost. Bidders are advised to go through instructions provided at 'Instructions for online Bid Submission'.

3) Tenderers can access tender documents on the website (For searching in the NIC site https://eprocure.gov.in/eprocure/app, kindly go to Tender Search option, select tender type and select ' Indian Institute of Management Bangalore' in department type Thereafter, Click on "Search" button to view all IIM Bengaluru tenders). Select the appropriate tender and fill them with all relevant information and submit the completed tender document online on the website https://eprocure.gov.in/eprocure/app as per the schedule.

4) The Bidders should have Java 8 update 231 version-32 bit for uploading the bid in the CPP Portal.

5) IIMB neither operates nor manages the CPP Portal where online bids are submitted and therefore will not be responsible for any technical issues related to bid submission (viz., being not being able to upload bid, blank/missing/part documents etc.). If the bid is incomplete on account of this, it will be treated as such and evaluated further. For any technical queries/issues related to online bid submission, Bidders must directly approach the support service of CPP Portal as per the details given on their website.

Bill of Quantity (BOQ)- Price bid

Bidders should necessarily submit their price bid in the format provided and no other format is acceptable. The prices mentioned in BOQ shall be considered for evaluation and comparison of bids. Bidders are required to download the BOQ file, open it and complete the Blue coloured (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder

should save it and submit it online, without changing the filename. If the BOQ file is found to be modified by the bidder, the bid will be rejected.

Submission of Online Bids:

1) Bids shall be submitted online only at CPPP website https://eprocure.gov.in/eprocure/app.

2) Bids received by Manual/ Offline bids /E-mail shall not be accepted under any circumstances.

3) The Bidder shall download the Tender Document directly from the website https://eprocure.gov.in/eprocure/app and shall not tamper/modify it in any manner. In case the same is found to be tampered/modified in any manner, such Tender/Bid will be summarily rejected and EMD would be forfeited.

4) The complete bidding process is online. Bidders should be in possession of a valid Digital Signature Certificate (DSC) of class III for online submission of bids. Prior to bidding DSC needs to be registered on the website mentioned above.

5) Bidders are advised to go through "Bidder Manual Kit" & "FAQ" links available on the login page of the e-Tender portal for guidelines, procedures & system requirements. In case of any technical difficulty, Bidders may contact the help desk numbers & email ids mentioned at the e-tender portal. Every Bidder will be required to obtain a Class-III Digital Signature (DSC) for submission of Bids.

6) IIMB shall receive the bids online through CPPP portal only. The e-Tender portal shall automatically stop accepting bids after the scheduled date and time specified in the Tender Document. Partially submitted bids shall be treated as invalid and shall not be processed.

7) Due date for Submission of Bids:

i) EMD must be paid through online transfer as per the bank details mentioned in this document within the due date of submission of bids.

ii) **Bidders are advised to upload, submit and freeze their E-bids** within the due date for submission of E-Bids in view of the electronic process so as to avoid last minute issues.

iii) IIMB may, at its discretion, extend the deadline for submission of bids by amending the bid documents in accordance with Clause relating to Amendment of Bidding Documents in which case all rights and obligations of IIMB and Bidders previously subject to the deadline will thereafter be subject to the due date as extended.

8) Late Submission of EMD:

i) Any EMD received by the IIMB after the due date for submission of bids prescribed by the IIMB is liable to be rejected.

ii) Bidders must note that the e-tender portal shall not permit uploading of bids after the scheduled time of submission.

9) Withdrawal, Substitution and Modification of Bids:

i) The bidder may withdraw or resubmit the modified bid his digitally signed bid after submission prior to the deadline for submission of bids, through provisions of e-tendering portal. For this, the bidder shall go to 'My Active Bids' and either withdraw or resubmit the modified bid.

10) Opening of E-Bids:

i) The E-bids shall be opened online by authorized officials of IIMB as per schedule given in the Tender Notice. In the case of two bid tender, the Price bid of only those bidders who qualified in technical evaluation, shall be opened.

ii) In the event of the specified date of Bid opening being declared a holiday for IIMB, the Bids shall be opened at the appointed time on the next working day. In two-part bidding, the financial bid shall be opened only after technical evaluation. No separate intimation shall be sent to the bidders in this regard.

iii) Since E-bid is an online process, the E-bid opening or any other process may be delayed due to any technical/server issue. If any such issue arises, this will not be tantamount to the process delay and IIMB will not be responsible for the same.

iv) On opening of technical bids online, accepting the bid will not mean that the firm is technically or financially qualified.

v) Bids will be opened online on the specified date and time. There is no need to visit IIMB premises to attend bid opening. If the bids cannot be opened on the due date and time due to any technical or administrative issues (network/connectivity issues, holidays, office closure etc.) the bids will be opened as soon as the issue is resolved or next working day as the case may be. Bids submitted online on CPP portal are safe, secure, and confidential and can be seen only after opening following the due process.

V. SCOPE OF WORK

1. Earthwork Excavation

2. Dismantling works

3. Concrete Works

4. Plumbing & Sanitary Works

Above items are only indicative and for guidance & brief description of jobs but should not be considered limited to this list. Tenderer should refer to the detailed tender documents, technical specifications and drawings for detailed items and scope of work included in this project. Any discrepancy in the above shall be brought to the notice of IIMB in the pre-bid meeting.

VI. SAFETY CONDITIONS

1. General:

The Bidder shall take all safety precautions / measures and ensure safety for the works, he has been contracted to execute. He shall follow all relevant safety codes of CPWD and IS codes and safety manuals. Some of the more important measures are listed below. The Bidder shall implement any further measures which may be required as per the safety codes of CPWD/ IS codes etc. and the measures which the Engineer may call for during the execution of the work.

2. Scaffolding:

Suitable scaffolds shall be provided for workmen for all work that cannot safely 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 labourer shall be engaged for holding the ladder and suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than 1/4 to 1 (1/4 horizontal and 1 vertical).

3. Guard Railing in Scaffolding / Staging / Platforms:

Scaffolding or staging more than 3.25 meters above the ground floor or floor swung or suspended from an overhead support or erected with stationary support, shall have a guard rail properly attached, bolted, braced and otherwise secured at least 1 meter 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 so fastened as to prevent it from swaying from the building or structures.

4. Working Platform / Gangway / Stairway:

Working platform, gangways and stairways shall be so constructed that they do not sag unduly or unequally, and if height of a platform or gangway or stairways is more than 3.25 meters above ground level or floor level, it shall be closely boarded, have adequate width and be suitably fenced provided with guard rail as described in 2 above.

5. Access to working platforms and other working places:

Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 5 meters in length. Width between side rails in a rung ladder shall in no case be less than 30 cm. for ladders upto and including 3 meters in length. For longer ladders this width shall be increased at least 6 mm. for each additional 30 cm. of length. Uniform step spacing shall not exceed 30 cm.

6. Hoisting Machines:

Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following:

Those shall be of good mechanical construction, sound material and adequate strength and free from patent defects and shall be kept in good repair and in good working order. Every rope used in hoisting or lowering materials or as a means or suspensions shall be of durable quality and adequate strength, and free from patent defects.

Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 shall be in charge of any hoisting machine including any scaffold winch or give signals to operator.

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, safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with safe working load. In case of hoisting machine having a variable safe working load, each safe working load and the condition under which it is applicable shall be clearly displayed on the machine prominently. No part of any machine or of any gear referred to above in this paragraph shall be loaded beyond safe working load except for the purpose of the testing.

Motors gearing, transmission, electric wiring and other dangerous parts of hoisting appliances shall be provided with efficient safeguards; hoisting appliances shall be provided with such means as will reduce to the minimum, risk of accidental descent of load. Adequate precautions shall be taken to reduce to the minimum risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energised, insulating mats, working apparel such as gloves, sleeves and boots, as may be necessary shall be provided. Workers shall not wear any rings, watches and carry keys or other materials which are good conductors of electricity.

Load tests: All cranes, hoisting machines etc. shall be load tested. Bidder shall submit test certificate from competent, authorised person before use.

7. Demolition works:

Before any demolition work is commenced and also during the process of the work:

a. All roads 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 over a cable or apparatus used by Bidder shall remain electrically charged.

c. All practical steps shall be taken to prevent danger to persons employed, from risk or fire or explosion, or flooding. No floor, roof, or other part of a building shall be so overloaded with debris or materials as to render it unsafe.

d. All blasting materials shall be stored and handled as per guidelines of relevant authorities.

8. Barricades:

i. Bidder shall erect and maintain barricades required in connection with his operation to guard or protect:

a. Excavation / Hoisting / Lifting areas
b. Slab Openings
c. Areas adjudged hazardous by Bidder's or Engineer’s Inspection.
d. Existing property subject to damage by Bidder's operations.

ii. Bidder's employees and those of his sub-Contractors shall become acquainted with IIMB / Engineer's barricading practice and shall respect the provisions thereof.

9. Net & Protective Platform:

The Bidder shall provide & maintain a closely knitted PVC net all-round tall buildings throughout the construction period. He shall also provide all-round from external face about 1.5 M+ wide temporary platforms at all the floor covered with welded steel mesh. This shall be maintained & updated throughout the construction period to avoid any accident due to dropping of construction materials/debris. This shall be strictly followed, and work shall be permitted only when complied to satisfaction of the Engineer. If the above are not fully taken care of the Engineer reserves the right to get the same carried out through other agency at the risk and cost of the Bidder.

10. Prevention of Fire and Protection:

All combustible waste materials, wood scaling, soiled rags, etc. should be removed daily and burned in suitable areas.

Fire, welding, and flame cutting should not be permitted in combustible areas. Fires and open flame devices should not be left unattended.

Smoking should be prohibited in all flammable material storages, viz. carpentry, paint shops, garages, service stations, etc. "No Smoking" signs should be posted on all such areas.

Accumulation of flammable liquids on floor, walks, etc, should be prohibited. All spills of flammable liquids should be cleaned up immediately.

Flammable liquids, lubricants, etc. should be handled and transported in safety containers and drums which can be kept tightly capped.

Petrol or other flammable liquids with a flash point below 100 Deg F should not be used for cleaning purposes.

Oxygen cylinders should not be stored with combustible materials.

All electric installations should be properly earthed. Repairs should not be made on electrical circuits until the circuit has been de-energized.

Fire extinguishers & fire buckets, painted red, should be provided at all fire hazardous locations. Extinguishers should be inspected, serviced & maintained in accordance with manufacturer’s instructions. The inspections should be evidenced by notations on the tag attached to the extinguisher.

Handling of Hazardous materials shall be as per statutory regulation.

11. Electrical Equipment:

All temporary and permanent electrical installations, power distribution and supply required for execution of Work shall be carried out conforming to existing

industrial and domestic safety rules and regulations. Important specific points to be noted are as under:

Meter room and main switches should be freely accessible at all times and fully protected against all weathers.

Power distribution system shall be identifiable with display marking on switches.

All power distribution shall be carried out with coated, adequately, insulated and of appropriate current / load rating cables. It shall be securely routed for this purpose. No loose, naked, hanging wires shall be permitted.

Overload protection devices shall be installed whenever and wherever heavy current / load consuming construction or plant machinery susceptible to hazard is in use and as directed by the Engineer.

Metallic plugs and sockets shall be used in field work. Switch board shall be in close proximity so as to have quick control over the supply

Proper and adequate earthling connection to be provided for all installation, plant machinery and distribution system.

Hand lamps and inspection lamps shall be adequately insulated and guarded with wire mesh and will have proper plugs for use.

Security and illuminatory light shall be secured firmly and protected to withstand all weather.

12. Protective equipment / gears:

All necessary personal protective equipment as considered adequate by the IIMB and the Engineer shall be available for use of the persons employed on the site and maintained in a condition suitable for immediate use; and the Bidder shall take adequate steps to ensure proper use of equipment by those concerned.

- Workers employed on mixing cement concrete shall be provided with protective footwear & protective goggles, hand gloves of polythene type.
- Those engaged in handling any material which is injurious to eyes shall be provided with protective goggles.
- Those engaged in welding works shall be provided with welders protective eye-shields.
- The following safety equipment should be provided to workers as required and their use enforced. Rubber boots; hard toe protective safety boots; hard hats & helmets, safety belts; goggles for stone/concrete cutters., gas welding aprons, respirator shields, manila ropes and slings for life lines, gloves, flash lights, battery lamps, safety nets, boatswains chairs, helmets, life and ring buoys.

Items of personal wear should be maintained in serviceable condition and should before being reissued to other employees or returned to stores to be cleaned, sterilised, inspected and repaired, if necessary.

Loose and frayed clothing, hand rings, loose watch chains, etc. should not be worn around moving machinery or other sources of entanglement.

13. Other Safety Measures:

Every receptacle used for raising or lowering stones, bricks, tiles, slates, or other subjects should be enclosed, constructed or designed so as to prevent the accidental fall of such objects.

All gears, tools, goods or loose material should be properly loaded into the bucket or receptacle in which they are being raised or lowered. If necessary, they should be properly secured, or effective precautions should be taken to prevent their fall.

No timber or materials with projecting nails should be used in any work because they can be a source of danger to people.

Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The Bidder shall provide all necessary fencing and lights to protect public accidents and shall be bound to bear expenses of defence of every suit, action or other proceeding at law that may be brought by any person for injury sustained owing to neglects of the above precautions and to pay any damages and costs which may be awarded in any such suit, action or proceedings to any such person or which may with the consent of the Bidder be paid to compromise any claim by any such person.

Adequate Safety Precautions shall be taken by the Bidder to ensure the Safety of the workmen engaged by him.

14. First Aid Injuries:

i. Bidder shall maintain first aid facilities for his workmen. First aid appliance including an adequate supply of sterilised dressings and sterilised cotton wool should be maintained in a readily accessible place. Appliances should be kept in good order and they should be placed under the charge of a responsible person who should be readily available during the working hours.

ii. Bidder shall make adequate arrangements for ambulance service and for treatment of injuries. Names of those providing these services shall be furnished to IIMB prior to start of constructions and their telephone numbers shall be prominently posted in Bidder's field office.

15. Maintenance:

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

16. Enforcement:

To ensure effective enforcement of the rules and regulations relative to safety precautions, arrangements made by the Bidder shall be open to inspection by the Engineer or his representatives and the Inspecting Officers.

17. Displays:

These safety provisions shall be brought to the notice of all concerned by display on a notice board at prominent places at the work spot. Persons responsible for ensuring compliance with the Safety Code shall be named therein by the Bidder.

18. Work permits:

The bidder shall at his own cost and responsibilities follow all the safety rules and regulations and safety codes such as: -

IS codes (Latest Revisions)	**As applicable to the relevant work**
3696-1987	Safety code for scaffolds and ladders.
4014 (part 2) -1986	Safety regulations for steel tubular scaffolding
3764-1966	Safety code for excavation work.
4081-1986	Safety code for blasting and related drilling operation.
4130-1976	Safety code of demolition of building.
4138-1977	Safety code for working in compressed air
4912-1978	Safety requirements for floor and wall openings, railings and toe board
7969-1975	Safety code for handling and storage of building materials
13415-1992	Safety code for protective barriers in and around the building
13416-(part 2) - 1992	Recommendations for preventive measures against hazards at workplace- fall prevention
5916-1970	Safety code for construction involving use of hot bituminous material.
7293-1974	Safety code for working with construction machinery.
8989-1978	Safety code for erection of concrete framed structure.
7205-1973	Safety code for Erection of Structural steel works

PROFORMA – A

UNDERTAKING LETTER

(To be submitted in the company letterhead with date)

To

Chief Manager (Infrastructure)
Indian Institute of Management Bangalore
Estate & Maintenance Section
Bannerghatta Road,
Bangalore - 560 076

Work:

Dear Sir,

This has reference to your above Notice inviting the tender (NIT) published in your IIMB web site.

We hereby state that we M/s _____ have submitted the above tender documents duly filling at the appropriate places without making any alterations, corrections, omissions in the tender issued by the IIMB.

Signature & Name of the Bidder

PROFORMA – B

BIDDER BANK DETAIL FORM

(To be submitted in the company letterhead with date)

The Indian Institute of Management Bangalore
Bannerghatta Road
Bangalore – 560 076

Dear Sir,

I / We hereby request you to remit our payments to our bank account as per the details furnished below:

Sl.No.	**Particulars**	**Particulars**
1	Name of the Agency/Organization	
2	Complete Address	
3	Name of the Contact Person	
4	Contact Numbers E-mail id	
5	Savings /current account number	
6	Name of the Bank	
7	Name of the branch with complete address	
8	IFSC Code	
9	PAN Number	

I / we hereby declare that I /we are authorized to sign this form and that the particulars furnished above are correct and complete in all respects. If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information, I /we shall not hold IIMB responsible.

Please find enclosed a cancelled cheque for your reference.

Authorised Signatory:
Name:
Designation:
Date:

PROFORMA – C

DECLARATION LETTER

(To be submitted in the company letterhead with date)

To

Chief Manager (Infrastructure)
Indian Institute of Management Bangalore
Estate & Maintenance Section
Bannerghatta Road,
Bangalore - 560 076

Work:

Dear Sir,

Please find herewith enclosed the Technical Bid document comprising of Terms & conditions, General & Special Conditions and Safety Code relating to the works specified in the Technical Bid Document hereinafter set out and having acquired the requisite information relating thereto as affecting the Technical Bid, I / We hereby offer to execute the works specified in the said document with the labour/worker rates mentioned at Price Bid portion of Technical Bid Document and in accordance in all respects with the conditions, technical specifications, particular specifications, safety conditions and instructions in writing referred to in conditions of Technical Bid, articles of agreement, general conditions of contract and in all other respects in accordance with such conditions so far as they may be applicable.

The document being read and understood all the contents of the Technical Bid Document do hereby accept all the Terms and conditions laid down in the said Technical Bid document and will abide by the same on acceptance and award of work.

Yours Faithfully,

FOR M/s_____

PROFORMA D

BIDDER CREATION TEMPLATE

(To be submitted in the company letterhead with date)

Bidder Name	
PAN number	
GSTIN	
TAN Number	
Address	
Email Id	
Phone number	
Bank Name	
Branch Name	
Benefeiciary Name	
Bank Account Number	
IFSC Code	
Organisation Type (whether Individual, corporation etc)	
Applicability of e-Invoicing (Yes/No)-(If No, please fill Proforma E)	

(The rows and columns can be adjusted by the bidder according to the length of the information).

PROFORMA E

(ON THE LETTERHEAD OF THE BIDDEER)

Date:

The Chief Finance Officer
Indian Institute of Management Bangalore
Bannerghatta Road
Bangalore – 560076
GSTIN: 29AAAAI0405N1ZQ
PAN: AAAAI0405N

Sub : Declaration on non-applicability of e-invoicing provisions under GST

We, (name of the bidder), with PAN ……..., having our registered office at……., hereby declare that our aggregate turnover as per Goods and Services Tax (GST) law in India is less than INR 10 crores and we are not required to comply with e-invoicing provisions under GST for generation a Unique Invoice Registration Number (IRN) and QR code.

Further, we also undertake that if the aggregate turnover of M/s. (name of the bidder), exceeds the current threshold or revised threshold notified by Government of India at any future date, then we shall issue documents in compliance with the GST provisions.

This statement is true and correct and we agree to compensate you for any demand, credit reversal, denial of refund, loss, interest or penalty imposed due to any incorrect declaration or non-compliance by us.

Thanking you,

Yours faithfully,
For (Bidder Name)

(Signature)

Name of the Authorized signatory
Designation
Contact no.:
e-mail ID:

PROFORMA F

(TO BE EXCECUTED ON NON JUDICIAL STAMP PAPER OF THE VALUE OF Rs._____ WITHIN 15 DAYS ISSUE OF WORK ORDER)

AGREEMENT

Articles of Agreement for "***NAME OF WORK***" ("Agreement") is executed on the <Insert Present date>day of _____ Two Thousand And _____,

Between

Indian Institute of Management Bangalore ("IIMB"), a body corporate and Institute of National Importance under the Indian Institute of Managements Act 2017 having its registered office at Bilekahalli, Bannerghatta Road, Bangalore-560076, represented through its Director (hereinafter called "IIMB", which expression shall include its successors and assigns wherever the context or meaning shall so require or permit) of the One Part;

And

_____, an organization duly incorporated under the applicable laws of India and having its office _____ _____, represented by its Proprietor _____ hereinafter called the "Contractor" (Which expression shall include its successors and assigns wherever the context or meaning shall so require or permit) of the **Other Part**.

IIMB, and the Contractor shall be individually referred to as "**Party**" and jointly referred to as "**Parties**".

Whereas

IIMB has, through the Tender dated _____ invited reputed contractors for executing the works in connection with "***NAME OF WORK***".

- The Contractor, being the successful contractor has been issued the Work Order dated _____bearing number _____
- IIMB and the Contractor agree to bind themselves on the terms and conditions hereinafter mutually agreed to.

Hence this Agreement is now made and entered into and both the Parties agree as follows:

Scope of Work: The Scope of Work shall be as per the stipulations contained in the Work Order bearing number _____ dated _____, and the terms contained in the Tender documents on "***NAME OF WORK"*** dated _____. The approximate value of the project, as per the Work Order is Rs_____ (Rupees _____ Only) exclusive of

applicable GST.

1. Term: Time is the essence of the Contract. The Contractor shall execute and fully complete all the works specified in the Work Order, i.e., within _____ from the date stipulated in the Work Order and in the manner and pursuant to the terms, obligations and conditions set forth herein and in the said Tender and Work Order.

2. Penalty for delay: In case the work is not completed in the manner mentioned above, and to the complete satisfaction of IIMB, the Contractor shall, without prejudice to any other rights and remedies of IIMB, pay a penalty of **minimum 1.0% to maximum 10%** of the value of the unfinished or balance of the work. IIMB shall decide the percentage of penalty after considering the unfinished or balance of the work at that point of time and the percentage of penalty shall vary for each week of such delay in completion of the work.

3. Payment Terms: In consideration of the work done under this Agreement, IIMB agrees to pay the Contractor at different stages as set forth in the Tender in that behalf. The Contractor shall be responsible for payment of all applicable Taxes on the works contract.

i. The Contractor shall promptly raise an invoice to IIMB on the completion of work at each stage as per the Tender terms before the 10th day of the subsequent month, for the works completed in the previous stage.
ii. IIMB shall pay such invoice within thirty (30) working days from the date of receipt of the undisputed invoice.
iii. On receipt of the Final payments, the Contractor shall furnish a "No Demand Certificate" to IIMB.

4. Obligations of Contractor:

a. The Contractor shall take all appropriate and reasonable efforts to complete the work at IIMB to the satisfaction of IIMB in a timely and effective manner.
b. The Contractor shall comply with all the Terms of this Agreement.
c. The Contractor shall be responsible for complying with all the applicable Laws and IIMB shall not be held liable for any default of the Contractor in this regard.
d. The Contractor shall ensure that all employees, workers, consultants etc., engaged pursuant to this Agreement at IIMB are its employees. The Contractor shall be solely responsible for payment and provision to those employees and personnel of salaries, wages, allowances and all applicable benefits such as EPF, ESI under the applicable law for the time being in force.
e. The Contractor shall complete the work to the satisfaction of IIMB as per the instructions of the authorized officer of IIMB.

5. Earnest Money Deposit (EMD): The EMD of Rs. _____ (Rupees _____ Only) submitted online by the Contractor through RTGS/NEFT shall be returned to the Contractor along with first RA bill. **No interest shall be paid on this deposit.**

6. Security Deposit (SD): 7.5% of the Gross Value of each bill shall be deducted as Security Deposit from the concerned RA Bill.

This security deposit shall be released to the contractor after successful completion of the Defects Liability Period.

7. Insurance: The Contractor shall provide for adequate insurance cover to his employees. The Contractor shall ensure that the said insurance includes all liabilities, which would cover material and building damage, workmen's compensation, third party liabilities etc., (CAR Policy for the Contract Value). The Contractor shall produce evidence of insurance coverage for all above before submitting invoices for payment. Such Insurance Policy shall be obtained from a reputed insurer and in the terms approved by IIMB; or
If the Contractor has a blanket insurance policy for all his Works and the policy covers all the items to be insured under this Agreement, the Contractor may assign such policy in favour of IIMB

8. Indemnity: The Contractor shall be responsible for any accident and all compensation payable to anybody including contract labour employed by or out of the Agreement or arising out of and in the course of execution of this Agreement. IIMB shall not be responsible or liable for making any payment whatsoever, which is to be made by the Contractor. If for any reason IIMB is made liable to pay compensation for any accident arising out of and in the course of execution of this Agreement, the Contractor shall indemnify IIMB to the fullest extent of compensation awarded or ordered by any Authority.

In the event of the non-fulfilment in any respect of the said covenant's, terms, obligations and conditions on the part of the Contractor, the Contractor shall pay IIMB, all losses, damages, costs, charges and expenses, including legal expenses as IIMB may be directly or indirectly put to in consequence of such non-fulfilment by the Contractor.

9. Confidentiality: Both the Parties hereby undertake that under no circumstances whatsoever they shall disclose any of the Terms of this Agreement and all or any Confidential Information belonging to the other like financial plans, business plans, and others, declared confidential to which they might have access during the association with one another in terms of this Agreement, except to the extent that is already in public knowledge/domain. The Confidential Information as hereinabove detailed shall not be disclosed during the subsistence of this Agreement and thereafter for a period of five years from the date of termination for whatever reason.

10. Termination: If the Contractor fails to perform the work set out in this Agreement within the stipulated period of time or carry out the work to the satisfaction of IIMB, IIMB shall terminate the Agreement as a whole or a part thereof at the risk and cost of the Contractor, without prior notice.

11. Consequence of Termination: In the event of termination of this Agreement, the parties agree to promptly deliver all the deliverables applicable to the fullest extent conceived, created or developed prior to the date of termination.

In case of termination due to the material breach of the terms of this Agreement by the Contractor, IIMB shall get the balance work executed through a third party and recover from the Contractor all the additional costs incurred by and damaged caused to IIMB in procuring such services from any other third party.

12. Arbitration: In the event of any dispute arising out of or in connection with this Agreement, the Parties agree to resolve the disputes amicably, failing

which the disputes shall be referred to Arbitration. The Arbitrator shall be appointed by the Director of IIMB. The venue of Arbitration shall be at Bangalore.

13. Applicable Law and Jurisdiction: This Agreement shall be governed and construed in accordance with the Indian Laws and subject to the exclusive jurisdiction of competent courts at Bangalore, India.

14. Miscellaneous:

a. **Relationship of Parties:** Nothing contained in this Agreement shall be construed as creating a partnership between the Parties or as deeming either Party as an agent or representative of or employee of the other. Neither Party may act as the agent of the other Party or incur any liability on behalf of the other Party.

b. **Assignment:** This Agreement shall not be assigned, sublicensed, sold, mortgaged, sub-contracted, or pledged to any other third person by the Contractor without the prior written consent of IIMB.

c. **Publicity:** Both the Parties shall be entitled to issue or make any press releases or other public announcements relating to this Agreement. However, all press releases or other public announcements relating to this Agreement must be approved in advance and in writing, in each instance, by both the Parties.

d. **Notice:** All notices, including notice of address change, required to be sent hereunder shall be in writing and shall be deemed to have been delivered when mailed by first class mail or reputable courier service return receipt requested to the address stated in the first page of this Agreement. Electronic communications are admissible provided these are sent with delivery confirmation receipt and followed by physical copy mailed as set forth above.

e. **Severability:** If any provision of the Agreement is or becomes invalid or impracticable in whole or part, the validity of the other provisions of this Agreement shall not be affected thereby. The invalid provisions shall be replaced by valid provisions that come closest to the economic intention pursued by the Parties.

f. **Amendments:** This Agreement may only be modified by mutual consent in writing, signed by the authorized representatives of each Party.

g. **Force Majeure:** No Party shall be in default under this Agreement by reason of its failure or delay in the performance of its obligation if such failure or delay is caused by acts of God, Government Laws and Regulations, Strikes/lock-outs at the venue, war, natural calamities or any other cause beyond its control and without its fault or negligence.

The Party claiming the relief under force majeure shall notify the other Party thereof without undue delay and if the impediment continues for more than three (3) months due to such causes as mentioned above, either party shall be entitled to terminate the Agreement by written notice to the other party without incurring any liability for breach of contract.

h. **Entire Agreement:** The terms and conditions contained in the following documents are deemed to form part of this Agreement, namely, the Tender document including the Notice Inviting Tender, General Conditions, Special Conditions, the Specifications, the Priced Bill of Quantities, the Schedule of rates and prices, and the Drawings mentioned in the Specifications. The letter of Acceptance, Work Order and all the communication between the Parties will also form part of this Agreement.

In Witness Whereof the said parties hereto have hereunto set their hands.

For IIMB	**For** Contractor
Witnesses:	Witnesses:
1.	1.
2.	2.

PROFORMA - G

LITIGATION DETAILS (COURT CASES/ARBITRATION)

(To be submitted in the company letterhead with date)

Year Name of the work

Name of the Client, with Address

Title of the court Case/Arbitration

Detail of the Court/ Arbitrator

Status Pending/ Decided

Disputed Amount (Current Value, the equivalent) in case of Court Cases/arbitration

Actual Awarded Amount (Rs) in decided Court Cases/arbitration

Signature and seal of Authorized Signatory of bidder

PROFORMA – H

DECLARATION REGARDING BLACKLISTING / DEBARRING FOR TAKING PART IN TENDER

(To be submitted in the company letterhead with date)

I / We ……. hereby declare that the bidder / bidder namely M/s …….. ***(name of the bidder)*** has not been blacklisted or debarred in the past by Union / State Government or organization from taking part in Government tenders in India and should not have any litigation in any of the courts.

OR

I / We …… ***(name of the bidder)*** hereby declare that the bidder / bidder namely M/s …….. ***(name of the bidder of the bidder)*** was blacklisted or debarred by Union / State Government or any organization from taking part in Government tenders for a period of …….. years w.e.f. ……. To …… The period has been completed on …… and now the bidder / bidder is entitled to take part in Government tenders.

In case the above information is found false, I / We are fully aware that the tender / contract will be rejected / cancelled by the Institute and the PEMD submitted by the bidder will be forfeited.

In addition to the above, IIMB will not be responsible to pay the bills for any completed / partially completed work.

Seal and Signature of the Bidder

PARTICULAR SPECIFICATIONS

Preamble:

These particular specifications shall be read in conjunction with the various other documents forming the contract, namely, e-Bid Notice. Conditions of contract, bill of quantities, and other related documents, together with any addenda thereto issued.

1. Scope of work

The work to be carried out under this contract shall consist of various items as generally described above as well as description of works contained in the bill of quantities or as given in the nomenclature of the items in the particular specifications, earlier taking precedence over the latter.

1.1 The item rates quoted by the contractor shall, unless otherwise specified also include compliance with / supply of the followings:

a. General works such as setting out, clearance of site before setting out and clearance of works after completion.

b. A detailed programme for the construction and completion of works (using CPM/ PERT techniques), including updating of all such activities on the basis of decisions taken at the periodic site review meetings as directed by the Engineer in charge.

c. Samples of various materials proposed to be used on the work for conducting tests thereon as required as per the provisions of the contract.

d. Design of mixes as per relevant clauses of the specifications giving proportion of ingredients, source of aggregate and binder along with accompanying trial mixes/mix designs to be submitted to the Engineer in charge for his approval before use in the works.

e. Any other item of work which is not specifically provided in bill of quantities, but which is necessary for complying with the provisions of the contract and the specifications.

f. Cost of setting up laboratory at site and carrying out all necessary quality control measures/ tests enumerated in the specification, by the contractor at his own cost and submission of tests results on completing of tests to the Engineer in charge thereof.

1.2 The works will be executed as indicated in the nomenclature of each item and particular specifications as given here under as made applicable to this contract.

1.3 In the absence of any definite provision in the particular specifications contained herein reference may be made to the CPWD SSR & Indian standards codes in that order. Wherever these are silent, the construction and completion of works shall conform to sound Engineering practice and in case of any dispute arising out of the interpretation of the above, the decisions of the Engineer-in-charge shall be final and binding on the contractor.

1.4 In addition, the abbreviations CPWD all be considered to have the following meaning:

IS: Indian Standards of the Indian Standards Institute.

1.5 All the codes of practice, Standards and specification applicable shall be the latest editions with all correction slips etc. or as directed by the Engineer-in-charge.

2. EARTHWORK, EXCAVATION AND SUB BASE

2.1 The following Indian Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest editions including all applicable official amendments and revisions shall be referred to.

a)	IS: 783	-	Code of practice for laying of concrete pipes.
b)	IS: 3764	-	Excavation work - Code of Safety .
c)	IS: 2720	-	Methods of test for soils:
d)	(Part-1)	-	Preparation of dry soil samples for various tests.
e)	(Part-2)	-	Determination of Water Content.
f)	(Part-4)	-	Grain size analysis.
g)	(Part-5)	-	Determination of liquid and plastic limit.
h)	(Part-7)	-	Determination of water content - dry density relation using light compaction.
i)	(Part-8)	-	Determination of water content – dry density relation using heavy compaction.
j)	(Part-9)	-	Determination of dry density – moisture content by constant weight of soil method.
l)	(Part-14)	-	Determination of density index (relative density) of cohesion less soils.
m)	(Part-22)	-	Determination of organic matter.
n)	(Part-26)	-	Determination of pH Value.
o)	(Part-27)	-	Determination of total soluble sulphates.
p)	(Part-28)	-	Determination of dry density of soils in place, by the sand replacement method.
q)	(Part-33)	-	Determination of the density in place by the ring and water replacement method.

r) (Part-34) - Determination of density of soil in place by rubber balloon method.

s) (Part-38) - Compaction control tests (Hilf Method).

2.1.1. General

Excavation for trenches over areas and for pits, etc. shall be done to widths, lines and levels as shown in drawings or to such lesser or greater widths, lines and levels as directed. The bottom and sides of excavation shall be trimmed to require levels, profile, etc. watered and thoroughly rammed. Should any excavation be taken below the specified levels, the contractor shall at his own cost fill up such excavation with cement concrete (M-10)to required levels. Filling in such excavation with excavated material is prohibited.

All excavation work shall be carried out by mechanical equipment unless, in the opinion of Engineer-in-charge, the work involved requires it to be carried out by manual methods.

2.1.2. Grubbing and Clearing

Before excavation is started, the area coming under cutting / excavation shall be thoroughly grubbed and cleared off shrubs, rank vegetation, grass, bush wood, debris, trees / sapling of girth upto 300 mm. The roots shall be removed upto depth of 600 mm below ground. The rubbish shall be removed outside the site as directed by the Engineer-in-charge.

2.1.3. Dewatering

The Contractor shall ensure that the excavation and the structures are free from water during construction and shall take all necessary precautions and measures to exclude ground/rain water so as to enable the works to be carried out in reasonably dry conditions in accordance with the construction programme. Sumps made for dewatering must be kept clear of the excavations/trenches required for further work. The method of pumping shall be approved by Engineer-in-charge, but in any case, the pumping arrangement shall be such that there shall be no movement of subsoil or blowing in due to differential head of water during pumping. Pumping arrangements shall be adequate to ensure no delays in construction. The dewatering shall be continued for at least (7) seven days after the last pour of the concrete. The Contractor shall, however, ensure that no damage to the structure results on stopping of dewatering.

The Contractor shall study the sub-soil conditions carefully and shall conduct any tests necessary at the site with the approval of the Engineer-in-charge to test the permeability and drainage conditions of the sub-soil for excavation, concreting etc., below ground level.

The scheme for dewatering and disposal of water shall be approved by the Engineer-in-charge. The Contractor shall suitably divert the water obtained from dewatering from such areas of site where a build up of water in the

opinion of the Engineer-in-charge obstructs the progress of the work, leads to unsanitary conditions by stagnation, retards the speed of construction and is detrimental to the safety of men, materials, structures and equipment.

When there is a continuous inflow of water and the quantum of water to be handled is considered in the opinion of Engineer-in-charge, to be large, a well point system- single stage or multistage, shall be adopted. The Contractor shall submit to the Engineer-in-charge, details of his well point system including the stages, the spacing, number and diameter of well points, headers etc., and the number, capacity and location of pumps for approval.

Unless separately provided for in the Schedule of quantities, cost of dewatering is deemed to have been included in the unit rates quoted for excavation. If separately provided for, the unit of measurement shall be as indicated in the Schedule of Quantities.

2.1.4. Timbering to excavation (shoring)

Where the soil is soft and sides of excavation needs supporting, suitably designed planking and strutting shall be provided.

Close timbering shall be done by completely covering the sides of the trenches and pits generally with short, upright members called 'polling boards'. These shall be of minimum 25 cm x 4 cm sections or as approved by the Engineer-in-charge. The boards shall generally be placed in position vertically side by side without any gap on each side of the excavation and shall be secured by horizontal walling of strong wood at maximum 1.2 metre spacings, strutted with ballies or as approved by the Engineer-in-charge. The length of the ballie struts shall depend on the width of the trench or pit. If the soil is very soft and loose, the boards shall be placed horizontally against each side of the excavation and supported by vertical Wallings, which in turn shall be suitably strutted. The lowest boards supporting the sides shall be taken into the ground and no portion of the vertical side of the trench or pit shall remain exposed, so as to render the earth liable to slip out.

Timber shoring shall be 'close' or 'open' type, depending on the nature of soil and the depth of pit or trench. The type of timbering shall be as approved by the Engineer-in-charge. It shall be the responsibility of the Contractor to take all necessary steps to prevent the sides of excavations, trenches, pits, etc. from collapsing.

Timber shoring may also be required to keep the sides of excavations vertical to ensure safety of adjoining structures or to limit the slope of excavations, or due to space restrictions or for other reasons. Such shoring shall be carried out, except in an emergency, only after approval from the Engineer-in-charge.

The withdrawal of the timber shall be done carefully to prevent the collapse of the pit or trench. It shall be started at one end and proceeded with, systematically to the other end. Concrete or masonry shall not be damaged during the removal of the timber.
In the case of open timbering, the entire surface of the side of trench or pit is not required to be covered. The vertical boards of minimum 25 cm x 4 cm sections shall be spaced sufficiently apart to leave unsupported strips of maximum 50 cm average width. The detailed arrangement, sizes of the timber and the spacing shall be subject to the approval of the Engineer-in-charge. In all other respects, the Specifications for close timbering shall apply to open timbering.

In case of large pits and open excavations, where shoring is required for securing safety of adjoining structures or for any other reasons and where the planking across sides of excavations/pits cannot be strutted against, suitable inclined struts supported on the excavated bed shall be provided. The load from such struts shall be suitably distributed on the bed to ensure no yielding of the strut. If however, Engineer-in-charge directs any timbering to be left-in, keeping in mind the type of construction or any other factor, Contractor shall be paid for at the scheduled item rate for such left-in timbering.

Unless otherwise separately provided for in Schedule of Quantities, the timber shoring is deemed to have been included in the unit rates quoted for excavation.

If separately provided for, then the actual effective area of shored faces as approved by Engineer-in-charge shall be measured in sq.mtrs. The area of planking embedded in the bed/sides of excavation will not be considered, nor the area supporting inclined struts in case of large pits/open excavation. All planks, boards, wallings, verticals, struts, props and all other materials required for shoring and subsequent safe dismantling and removal shall be included in the quoted unit rates.

2.1.5. Soil / Rock Classification

2.1.5.1. General

All materials to be excavated shall be classified by Engineer-in-charge, into one of the following classes and shall be paid for at the rate contracted for that particular class of material. No distinction shall be made whether the material is dry, moist or wet. The decision of Engineer-in-charge regarding classification of the material shall be final and binding on contractor and not be a subject matter of any appeal or arbitration. Excavation shall be classified under one of the following categories by the Engineer-in-charge.

2.1.5.2. Ordinary and Hard Soils

These shall include all kinds of soils containing kankar, sand, silt, murrum and/or shingle, gravel, clay, loam, peat, ash, shale etc. which can generally be excavated by spade, pick-axes and shovel and which is not classified under "soft and decomposed rock" and "hard rock" defined below. This shall also include embedded rock boulders not longer than 1 metre in any direction and not more than 200 mm in any one of the other two directions.

b) Hard Rock
This shall include all rock occurring in large continuous masses, which cannot be removed except by blasting for losening it. Hard varieties of rock with or without veins and secondary minerals, which, in the opinion of Engineer-in-charge require blasting, shall be considered as hard rock. Concrete work both reinforced and unreinforced to be dismantled will be measured under this item unless a separate provision is made in the Schedule of Quantities.

c) Soft and Decomposed Rock
This shall include rock, boulders, slag, chalk, slate, hard mica schist, laterite, sand stone and all other materials which in the opinion of Engineer-in-charge is rock but does not need blasting and could be removed with picks, hammer, crow bars, wedges and pneumatic breaking equipment. The mere fact that contractor resorts to blasting for reasons of his own, shall not qualify for classification under "hard rock".

2.1.5.3. Stripping Loose Rock

All loose boulders, detached rocks partially and other loose material which might move therewith not directly in the excavation but so close to the area to be excavated as to be liable, in the opinion of Engineer-in-charge, to fall or otherwise endanger the workmen, equipment, or the work shall be stripped off and removed from the area of the excavation. The method used shall be such as not to render unstable or unsafe the portion, which was originally sound and safe.

Any material not requiring removal in order to complete the permanent works, but which, in the opinion of Engineer-in-charge, is likely to become loose or unstable later, shall also be promptly and satisfactorily removed. The cost of such stripping will be paid for at the unit rates accepted for the class of materials in question.

Where blasting has to be resorted to for rock cutting it shall be the responsibility of the contractor to arrange for the following at his entire risk, cost and responsibility.

a) Permission from all the connected Public Authorities such as Municipal Corporation, Inspector of Explosives, Police, Highway Authorities, etc. shall be obtained.

b) Fees, royalties and any other levies, attendant on such blasting work shall be entirely borne by the contractor.

c) All precautionary measures such as notices to adjoining property and other agencies working in and around the plot, signaling and watch etc. shall strictly adhere to according to the various regulations in force.

d) Storing of blasting materials shall be strictly as per Explosive Regulations.

The tendered must acquaint himself with the site conditions in regard to blasting, nature of rock likely to be met with, timing and other restrictions to blasting etc. No. Claims whatsoever in these regards shall be entertained.

2.1.5.4. Disposal of Surplus excavated materials

All materials considered surplus shall be removed to destinations and disposed off as directed. The disposal of the material can be in any of the following ways as directed by the Engineer-in-charge.

1. Filling in low lying areas
2. Filling in at places of filling such as under floors, in roads, etc.
3. Stacking of material in pre-designated stacking yard.
4. Removal of material outside the plot for disposal.

2.1.5.5. Measurements

Measurements for all excavation, filling, carting away and earthwork shall be in solid measure. The rates quoted by the tenderers are thus for solid measure units. The following factors shall be applied to obtain quantities of solid measure.

- Excavation : Volume shall be determined by levels taken before commencement of excavation and after completion up to the required level.
- Filling watered and consolidated in layers : Volume shall be determined by levels taken before and after compacted filling and by measuring the length and breadth as required.
- Stack measure as in rubble, etc. : Volume of stack less 40%

The mode of measurement for various types of excavations & disposal shall be as under: -

a) In case of trenches, pits and areas, measurements shall be on the basis of the width of foundation and the depth to bottom of foundation (bottom of bed concrete if provided) formation. Excavation for trenches and pipes & cables shall be measured separately.
b) Excavation in rock shall be measured up to levels indicated or required. No undulations as physically appearing after excavation shall be taken into consideration while arriving at the quantities.
c) Where such measurement is not possible as in the case of strata intermixed with soil, excavated rock shall be properly stacked as directed by the Engineer-in-charge and the volume of rock

calculated on the basis of stack measurements after making appropriate allowance for voids.

d) Excavation beyond the widths or depths required will not be paid for, any additional concrete or bedding material required as a result of over-excavation shall be at the Contractor's expense.

e) Rates

The rates shall be inclusive of all the operations described above including clearing and grubbing, dewatering, shoring and disposal at site as directed by the Engineer-in-charge.

f) Earth Filling, Backfilling and Site Grading

g) General

All fill material shall be subject to the Engineer-in-charge's approval. If any material is rejected by Engineer-in-charge, the Contractor shall remove the same forthwith from the site. Surplus fill material shall be deposited/disposed off as directed by Engineer-in-charge after the fill work is completed.

No earth fill shall commence until surface water discharges and streams have been properly intercepted or otherwise dealt with to the approval of the Engineer-in-charge.

The Contractor shall not commence the placement of any fill or back fill at any location without the approval of the EIC.

2.1.5.6. Material

To the extent available, selected surplus soils from excavations shall be used as backfill. Backfill material shall be free from lumps, organic or other foreign material. All lumps of earth shall be broken or removed. Where excavated material is mostly rock, the boulders shall be broken into pieces not larger than 150 mm size, mixed with properly graded fine material consisting of murum or earth to fill the voids and the mixture used for filling.

If fill material is required to be imported, the Contractor shall make arrangements to bring such material from outside borrow pits. The material and source shall be subject to the prior approval of the Engineer-in-charge. The pH value of soil shall be between 5.5 to 9 and the soil shall have the following grading analysis.

Sand : 20% to 75%
Silt : 10% to 60%
Clay : 05% to 30%

The approved borrow pit areas shall be cleared of all bushes, roots of trees, plants, rubbish, etc. Topsoil containing foreign material shall be removed. The materials so removed shall be disposed off as directed by Engineer-in-charge. The Contractor shall provide the necessary access roads to borrow areas and maintain the same if such roads do not exist, at his cost.

2.1.6. Filling in pits and trenches around foundations of structures, walls, etc.

As soon as the work in foundations has been accepted and measured, the spaces around the foundations, structures, pits, trenches, etc., shall be cleared of all debris, and filled with earth in layers not exceeding 15 cm, each layer being watered, rammed and properly consolidated, before the succeeding one is laid. Each layer shall be consolidated to the satisfaction of Engineer-in-charge. Earth shall be rammed with approved mechanical compaction machines. Usually no manual compaction shall be allowed unless the Engineer-in-charge is satisfied that in some cases manual compaction by tampers cannot be avoided. The final backfill surface shall be trimmed and leveled to a proper profile to the approval of the Engineer-in-charge.

2.1.7. Sand Filling in Plinth and Other Places

At places where backfilling is required to be carried out with local sand it shall be clean, medium grained and free from impurities. The filled-in-sand shall be kept flooded with water for 24 hours and drained to ensure maximum hydraulic compaction. Any temporary work required to contain sand under flooded condition shall be on Contractor's account. The surface of the consolidated sand shall be dressed to required level or slope. Construction of floors or other structures on sand fill shall not be started until the Engineer-in-charge has inspected and approved the fill.

2.1.8. Murrum Filling

The liquid limit & plasticity index of such materials shall be below 20 and 6 respectively and the fraction passing 75-micron sieve does not exceed 10 %. It shall be laid in layers not exceeding 15 cm & compacted as per the directions of Engineer-in-charge.

2.1.9. Filling in Trenches

Filling in trenches for pipes and drains shall be commenced as soon as the joints of pipes and drains have been tested and passed. The backfilling material shall be properly consolidated by watering and ramming, taking due care that no damage is caused to the pipes.

Where the trenches are excavated in soil, the filling from the bottom of the trench to the level of the center line of the pipe shall be done by hand compaction with selected approved earth in layers not exceeding 8 cm; backfilling above the level of the center line of the pipes shall be done with selected earth by hand compaction, or other approved means in layers not exceeding 15 cm.

In case of excavation of trenches in rock, the filling up to a level 30 cm above the top of the pipe shall be done with approved excavated soil. The filling up to the level of the center line of the pipe shall be done by hand compaction in layers not exceeding 8 cm whereas the filling above the center line of the pipe shall be done by hand compaction or approved

means in layers not exceeding 15 cm. The filling from a level 30 cm above the top of the pipe to the top of the trench shall be done by hand or other approved mechanical methods with broken rock filling of size not exceeding 15 cm mixed with fine material as available to fill up the voids.

Filling of the trenches shall be carried out simultaneously on both sides of the pipe to avoid unequal pressure on the pipe.

1.2.9.1. Measurement

Excavation for trenches for pipes, cables etc. shall be paid as under.

(a) Upto 1 meter depth, the width of the trench for the purpose of measurement of excavation shall be arrived at by adding 40 cm to the external diameter of the pipe (not the sockets), cable, conduits etc. When a pipe is laid on concrete bed/cushioning layer the authorized width shall be cable external diameter of the pipe/cable plus 40 cm for the width of concrete bed/cushioning layer, whichever is more.

(b) For depths exceeding 1 meter as allowance of 5 cm per meter of depth for each side of the trench shall be added to the authorized width (i.e. External diameter of the pipe plus 40 cm) except where battering or benching has been ordered. This allowance shall be the entire depth of the trench. The authorized width in such case shall, here fore, be equal to (depth of trench) /10 plus external diameter of pipe plus 40 cm or the width of concrete Bed/cushioning, whichever is more

(c) When more than one pipe, cable, conduit etc. are laid, the diameter shall be reckoned as the horizontal distance from outside to outside of the outermost pipes, cables, conduits etc.

2.1.10. General Site Grading

Site grading shall be carried out as indicated in the drawings and as approved by the Engineer-in-charge. Excavation shall be carried out as specified in the Specifications. Filling and compaction shall be carried out as specified and elsewhere unless specified otherwise shall be carried out as indicated below.

The fill shall be placed in layers not exceeding 200 mm and leveled uniformly and mechanically compacted before the next layer is deposited.

To ensure that the fill has been compacted as specified, field and laboratory tests shall be carried out by the Contractor at his own cost.

Field compaction tests shall be carried out in each layer of filling until the fill to the entire height has been completed. This shall hold good for embankments as well. The fill will be considered as incomplete if the desired compaction has not been obtained.

The Contractor shall protect the earth fill from being washed away by rain or damaged in any other way. Should any slip occur, the Contractor should remove the affected material and make good the slip at his cost.

If so specified, the rock as obtained from excavation may be used for filling and leveling to indicate grades without further breaking. In such an event, filling shall be done in layers not exceeding 50cms approximately. After rock filling to the approximate level, indicated above has been carried out, the voids in the rock filling shall be filled with finer materials such as earth, broken stone, etc. and the area flooded so that the finer materials fill up the voids. Care shall be taken to ensure that the finer fill material does not get washed out. Over the layer so filled, a 100 mm thick mixed layer of broken material and earth shall be laid and consolidation carried out by a 12 ton roller. No less than twelve passes of the roller shall be accepted before subsequent similar operations are taken up.

2.1.11. Fill Density

The compaction, where so called for, shall comply with minimum 95% of maximum dry density as per IS 2720 (Part 8) at moisture content differing not more than 4% from the optimum moisture content. The Contractor shall demonstrate adequately by field and laboratory tests that the specified density has been obtained.

2.1.12. Lead

Lead for deposition/disposal of excavated material, shall be the crow flight distance as specified in the respective item of work. No extra compensation is admissible on the grounds that the lead including that for borrowed material had to be transported over marshy or 'katcha' land/route.

2.1.13. Measurements

Backfilling as per specification the sides of foundations of columns, footings, structures, walls, tanks, rafts, trenches etc. with excavated material will be paid for separately. It shall be clearly understood that the rate quoted for excavation shall include stacking of excavated material as directed, excavation/packing of selected stacked material, conveying it to the place specified etc. as specified. As a rule, material to be backfilled shall be stacked temporarily as directed by the Engineer-in-charge.

Backfilling, plinth filling etc. with borrowed earth will be paid for at rates quoted. The quoted rate shall include all operations such as clearing, excavation, lead and transport, fill, compaction etc, as specified. Quantity of consolidated filling based on payment line for excavation shall be measured and paid for in cubic meters. The lead, lift etc. shall be as indicated in the schedule of quantities.

Actual quantity of consolidated sand filling and murrum filling shall be measured and paid for in cubic meters.

2.1.14. Rates

The rates shall be inclusive of clearing and grubbing, spreading, watering and compaction etc. as per specification above.

PLAIN & REINFORCED CONCRETE

2.1. Applicable Codes

The following Indian Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest editions including all applicable official amendments and revisions shall be referred to.

2.2. Materials

1) IS.269 Specification for 33 grade ordinary Portland cement.
2) IS.455 Specification for Portland slag cement.
3) IS.1489 Specification for Portland-pozzolana cement (Part 1 & 2).
4) IS: 8112 Specification for 43 grade ordinary Portland cement.
5) IS: 12330 Specification for sulphate resisting Portland cement.
6) IS: 383 Specification for coarse and fine aggregates from natural sources for concrete.
7) IS: 432 Specification for mild steel and medium (tensile steel bars and hard-drawn steel) wires for concrete reinforcement. (Part 1 & 2)
8) IS: 786 Specification for high strength deformed steel bars and wires for concrete reinforcement.
9) IS: 1566 Specification for hard-drawn steel wire fabric for concrete reinforcement.
10) IS: 9103 Specification for admixtures for concrete.
11) IS: 2645 Specification for integral cement water- proofing compounds.
12) IS: 4990 Specification for plywood for concrete shuttering work.

2.2.1. Material Testing

1) IS.4031 Methods of physical tests for hydraulic cement (Parts 1 to 15)
2) IS: 4032 Method for chemical analysis of hydraulic cement.
3) IS: 650 Specification for standard sand for testing of cement.
4) IS: 2430 Methods for sampling of aggregates for concrete.
5) IS.2386 Methods of test for aggregates for concrete (Parts 1 to 8)
6) IS: 3025 Methods of sampling and test (physical and chemical) for water used in industry.
7) IS: 6925 Methods of test for determination of water soluble chlorides in concrete admixtures.

2.2.2. Material Storage

1) IS: 4082 Recommendations on stacking and storing of construction materials at site.

2.2.3. Concrete Mix Design

1) IS: 10262 Recommended guidelines for concrete mix design.
2) SP: 23 (S&T) Handbook on Concrete Mixes

2.2.4. Concrete Testing

1) IS.1199 Method of sampling and analysis of concrete.
2) IS: 516 Method of test for strength of concrete.
3) IS: 9013 Method of making, curing and determining compressive strength of accelerated cured concrete test specimens.
4) IS: 8142 Method of test for determining setting time of concrete by penetration resistance.
5) IS: 9284 Method of test for abrasion resistance of concrete.
6) IS: 2770 Methods of testing bond in reinforced concrete.

2.2.5. Equipments

1) IS: 1791 Specification for batch type concrete mixers.
2) IS: 2438 Specification for roller pan mixer.
3) IS: 4925 Specification for concrete batching and mixing plant.
4) IS: 5892 Specification for concrete transit mixer and agitator.
5) IS: 7242 Specification for concrete spreaders.
6) IS: 2505 General Requirements for concrete vibrators: Immersion type.
7) IS: 2506 General Requirements for screed board concrete vibrators.
8) IS: 2514 Specification for concrete vibrating tables.
9) IS: 3366 Specification for pan vibrators.
10) IS: 4656 Specification for form vibrators for concrete.
11) IS: 11993 Code of practice for use of screed board concrete vibrators.
12) IS: 7251 Specification for concrete finishers.
13) IS: 2722 Specification for portable swing weigh batchers for concrete (single and double bucket type).
14) IS: 2750 Specification for steel scaffoldings.

2.2.6. Codes of Practice

1) IS: 456 Code of practice for plain and reinforced concrete.
2) IS: 457 Code of practice for general construction of plain and reinforced concrete for dams and other massive structures.
3) IS: 3370 Code of practice for concrete structures for storage of liquids (Parts 1 to 4)
4) IS: 3935 Code of practice for composite construction.
5) IS: 2204 Code of practice for construction of reinforced concrete shell roof.
6) IS: 2210 Criteria for the design of reinforced concrete shell structures and folded plates.

7) IS: 2502 Code of practice for bending and fixing of bars for concrete reinforcement.
8) IS: 5525 Recommendation for detailing of reinforcement in reinforced concrete works.
9) IS: 2751 Code of practice for welding of mild steel plain and deformed bars used for reinforced concrete construction.
10) IS: 9417 Specification for welding cold worked bars for reinforced concrete construction.
11) IS: 3558 Code of practice for use of immersion vibrators for consolidating concrete.
12) IS: 3414 Code of practice for design & installation of joints in buildings.
13) IS: 4326 Code of practice for earthquake resistant design and construction of building.
14) IS: 4014 Code of practice for steel tubular scaffolding (Parts 1 & 2)
15) IS: 2571 Code of practice for laying insitu cement concrete flooring.
16) IS: 7861 Code of practice for extreme weather concreting: Part 1 Recommended practice for hot weather concreting.
17) IS: 1893 Criteria for earthquake resistant structures subjected to seismic forces.
18) IS: 13920 Code of Practice for Ductile Detailing of Reinforced Concrete Structures subjected to Seismic forces.
19) IS:13827 Improving Earthquake Resistances of Earthen Buildings-Guidelines.
20) IS: 13828 Improving Earthquake Resistance of Low Strength Masonry Buildings-Guidelines.

2.2.7. Construction Safety

1) IS: 3696 Safety code for scaffolds and ladders. (Parts 1 & 2)
2) IS: 7969 Safety code for handling & storage of building materials.
3) IS: 8989 Safety code for erection of concrete framed structures.

2.2.8. Measurement

1) IS 1200 Method of measurement of building and Engineering Works
2) IS 3385 Code of practice for measurement of Civil Engineering Works

2.3. <u>General</u>

Concrete and reinforced concrete work shall be carried out generally in conformity with the latest Indian Standard IS: 456 except for provisions indicated herein below. All work is to be carried out with utmost precision and upto date scientific know-how and the contractor shall employ thoroughly competent staff to achieve the highest standards.

2.4. Materials

2.4.1. Cement

Cement for the work shall be ordinary Portland Cement conforming to the latest Indian Standards IS: 8112-43 grade and of the best normal setting quality unless a quick setting quality is expressly instructed in the specifications or otherwise during the course of the work by the Engineer-in-charge. Only one type of cement shall be used in any one mix. The source of supply, type or brand of cement within the same structure or portion thereof shall not be changed without approval from the Engineer-in-charge. The contractor shall always purchase Portland cement as fresh as possible after manufacture and shall supply the manufacture's test certificate, corresponding to the batch of cement intended for use in work. Where there is reason to believe the cement has been long stored, the Engineer-in-charge may demand a Laboratory Test Certificate regarding the character of cement and the contractor shall furnish the same at no extra cost from authorized laboratory. The Engineer-in-charge shall reject any cement, which in his opinion does not meet the required standards.

All bags and containers in which cement is packed shall be stored in a dry, weather-tight, and properly ventilated structure with adequate provision for prevention and absorption of moisture. The contractor shall at all times maintain for the inspection of the Engineer-in-charge a log book indicating the receipt of cement brand and agent from whom obtained and the age of cement. Cement, which has caked or perished by being wet or otherwise, shall on no account be used on the work.

Cement shall be consumed on the works in the same sequence as that of its receipt at site. Cement reclaimed from cleaning of bags or from spillage from containers or otherwise shall on no account be used.

If cement is not stored properly and has deteriorated, the material shall be rejected. Cement bags shall be stored in dry weatherproof shed with a raised floor, well away from the outer walls allowing clearance for man movement and insulated from the floor to avoid moisture from ground. Not more than 10 bags shall be stacked in any tier. Storage arrangement shall be approved by the Engineer-in-charge. Storage under tarpaulins shall not be permitted.

2.4.2. Sand (Refer Table No. I)

Sand (fine aggregated) shall generally conform to IS 383. Sand shall be natural sand, crushed gravel sand or crushed stone sand at the discretion of the Engineer-in-Charge. Use of sea sand is prohibited. Sand shall be composed of hard siliceous material and shall be clean and of sharp angular grit type. Sand shall be properly graded minimizing voids. Allowance for bulk age of sand shall be made. The fineness modulus of sand shall neither be less than 2.2 nor more than 3.2.

2.4.3. Coarse Aggregate (Refer Table No. II & III)

Coarse aggregate shall be approved hard aggregate generally conforming to IS 383.

Each size of coarse and fine aggregates shall be stacked separately and shall be protected from leaves and contamination with foreign material. The stacks shall be on hard, clean, free draining bases, draining away from the concrete mixing area.

2.4.4. Water

Water for all concrete work shall be clean, free from deleterious matter such as oils, acids, alkalies, sugar and vegetable matter. Every attempt shall be made to use water, which is fit for drinking purposes. Water storage facilities provided by the contractor shall be maintained properly to preclude contamination of water by any of the harmful substances. The quantity of water to be added to concrete for mixing shall be such as to afford workability consistent with strength.

The Contractor shall make his own arrangements for storing water at site in tanks to prevent contamination.

TABLE – I

Unless otherwise directed or approved, the grading of sand shall be within the limits indicated hereunder: -

Fine aggregate conforming to Grade Zone IV shall not be used for RCC works .

I.S. Sieve Designation	PERCENTAGE PASSING FOR			
	Grading Zone I	Grading Zone II	Grading Zone III	Grading Zone IV
10 mm	100	100	100	100
4.75 mm	90 – 100	90 – 100	90 – 100	95 – 100
2.36 mm	60 – 95	75 – 100	85 – 100	95 – 100
1.18 mm	30 – 70	55 – 90	75 – 100	90 – 100
600 micron	15 – 34	35 – 59	60 – 79	80 – 100
300 micron	5 – 20	8 – 30	12 – 40	15 – 50
150 micron	0 – 10	0 – 10	0 – 10	0 – 15

TABLE – II

GRADING OF COARSE AGGREGATE

I.S. Sieve Designation	Percentage passing for single sized aggregate of nominal size				
	40 mm	20 mm	16 mm	12.5 mm	10 mm
63 mm	100	-	-	-	-
40 mm	85- 100	100	-	-	-
20 mm	0 – 20	85 -100	100	-	-
16 mm	-	-	85 100	100	-
12.5 mm	-	-	-	85 –100	100
10 mm	0 – 5	0 – 20	0 – 30	0 – 45	85 – 100
4.75 mm	-	0 – 5	0 – 5	0 – 10	0 – 20
2.36 mm	-	-	-	-	0 – 5

I.S. Sieve Designation	Percentage passing for Grading aggregate of nominal size			
	40 mm	20 mm	16 mm	12.5 mm
63 mm	100	-	-	-
40 mm	95– 100	100	-	-
20 mm	30 – 70	95 –100	100	100
16 mm	-	-	90 –100	-
12.5 mm	-	-	-	90 –100
10 mm	10 – 35	25 – 55	30 – 70	40 – 85
4.75 mm	0 – 5	0 – 10	0 – 10	0 – 10
2.36 mm	-	-	-	-

TABLE – III

UPPER LIMIT FOR DELETERIOUS MATERIALS IN COARSE & FINE AGGREGATES

The percentages of deleterious substances in the aggregate delivered to the mixer shall not exceed the following:

		Percent by Weight	
		Uncrushed	**Crushed**
i)	Material finer than 75 micron I.S sieve - Coarse Aggregates (CA) - Fine Aggregates (FA)	3.00 3.00	3.00 15.00
ii)	Coal and lignite (CA) and (FA)	1.00	1.00
iii)	Clay lumps (CA) and (FA)	1.00	1.00
iv)	Soft fragments (CA) (FA)	3.00 0.00	0.00 0.00
v)	Total of all above substances (CA) (FA)	5.00 5.00	5.00 2.00

2.4.5. Reinforcement Steel

2.4.4.2. Material Specification

Steel used for reinforcement shall be any of following types specifically applicable as per Bill of Quantities

- Mild steel and medium tensile bar IS 432 Part I (FE 415)
- HYS deformed bars/TMT bars (Fe 415) IS 1786
- Structural steel section (Grade A) IS 2062
-

2.4.4.3. Tolerance in Mass

Refer to the following: -

TABLE

(Tolerance of Nominal Mass)

Sr. No.	Nominal Size in mm	Tolerance on the nominal mass percent		
		Batch	Individual Sample +	Individual sample for coil (-x-)
a)	upto and including 10	± 7	-8	± 8
b)	over 10, upto and including 16	± 5	- 6	± 6
c)	over 16	± 3	± 4	± 4

\+ For individual sample plus tolerance is not specified

(x) For coil batch tolerance is not applicable.

Tolerance shall be determined in accordance with method given in IS1786.

2.4.4.4. a) TMT / HYS Deformed Bar

High strength deformed bars and wires shall conform to IS : 1786. The physical properties for all sizes of steel bars are mentioned below in Table below.

TABLE

Sr. No.	Property	Grade		
		Fe 415	Fe 500	Fe 550
1.	0.2% proof stress / yield stress, min N/mm^2	415	500	550
2.	Elongation, percent min. on gauge length 5.65 √A, Where A is the X-Sectional Area of the test piece.	14.5	12	8
3.	Tensile strength(min)	10% more than actual 0.2% proof stress but not less than 485 N/mm^2	8% more than actual 0.2% proof stress but not less than 545 N/mm^2	6% more than actual 0.2% proof stress but not less than 585 N/mm^2

Tests: Selection and preparation of Test sample. All the tests pieces shall be selected by the EIC or his authorized representative in accordance with provisions as laid in IS: 1786 either –

a) From cutting of bars

Or

b) If he so desires, from any bar after it has been cut to the required or specified size and the test piece taken from any part of it.
In no case, the test pieces shall be detached from the bar or coil except in the presence of the Engineer-in-charge or his authorized representative.

The test pieces obtained in accordance with as above shall be full sections of the bars as rolled & subsequently cold worked and shall be subjected to physical/chemical tests without any further modifications. No deductions in size by machining or otherwise shall be permissible. No test piece shall be enacted or otherwise subject to heat treatment. Any straightening, which a test piece may require shall be done cold.

2.4.4.5. Stacking and Storage

Steel for reinforcement shall be stacked on top of timber sleepers to avoid contact with ground / water and shall be stored in such a way to prevent distorting and corrosion. Bars of different classifications, sizes and lengths shall be stored separately to facilitate issue in such sizes and lengths to cause minimum wastage in cutting from standard length.

Fabrication and Fixing of Reinforcement

a) General Requirements

Steel for reinforcement shall be clear and free from loose milscales, dust, loose rust, coats of paints, oil or other coatings, which may destroy or reduce bond. It shall be stored in such a way as to avoid distortion and to prevent deterioration and corrosion. Prior to assembly of reinforcement on no account any oily substance shall be used for removing the rust.

b) Assembly of Reinforcement

Bars shall be bent correctly and accurately to the size and shape as shown in the detailed drawing or as directed by the Engineer-in-charge. Preferably bars of full length shall be used. Necessary cutting and straightening is also included. Over lapping of bars, where necessary shall be done as directed by the Engineer-in-charge. The overlapping bars shall not touch each other and these shall be kept apart with concrete between them by 25 mm or 1 ¼ times the maximum size of the coarse aggregate whichever is greater. But where this is not possible, the overlapping bars shall be bound together at intervals not exceeding twice the dia. Of such bars with two strands annealed steel wire of 0.90 mm to 1.6 mm twisted tight. The overlaps / splices shall be staggered as per directions of the Engineer-in-charge. But in no case the over lapping shall be provided in more than 50% of cross sectional area at one section.

c) Bonds and Hooks Forming End Anchorages

Reinforcement shall be bent and fixed in accordance with procedure specified in IS 2502, code of practice for bending and fixing of bars for concrete reinforcement.

d) Anchoring Bars in Tension

Deformed bars may be used without end anchorages provided, development length requirement is satisfied. Hooks should normally be provided for plain bars in tension. Development length of bars will be determined as per IS : 456.

e) Anchoring Bars in Compression

The anchorage length of straight bar in compression shall be equal to the "Development Length" of bars in compression as specified in IS : 456. The projected length of hooks, bends and straight lengths beyond bend, if provided for a bar in compression, shall be considered for development length.

f) Binders, stirrups, links and the like

In case of binders, stirrups, links etc. the straight portion beyond the curve at the end shall be not less than eight times nominal size of bar.

g) Placing in Position

Fabricated reinforcement bars shall be placed in position as shown in the drawings or as directed by the Engineer-in-charge. The bars crossing one another shall be tied together at every intersection with two strands of annealed steel wire 0.9 to 1.6 mm thickness twisted tight to make the skeleton of the steel work rigid so that the reinforcement does not get displaced during deposition of concrete.

The bars shall be kept in correct position with combination of cover blocks, spacers and templates as directed by Engineer-in-charge.

TABLE

Cross Section Area and Mass of Steel Bar

Nominal Size Mm	**Cross Sectional Area Sq.mm**	**Mass per meter Run Kg.**
6	28.3	0.222
7	38.5	0.302
8	50.3	0.395
10	78.6	0.617
12	113.1	0.888
16	201.2	1.58
18	254.6	2.00
20	314.3	2.47
22	380.3	2.98
25	491.1	3.85
28	616.0	4.83
32	804.6	6.31

36	1018.3	7.99
40	1257.2	9.85
45	1591.1	12.50
50	1964.3	15.42

h) Rate

The rate for reinforcement shall include the cost of labour and materials required for all operations described above such as cleaning of reinforcement bars, straightening, cutting, hooking, bending, binding, placing in position etc. as required or directed including tack welding on crossing of bars in lieu of binding with wires.

2.3.5 Testing of Materials:

(a) (I) Manufacturer's Tests

For each batch of materials supplied Manufacturer's Test Certificate as per IS :1786 shall be submitted for approval.

(ii) Tests – Following type of lab test shall be carried out.

1)	Tensile Tests	This shall be done as per IS 1608
2)	Bend Test	This shall be done as per IS 1599
3)	Re-test	This shall be done as per IS 1786
4)	Rebend Test	This shall be done as per IS 1786
5)	Chemical composition Test	This shall be done as per IS228
6)	Unit weight Test	This shall be done as per IS 1786

Should any one of the test pieces first selected fail to pass any of the tests specified above, two further samples shall be selected for testing in respect of each failure. Should the test pieces from both these additional samples pass, the materials represented by the test samples shall be deemed to comply with the requirement of the particular test. Should the test piece from either of these additional samples fail, the material represented by the test samples shall be considered as not having complied with standard.

(b) Acceptance Criteria

Based on the results of tests carried out as mentioned above, the Engineer-in-charge will decide the acceptance of the batch under test for use in RCC structures, and his decision shall be final and binding on the Contractor.

The charges for all the tests in an authorized laboratory shall be borne by the Contractor and are deemed to have been included in the price quoted for the relevant BOQ item. It shall be clearly understood by the Contractor that the confirmatory test stipulated here before are mandatory and the

time required for such testing shall be catered for in the delivery schedule for materials.

All reinforcement shall be clean, free from pitting, oil, grease, paint, loose mill scales, rust, dirt, dust, or any other substance that will destroy or reduce bond.

2.4 Concrete

All structural concrete shall be Mix designed & weight batched.

2.4.1 Design Mix

Design mix concrete is that in which design of mix i.e. the proportion by weight of cement, aggregates and water is arrived as to have mean target strength with required workability in wet condition and the desired durability in hardened state.

2.4.2 Grade of Concrete

The compressive strength of various grades of designed concrete shall be as per Table below (Table IV)

TABLE IV

GRADE OF CONCRETE

Sr. No.	Type of Concrete	Min. Cement Content in Kg/ Cum of Concrete	Compression Strength	
			7 day N/mm²	28 days N/mm²
1.	M 15 (PCC)	240	10.0	15
2.	M 20 (RCC)	300	13.5	20
3.	M 25 (RCC)	300	17.0	25

Compressive Strength indicated above pertains to pressure test on works test cubes 15 cm x 15 cm x 15 cm after normal curing for 14 days as per IS: 516 and satisfy the test requirements as per table II of IS 456-2000.

The minimum cement content stipulated above should be adopted irrespective of whether the Contractor achieves the desired strength with less quantity of cement. The Contractor's quoted rates for concrete shall provide for the above eventuality and nothing extra shall become payable to the Contractor in this account. Even in the case where the quantity of cement required is higher than that specified above to achieve desired strength based on an approved mix design, nothing extra shall become payable to the Contractor.

The Contractor shall not commence concreting in the Permanent Works until details of trial mixes and test results for each class of concrete have been submitted to and approved by the EIC.

The Contractor shall not alter the approved mix proportions nor the approved source of supply of any of the ingredients without having previously obtained the approval of the Engineer-in-charge.

During production, the Engineer-in-charge may require trial mixes to be made before a substantial change is made in the materials or in the proportions of the materials to be used.

It shall be the Contractor's sole responsibility to carry out the mix designs at his own cost from a reputed institute as approved by Engineer-in-charge. He shall furnish to the Engineer-in-charge at least 30 days before concreting operations, a statement of proportions proposed to be used for the various concrete mixes and the strength results obtained.
A range of slumps, for pavements is given below which shall generally be used unless otherwise instructed by the EIC:

tructure/Member	**Slump in millimeters**	
	Maximum	**Minimum**
Pavements	50	40
Heavy mass construction	75	25

Note: All concreting done for water retaining structures shall have a minimum slump value of 60 mm and maximum of 100 mm

2.4.3 Design Procedure for Concrete Mix (refer IS 10262)

2.4.3.1 Data to be stipulated / specified

1. Characteristics compressive strength of concrete at 28 days
2. Degree of workability
3. Limitations on Water Cement ratio
4. Standard Deviation
5. Minimum Cement Content as per IS: 456
6. Standard Deviation (Table V)
7. Degree of Control (Table VI)

2.4.3.2 Target Strength

As per IS 456 and IS 1343 target average Compressive strength at 28 days is fck + 1.65s
Where fck = characteristics compressive strength at 28 days
S = standard deviation.

Batching

In proportioning concrete, the quantity of cement and aggregates shall be determined by mass. Water shall be measured by volume in calibrated Can/tanks. Uniform quality of graded aggregates and water cement ratio shall be maintained.
Admixtures if required shall be mixed as per the relevant IS: 9103/456 and as recommended in the mix design without any extra cost.

2.4.3.3 Mixing

Concrete shall be mixed in a mechanical mixer. The mixer should comply with IS 1791. It shall be fitted with hopper. The mixing shall be continuous until there is uniform distribution of the material, and the mass is uniform in colour and consistency. If there is segregation after unloading from the mixer, the concrete should be remixed. The mixing time shall not be less than 2 minutes.
Each time the work stops, the mixer shall be cleaned out, and while recommencing; the first batch shall have 10% additional cement to allow for sticking in the drum.

2.4.4 Transporting, Placing and Compacting

2.4.4.2. Transportation

Concrete shall be transported from the mixer to the place of laying as rapidly as possible by methods, which will prevent the segregation or loss of any of the ingredients, and maintaining the required workability.

2.4.4.3. Placing

The concrete shall be deposited as nearly as practicable in its final position to avoid rehandling. It shall be laid gently (not thrown) and shall be thoroughly vibrated and compacted before setting commences and should not be subsequently disturbed. Method of placing shall be such as to preclude segregation. Care shall be taken to avoid displacement of reinforcement or movement of form work and damage due to rains. Concrete shall not be dropped from a height of more than 1 m.

While placing concrete the Contractor shall proceed as specified below and also ensure the following:

(a) Continuously between construction joints and pre- determined abutments.

(b) Without disturbance to forms or reinforcement.

(c) Without disturbance to pipes, ducts, fixings and the like to be cast in; ensure that such items are securely fixed. Ensure that concrete cannot enter open ends of pipes and conduits etc.

(d) Without dropping in a manner that could cause segregation or shock.

(e) In deep pours only when the concrete and formwork designed for this purpose and by using suitable chutes or pipes.

(f) Do not place if the workability is such that full compaction cannot be achieved.

(g) Without disturbing the unsupported sides of excavations; prevent contamination of concrete with earth. Provide sheeting if necessary. In supported excavations, withdraw the linings progressively as concrete is placed.

(h) If placed directly onto hardcore or any other porous material, dampen the surface to reduce loss of water from the concrete.

(i) Ensure that there is no damage or displacement to sheet membranes.

(j) Record the time and location of placing structural concrete.

(k) Maintain separate pour card for each pour as per the format approved by Engineer-in-charge.

2.4.4.4. Compaction

Concrete shall be thoroughly compacted and fully worked around embedded fixtures and into corners of the form work. Mechanical vibrator of appropriate type shall do compaction till a dense concrete is obtained. The mechanical vibrators shall conform to IS 2505, IS 2506, IS 2514, IS 4656 specifications for concrete vibrators (immersion type). To prevent segregation, over vibration shall be avoided. The use of mechanical vibrator may be relaxed by the Engineer-in-charge at his discretion for certain items and permit hand compaction.

Hand compaction shall be done with the help of tamping rods. Compaction shall be completed before the initial setting starts. For the items where mechanical vibrators are not to be used, the contractor shall take permission of the EIC in writing before the start of the work. After compaction the top surface shall be finished even and smooth with wooden trowel before the concrete begins to set.

2.4.4.5. Construction Joints

Concreting shall be carried out continuously upto construction joints. The position and arrangement of construction joints shall be as per approved drawings or as directed by the Engineer-in-charge. Number of such joints shall be kept minimum. Joints shall be kept as straight as possible.

As soon as the exposed concrete has sufficiently hardened, the surface of the joint shall be water jetted or brushed with a stiff brush to expose the larger aggregate without being disturbed. Alternatively, if the preparation is not satisfactory, or proper joint preparation is not possible due to inclement weather, the Contractor shall thoroughly remove the laitance of hardened concrete by mechanical chipping after seven days of concrete work at his own cost. Before placing fresh concrete against a construction joint all loose material shall be removed and the surface sluiced with water until it is perfectly clean, thereafter all pounded water should be removed.

When concreting is to be resumed on a surface, which has not fully hardened, all laitance shall be removed by wire brushing, the surface wetted, free water

removed and a coat of cement slurry applied. On this, a layer of concrete not exceeding 150 mm thickness shall be placed and well rammed against the old work. Thereafter work shall proceed in the normal way.

2.4.4.6. Standard of Acceptance

(a) The average strength of group of cubes for each grade cast for each day shall not be less than the specified work cube strength. 20 per cent of cubes cast for each day may have values less than the specified strength provided that the lowest value is not less than 85% of the specified strength.

(b) Concrete strength less than specified may as a special case be accepted in a member with the approval of EIC provided that the maximum stress in the member under the maximum design live load does not exceed the permissible safe stress appropriate to the lower strength of the concrete.

(c) Concrete which does not meet the strength requirements as specified but has a strength greater than that of the lowest value of 85% may, at the discretion of the designer, be accepted as being structurally adequate without further testing. However in such cases pro-rata reduction in the rate of concrete shall be incorporated for payment.

(d) Concrete of each grade shall be assessed separately.

(e) Concrete shall be assessed daily for compliance.

2.4.4.7. Criteria for acceptance of work

Part or element of concrete work shall be deemed to be acceptable, provided the three cubes tested for 28 days strength conform to the following:

a) Average of the three cubes strengths shall not be less than the specified strength.

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

c) If any individual cube strength exhibits more than 133% of the specified strength, such cube shall be classified as freak and the criteria in (a) and (b) above, shall be applied for the remaining two cubes only and the acceptability determined.

d) Quantum of cubes and testing

A set of 6 cubes shall be cast per every sample of concrete. The minimum frequency of sampling of concrete of each grade shall be as under:

Quantity of Concrete (in m3)	No. of samples
1 – 5	1
6 – 15	2
16 – 30	3
31 – 50	4
51 and above	4+1 additional sample for each additional 50 m3 or part there of.

At least one sample shall be taken from each shift and a set of 6 Cubes on every important element as decided by the EIC.

The decision of The Engineer-in-charge in this regard shall be final and binding.

TABLE 5

Grade of concrete	Standard Deviation for different degree of control in N / mm^2		
	Very Good	Good	Fair
M15	2.5	3.5	4.5
M20	3.6	4.6	5.6
M25	4.3	5.3	6.3
M30	5.0	6.0	7.0
M35	5.3	6.3	7.3

(f) Degree of quality control expected under different site conditions is described in table 6.

TABLE 6

Degree of Control	Condition of production of concrete
Very Good	Fresh cement from single source and regular tests, weigh batching of all materials, aggregates supplied in single size, control of aggregates grading and moisture content, control of water added, frequent supervision, regular workability and strength tests and field laboratory facilities.

Good	Carefully stored cement and periodic test, weigh batching of all materials, controlled water, graded aggregate supplied, occasional grading and moisture tests, periodic check of workability & strength, intermittent supervision and experienced workers.
Fair	Proper storage of cement, volume batching of all of the aggregates, allowing for bulking of sand, weigh batching of cement, water content controlled by inspection of mix & occasional supervision and tests.

2.4.4.8. Finish to concrete surfaces

Finish to concrete surfaces at various situations shall be as per directions of The Engineer-in-charge. Where form finish is specified, the final surface shall be smooth and even and no undulations, ridges, spots etc. shall be permitted. They shall also be laid to pattern as directed. In case surfaces intended and directed for form finish, exhibit any of the defects above mentioned, the surfaces shall be rubbed with carborundum or plastered and finished as directed at the risk and cost of the contractor. The decision as to the acceptability or otherwise of a surface will be notified by The Engineer-in-charge and the contractor will implement the instructions accordingly.

2.4.4.9. Concrete cover for reinforcement

Where not specifically indicated in the drawings, concrete cover for reinforcement shall be as per the latest IS 456 or as per directions at site from time to time. Proper concrete cover blocks to suit various covers as required shall be provided in adequate numbers sufficiently ahead of the work.

2.4.4.10. Curing

It is very important that all cement concrete work shall be cured properly. All concrete work shall be covered with a layer of sacking, canvas, Hessian or similar absorbent material and kept wet continuously for not less than a fortnight or as directed. Water used for curing shall also be free from any deleterious substances and shall generally be fit for drinking. The work shall be adequately protected from premature drying, winds, directed sun rays, rapid cooling during the first few days after placing, vibration and impact which may disrupt the concrete and interfere with its bond to the reinforcement. Membrane curing shall be allowed with prior permission of EIC without any extra payment.

2.4.4.11. Repair and Replacement of Unsatisfactory Concrete

Immediately after the shuttering is removed, all the defective areas such as honey-combed surfaces, rough patches, holes left by form bolts etc. shall be inspected by the Engineer-in-charge who may permit patching of the defective areas or reject the concrete work.

All through holes for shuttering shall be filled for full depth and neatly plugged flush with surface.

Rejected concrete shall be removed and replaced by the Contractor at no additional cost to the IIMB.

For patching of defective areas all loose materials shall be removed and the surface shall be prepared as approved by the Engineer-in-charge.

Bonding between hardened and fresh concrete shall be done either by placing cement mortar with approved bonding agent or by applying epoxy. The decision of the Engineer-in-charge as to the method of repairs to be adopted shall be final and binding on the Contractor. The surface shall be saturated with water for 24 hours before patching is done with 1:4 cement sand mortar. The use of epoxy for bonding fresh concrete shall be carried out as approved by the Engineer-in-charge.

All the form bolt repairs and delayed repairs shall be carried out using a proportion of white cement in repair mix to the approval of the Engineer-in-charge, so as to match the colour of the surrounding area.

2.5 Nominal Mix Concrete

2.5.1 Mix Design & Testing

Mix design and preliminary tests are not necessary for Nominal Mix Concrete. However works tests shall be carried out as per IS:456. Proportions for Nominal Mix Concrete may be adopted as per Table 9 of IS:456. However it will be the Contractor's sole responsibility to adopt appropriate nominal mix proportions to yield the specified strength.

2.5.2 Batching & Mixing of Concrete

Based on the adopted nominal mixes, aggregates shall be measured by volume. However cement shall be by weight only, using whole bags of cement.

2.6 Optional Tests

If the Engineer-in-charge is not satisfied with the results of the tests or otherwise considers that the materials i.e. cement, sand, coarse aggregates, reinforcement and water are not in accordance with the

Specifications or if specified concrete strengths are not obtained, he may order tests to be carried out on these materials in laboratory, to be approved by the Engineer-in-charge, as per relevant IS Codes. Contractor shall have to pay for these tests.

In the event of any work being suspected of faulty material or workmanship requiring its removal or if the works cubes do not give the stipulated strengths, the Engineer-in-charge reserves the right to order the Contractor to take out cores and conduct tests on them or do ultrasonic testing or load testing of structure as referred to in IS 456, etc.

The Engineer-in-charge also reserves the right to ask the Contractor to dismantle and re-do such unacceptable work, at no cost to the IIMB.

If the structure is certified as failed by Engineer-in-charge, the cost of the test and subsequent dismantling/reconstruction shall be borne by the Contractor.

The quoted unit rates/prices of concrete shall be deemed to provide for all tests mentioned above.

2.7 Preformed Fillers and Joint Sealing Compound

2.7.1 Materials

Preformed filler for expansion/isolation joints shall be non-extruding and resilient type of bitumen impregnated fibres conforming to IS: 1838 (Part I).

Bitumen coat to concrete/masonry surfaces for fixing the preformed bitumen filler strip shall conform to IS: 702. Bitumen primer shall conform to IS: 3384.

Sealants shall be: Sealant Polysulphide
Sealant shall be a cold pouring compound complying with BS 4254/IS 12118, suitable for sealing movement and construction joints in concrete and other areas. It shall be water tight & non-sagging. It shall be tough, abrasion-resistant and shall not decompose in strong sunlight.

Hardness (Shore A) : 15-20
Transverse Movement Accommodation : ±12.5%

2.7.2 Workmanship

The thickness of the preformed filler shall be 25mm for expansion joints and 50mm for isolation joints around foundation supporting rotatory equipments. Contractor shall procure the strips of the desired thickness and width in lengths as manufactured. Assembly of small pieces/thicknesses of strips to make up the specified size shall not be permitted.

The concrete/masonry surface shall be cleaned free from dust and any loose particles. When the surface is dry, one coat of industrial blown type bitumen of grade 85/25 conforming to IS:702 shall be applied hot by

brushing at the rate of 1.20 kg/sq.m. When the bitumen is still hot the preformed bitumen filler shall be pressed and held in position till it completely adheres. The surface of the filler against which further concreting/masonry work is to be done shall similarly be applied with one coat of hot bitumen at the rate of 1.20 kg/sq.m.

Sealing compound shall be heated to a pouring consistency for enabling it to run molten in a uniform manner into the joint. Before pouring the sealing compound, the vertical faces of the concrete joint shall be applied hot with a coat of bitumen primer conforming to IS:3384 in order to improve the adhesive quality of the sealing compound.

The Contractor shall construct recesses at all joints and on both faces of the concrete work except on the underside of ground slabs. The recesses shall be accurately formed to the lines and dimensions shown on the Drawings or as agreed with the Engineer-in-charge.

The Contractor shall prepare the surfaces of the recess and shall supply a joint sealer and fill or caulk the recess completely with it.

Joint sealing shall not be commenced without the approval of the Engineer-in-charge.

All joint sealers shall be from an approved manufacturer. The Contractor shall supply the manufacturer's test certificates for each consignment of each type of joint sealant delivered to the Site and shall if requested supply to the Engineer-in-charge sufficient samples of each type and consignment for confirmatory tests to be carried out in accordance with the appropriate test procedure.

Sealants shall be installed in strict accordance with the manufacturer's instructions. De-bonding strip shall be used in conjunction with the sealers as indicated on the Drawings. The de-bonding strip shall be compatible with the joint sealer and shall be resistant to attach from the primer used to bond the sealer to the concrete.

Polysulphide sealants shall not abut bitumen sealers. Surfaces to receive Polysulphide sealants shall be kept free from bituminous paints. All sealants shall be appropriate for the prevailing climatic conditions. Bituminous sealants shall comply with the BS 2499 and Polysulphide sealants shall comply with IS 12118/BS 4254.

2.7.3 Measurement

Measurement for the preformed joint filler shall be in sq.m correct to two places of decimal for the specified thickness as per items of work. Measurement for applying the bitumen coat to concrete / masonry surfaces shall be in sq.m correct to two places of decimal. Measurement for the joint sealing compound shall be in running meters correct to two places of decimal for the specified width and thickness as per the items of work.

Quality control:

Following quality control tests shall be carried out at frequencies specified against each:

Sl n	Test Method	Frequency	Acceptance Criteria
1	Moisture conten IS:2720 just befor (Part II) compaction.	1 test per 250 Sq m	1% above to 2% below OMC. As per Para 20
2.	Cement content IS:1514 immediately after mixing	1 test per 250 Sq m	Moving average of 10 tests not to be < designed cement content provided further that no test value is < 75% of the designed cement content.
3.	Compaction IS: 2720 control (Part XXVIII)	1 test for 500 Sq m	As per Para 22.
4.	Degree of As per pulverization Para 4.4	Regularly	As per Para 12.
5.	Surface Accuracy	Regularly	As per Para 23.

2.8 Rectification of surface irregularity:

2.8.1 High Surface:

2.8.2 Where it is detected within three hours of mixing of cement and soil/blended materials that the surface is low it shall be corrected by scarifying to a depth of 5 cm supplemented with freshly mixed materials and re-compaction.

2.8.3 Where the detection is made after three hours of mixing of cement and oil/blended materials, the full depth of the layer shall be removed and replaced with fresh mixed materials for at least 10 Sq m areas and re-compacted.

2.8.4 Maintenance of compacted formation:

The completed formation shall be maintained in a undisturbed condition. If the completed formation is loosened or damaged in any way, the same shall be repaired or replaced as directed by the Engineer-in-charge before laying the overlying constructions. Nothing extra shall be paid on this account. Charge before laying the overlying construction, nothing extra shall be paid on this account.

2.8.5 Measurements:

2.8.6 Fixing of base line and bench mark shall be carried out.

2.8.7 With the help of this base line and bench mark, ground levels shall be taken at 3m intervals longitudinally and transversely. Where there are local depressions or mounds, the intervals of 3m shall be suitable be reduced both longitudinally and transversely, as directed by the Engineer-in-

charge. The levels shall be taken in the presence of the contractor or his authorized representative who will sign the level book in token of his acceptance.

2.8.9 After the completion of the work, the final levels shall be taken at the grid points, where previously the ground levels were taken, in the presence of the contractor or his authorized representative and his dated signature obtained on the level in token of his acceptance.

2.8.10 The contractor shall be responsible for accurate fixing of all levels, for setting clear & firm bench marks & base lines & maintaining them throughout the contract period. The contractor shall bear the cost of all the operations including materials & labour described above for fixing & checking the levels at all stages of the work.

2.8.11 These levels shall make the basis of payment.

2.8.12 The quantity shall be computed in cubic meters correct two places of decimals from cross-sections after compaction. No deduction shall be made for voids.

2.8.13 The quantity for payment shall be the theoretical quantity (Based on proposed formation levels) or actual quantity (based on actual levels) whichever is less.

2.8.14 Rates:

2.8.15 Rate shall include the cost of all materials, plant, machinery and labour required for all the operations described above including all cartages and lifts,

2.8.16 The rate also includes all cost of setting up the laboratory at site and carrying out the quality control measures/tests enumerated above by the contractor at his own cost in the presence of EIC or his authorized representative and submission of test results on completion of tests to the Engineer-in-charge thereof.

3. Plumbing & Sanitary Works

3.1 System Description- Plumbing & Sanitary Works

The plumbing system is designed based on National Building Code 2016 and Local Bylaws.

Based on the above standards the entire plumbing system is designed keeping in the consideration the adequate water and pressure available at all the user points.

The source of water supply is from existing Bore well, Municipal (if available) and bought out water supply.

The reticulation of both domestic & flushing water supply system shall be with a hydropneumatics system to the individual floors.

Applicable Codes and Standards

The installation shall conform in all respects to the following standards in general:

IS 7558 – 1974	Code of practice for domestic hot water installation
IS 5329 – 1983	Code of practice for sanitary pipe work above ground for buildings.
Is 2064 – 1973	Code of practice for selection, installation and maintenance of sanitary appliances
IS 1200 (Part 16)	Method of measurement of laying of water and sewer lines including appurtenant
IS 1200 (Part 19)	Method of measurement of Water supply, plumbing and drains.
IS 783 – 1959	Code of practice for laying of concrete pipes
IS 13592 – 1992	Specification for unplasticized PVC pipes for soil and waste discharge system inside building including ventilation and rainwater.
IS 2527 – 1984	Code of practice for fixing rainwater gutters and down pipes for roof drainage.
IS 6784 – 1984	Method of performance testing of water meters (Domestic type).
IS 12235 (Parts 1 to 11)	Methods of test for unplasticized PVC pipes for portable water supplies.
IS 458 – 1988	Specification for pre-cast concrete pipes (with or without reinforcement)
IS 771 (Part 3to 6)	Specific requirements for urinals
IS 2548 (Part 1&2)	Specification for plastic seats and covers for water closets.
IS 1703 – 1977	Specification for ball valves (Horizontal plunger type) including floats for water supply purposes.
IS 4038 – 1979	Specification for foot valves for water works purposes.
IS 1172 – 1983	Code of basic requirements for water supply, drainage & sanitation (revised).
IS 1239 – 1990 (Part I)	Specifications for mild steel tube, tubular and other steel pipefittings.

IS 1239 – 1992 (Part II)	Specifications for mild steel tube, tubular and other steel pipefittings.
IS 1726 – 1991	Code for cast iron manhole frame and cover (Third revision).
IS 1742 – 1983	Code of practice for building drainage. (Second revision)
IS 2064 – 1973	Code of practice for selection, installation and maintenance of sanitary appliances.
IS 2065 – 1983	Code of practice for water supply to buildings.
IS 4111 – 1986	Code of practice for Ancillary structures in sewerage system
BS 4515	Specification for unplasticized PVC pipefittings.
IS 4985 – 1988	Specification for unplasticized PVC pipes for portable water supplies (second revision)
IS 732 & IS 2274 - 1963	Indian Standard code of practice for electrical wiring & installation.
IS 771	Part I to Part VII-Specification for vitreous china sanitary ware.
IS 778	Specification for gunmetal gate, globe and check valves for water, steam and oil only.
IS 800	Structural Steel Works
IS 1726	Specification for cast iron manhole covers and frames intended for use in drainage work.
IS 1239	Specification of GI class'B' Pipes & fittings for external water supply pipes

National building Code for Water Supply, drainage and Sanitation. Part IX Plumbing services section 1 and 2.

The installation shall also be in conformity with the bylaws and requirements of the local authority in so far as these become applicable to the installation. Wherever this specification calls for, a higher standard of materials and/or workmanship than those required by any of the above regulations and standards, then this specification shall take precedence over the said regulations and standards.

Wherever the specifications and drawings require something that may conflict with the regulations, the regulations shall govern. This shall be referred to the Construction Managers / Professional Team for approval.

Drawings, Specifications and Deviations

The drawings and specifications lay down minimum standards of equipment and workmanship. Should the tenderer wish to depart from the provisions of the specifications and drawings either on account of manufacturing practice or for any other reasons, he should clearly draw attention in his tender to the proposed points of departures and submit such complete information, Drawings and specifications will

enable the merits of the deviations to be fully appreciated. In the absence of any such deviation list, it will be deemed that the tenderer is fully satisfied with the intents of the specifications and the drawings and their compliance with the statutory provisions and local codes. All deviations or departures not brought out to the notice shall be disregarded.

Tools And Spare Parts

All the tools and tackles, scaffolding and staging required for erection and assembly of the installation covered by the contract shall be obtained by the contractor himself. All other material such as foundation bolts; nuts etc, required for the installation of the plant shall be supplied and included in the contract.

Tenderer shall include spares recommended by him for two years operation [commencing from the Date of Issue of the Certificate of Substantial Completion] for each type of equipment covered by the specification.

Shop Drawing, Inspection and Testing,

Working and construction drawings

The contractor shall prepare shop drawings and all work shall be according to approved working drawings. Shop drawings shall give all dimensions and shall incorporate the requirements of the clients/Construction Managers / Professional Team. Approval of drawings does not relieve the contractor of his responsibility to meet the intents of the specifications. All such drawings for approval shall be submitted in 6 copies to the Construction Managers / Professional Team. In addition, the contractor shall submit manufacturer's details and get them approved before ordering. This has to be done whether the materials / equipment are one of the approved makes or not.

Testing and Inspection

The contractor shall carry out tests on different equipment and system in total as specified in various sections of the tender in the presence of the Construction Managers / Professional Team in order to enable them to determine whether the plant, equipment and installation in general comply with the specifications. All equipment shall be tested after carrying out the necessary adjustments and balancing to establish equipment ratings and all other design conditions. The test data shall be submitted in Acceptance Test Form.

Calibration of instruments and meters

Instruments required for testing shall be furnished by the contractor for testing with initial requirements of all consumables. All the instruments, meters etc to be used at site and on the system shall have a valid calibration certificate issued by the competent authority. The contractor shall maintain and make available all such calibration certificates.

Handing over requirements

The plant shall be handed over after satisfactory testing along with 6 sets of the following documents along with CDs (Soft copy).

1. Detailed equipment data in the approved proforma

2. Manufacture's maintenance and operating instructions manuals

3. Set of as built drawings, layouts, piping, ducting, cable routing, cable schedules etc
4. Approved test readings of all equipment and installations

5. Inspection Certificates

6. Certificates of approval from statutory or Local Authorities for the operation and maintenance of the installations, wherever such approval or certification is required. This shall include Application filed along with enclosures and receipts of fees paid and deposits made.

7. Warranty / guarantee certificate for all equipment

8. List of recommended spares together with list of suppliers and their contact details.
9. Certificate from the contractor that he has cleared the site of all debris and litter caused by him. However, contractor has also to periodically clear the site from all the debris, which are generated from his part of scope.
10. Undertaking that all the materials supplied by him at site are fully tax paid and shall produce all documentation for satisfaction of the Construction Managers / Professional Team or taxation authorities.

Submission of the above documentation shall form a precondition for final acceptance of the plant and installation and final payments.

Statutory approvals inspection

The contractor shall be fully responsible for meeting all the statutory obligations and local inspectorates wherever applicable to the works carried out by them. The contractor should prepare all working drawings and obtain approval of competent authorities and also have the equipment and installation inspected and got approved.

All obtaining approval fee and deposit towards statutory approval and inspection paid against demand in writing from the appropriate authority will be reimbursed on submission of original receipts. All other expenses for submission and approval of the various and relevant statutory / bodies shall be embodied in the tender prices.

GENERAL PROVISIONS

3.1.1. SCOPE

The General character and the scope of work to be carried out under this section is illustrated in the specifications and drawings attached herewith. The contractor shall carry out and complete the said work under this contract in every respect in conformity with the rules and regulations of the local authority. The Contractor shall supply all labour, materials, appliances, tools and equipment necessary for the work for plumbing services installation including testing, commissioning and maintenance as specified herein, and as per the relevant Bureau of Indian Standards (BIS), British Standards codes, and local realities. This also includes any material, appliances and equipment not specifically mentioned herein or noted on the drawings as being supplied or installed

which are necessary and customary to make a complete installation properly connected and in working order.

Carryout all incidental works connected with plumbing services installation such as excavation of trenches and back filling, cutting and chasing in concrete and brick and making good, cutting/drilling holes through walls, floors, and grouting for fixing of fixtures/equipment and so forth.

Furnish and install complete workable plumbing services installation as shown on the drawings and described in this specification and as per the latest Bureau of Indian Standards (BIS), British Standards (BS) specifications including all that which is necessary to all the buildings, internally and externally including MS angle Iron brackets, Hi-tech pipe supports required for pipe fixing on walls and ceiling.

Furnish and installation of site utilities such as the sewerage and sewerage appurtenances internally as well as around the building and up to the sewage treatment plant as indicated in the drawing.

Receiving / storing / installation of sanitary wares and accessories shall be plumbing contractor's scope of work (Supplied by Others)

Cooperating and interfacing with other trade contractors in putting the installation in place. Any work done without regard or consultation with other trade contractors, shall be removed by the contractor without additional cost, to permit proper installation of all other work, as desired by the Construction Managers / Professional Team.

Repair all damage done to the premises as a result of this installation and remove all debris left by those engaged for this installation to the satisfaction of Construction Managers / Professional Team.

Cleaning of all plumbing and sanitary fixtures, testing and proving the satisfactory performance of all fixtures at the time the buildings are handed over to the Construction Managers / Professional Team.

It is the responsibility of the contractor to take care of all fittings and fixtures fitted until the time of final handing over to the Construction Managers.

Painting of all concealed and exposed pipes shall be as specified.

Taking full responsibility for getting the entire installation duly approved by the authorities concerned and for all expenses in connection with the same. Taking full responsibility of obtaining and delivering the certificate of final inspection and approval by the concerned authorities to Construction Managers / Professional Team the.

3.1.2. LICENSED PLUMBER

All work performed by the contractor shall be through licensed plumbing supervisor possessing a valid plumbing contractor's license employing Engineers, Technicians, Foremen, Plumbers, Masons, Helpers, etc., as required.

3.1.3. FEES, PERMITS AND NOTICES

Contractor shall comply with all bye-laws and regulations of local and other statutory authorities having jurisdiction over the works and shall be responsible for the payment

of all fees and other charges and giving and receiving of all necessary notices. Contractor shall keep the Construction Managers / Professional Team timely informed about regulations and requirements of statutory

authorities and shall obtain the final certificates of inspection and approval from the authorities.

3.1.4. SPECIFICATIONS AND DRAWINGS.

The specifications and drawings shall be considered as part of this contract and any work or materials shown on the drawings and not called for in the specifications or vice versa shall be executed as if specifically called for in both.

The tender drawings indicate the extent and general arrangement of the fixtures, drainage system, etc. The drawings indicate the points of supply and termination of work shall be installed as indicated in the drawings. However, any changes found essential to co-ordinate with this work and other trades shall be made without any additional cost. The drawings and specifications are meant for the assistance and guidance of the contractor, and exact location, distance and levels will be governed by the individual building and site conditions. Therefore, approval of the Construction Managers / Professional Team shall be obtained before commencement of work.

Exact routing and sizes of all piping on all the floors and the vertical stacks.
Ground and invert levels of all drainage pipes together with location of all manholes and connections up to outfall.

Run of all water supply lines with diameters, location of control valves, access panels.

Location of all the mechanical equipments with layout and piping connections.
Contractor shall provide six sets of catalogues, performance data and list of spare parts together with the name and address of the manufacturer for all electrical and mechanical equipment provided by him.

All "Warranty Cards" given by the manufacturers shall be handed over to the Construction Managers / Professional Team.

3.1.5. MANUFACTURERS INSTRUCTIONS

Where manufacturers have furnished specific instructions relating to the materials used in this job and methods of construction that are not specifically mentioned in these documents, such instructions shall be followed in all cases. The contractor shall also furnish six sets of the detailed instruction, operating and maintenance manuals including detailed completion drawings and Fire Safety Plans on a bound copy to approved scale. Further it is the responsibility of the contractor to train the Employer's / Employer's Authorized Representatives' personnel in the operation and maintenance of the system.

3.1.6. MATERIALS

Materials shall be of approved make and quality specified. They shall conform to the respective Bureau of Indian Standards, British Standards Specifications and supported by Manufacturing Certificate / test certificate.

All materials shall be used as per the list of approved makes, however the final choice shall always remain with the Construction Managers / professional team.

In any case of non-availability of materials in metric sizes, the nearest size of FPS units shall be provided with prior approval of the Construction Managers / Professional Team at no extra cost.

3.1.7. GUARANTEE

The contractor shall guarantee both the material and workmanship of first class quality corresponding to standard engineering practice for a period of 12 months from the date of issue of completion substantial. Any defective materials / workmanship shall be rejected and the contractor has to rectify / replace at his own cost. The Guarantee Certificates of the materials supplied shall be handed over to the Construction Managers / Professional Team.

3.2. SITE UTILITIES

3.2.1 UTILITIES TRENCHES

The specification establishes general criteria for efficient implementation of site utilities. The following site utilities shall be placed as per the planning and as per specifications.

a. Storm water drainage
b. Soil and waste system
c. water supply system
d. Fire protection system
e. Other mechanical systems
f. Electrical cables.

3.2.2. ALIGNMENT AND GRADE

Drains are to be laid to correct alignment & grade shown in the drawings but subject to such modifications as necessary to meet the requirements of the works. No deviations from the lines, depths of cutting or gradients of sewers shown in the plans and sections shall be permitted except by the express direction in writing of the Construction Managers / Professional Team. The pipe shall be laid to slope with the socket and spigot ends on higher and lower side respectively.

3.2.3. OPENING OUT TRENCHES

In excavating the trenches, the road metalling, pavement kerbing, etc., are to be placed on one side and preserved for reinstatement and the trench or other excavation shall be filled up and laid back to original condition at no extra cost. Before any road metal is replaced, it shall be carefully shifted. The surface of all trenches and holes shall be restored and maintained to the satisfaction of the Construction Managers / Professional Team. The contractor shall not cut or break down any live fence or trees in the line of the proposed works but shall tunnel under them unless the Construction Managers orders the contrary. The contractor shall scrub and clear the surface over the trenches and other excavations of all stumps, roots and other encumbrances affecting execution of work and shall remove the same from the site as per the directions of the Construction Managers.

3.2.4. EXCAVATION TO BE TAKEN TO PROPER DEPTH

Trenches shall be excavated in all conditions of soil and to such a depth that the sewers / or other pipes shall rest as described in the several clauses relating thereto and so that the inverts may be at the levels given on the section Should the contractor excavate the trench to a greater depth than is required the extra depth shall have to be filled up with concrete at the contractor's own cost to the requirements and satisfaction of the Construction Managers / Professional Team.

3.2.5. REFILLING

After the sewer or other piping work has been laid and proved to be water-tight, the trench or other excavation shall be refilled. Utmost care shall be taken in doing this so that no damage is caused to the sewer and other permanent works. Filling in the trenches up to 50cms. above the crown of the sewer shall consist of the finest selected materials placed carefully and consolidated. After this has been laid, the trench and other excavation shall be refilled carefully in 15cms. layers with material taken from the excavation, each layer being watered and consolidated.

3.2.6. BACK FILLING OF TRENCH (IS: 12288 – 1987)

For the purpose of back filling, the depth of the trench shall be considered as divided into the following three zones from the bottom of the trench of its top, for the purpose of refill materials to be used.

ZONE A
From bottom level of trench to the level of the center line of the pipe. .

ZONE B
From the level of the center line of the pipe to a level 30 cm above the top of the pipe,

ZONE C
From a level 30 cm above the top of the pipe to the top of the trench

3.2.7. BACK FILL MATERIALS

All backfill materials shall be free from cinders, ashes, slag, refuse, rubbish, vegetable or organic materials, lumpy or frozen materials boulder, rocks or stone or other materials which in the opinion of the Construction Managers / Professional Team, is unsuitable for deleterious. Fine excavated earth, which shall pass through a sieve of aperture size 20mm can be used for filling in zones A & B. However, material containing stones up to 20mm as their greatest dimension may be used in zone C only unless otherwise specified by the Construction Managers / Professional Team. Where excavated material in considered by the Construction Managers / Professional Team not suitable for back filling, clean river sand shall be used for the same.

3.2.8. BACK FILL SAND

River sand used for back fill shall be natural sand complying with Para 1.6 graded from fine to coarse. The total weight of clay in it shall not exceed 10 percent. All material shall pass through a sieve of aperture size 20mm (IS-2405-1980) and not more than 5 percent shall remain on IS sieve of aperture size 6.30mm.

3.2.9. BACK-FILL GRAVEL

Gravel used for back fill shall be natural gravel and having durable particles graded from fine to coarse in a reasonably uniform combination with no boulders or stone larger than 50mm in size. It shall not contain excessive amount of loam and clay and not more than 15 percent shall remain on a sieve of aperture size 75 micron.

3.2.9.1. Back filling in zone A shall be done by hand with fine excavated material or river sand, fine gravel or other approved materials placed in layers of 8cm and compacted by tamping. The back filling material shall be deposited in the trench for its full width of each side of the pipe, fittings and appurtenances simultaneously.

3.2.9.2. Back-filling in zone B using fine excavated material shall be done by hand or approved mechanical methods using the fine excavated material special care being taken to tamping and to avoid injuring or moving the pipe. If excavated material is not suitable, the type of back-fill material to be prescribed by the Construction Managers / Professional Team to suite individual locations.

3.2.9.3. Back filling in zone C shall be done by hand or approved mechanical methods and well compacted. Excavated earth having stones of size not exceeding 20mm can be used for zone C. If the excavated earth unsuitable for back fill the filling material shall be specified by the Construction Managers / Professional Team.

3.2.9.4. BACKFILL WITH EXCAVATED MATERIALS

Where the excavation is made through permanent pavements, curbs, paved footpaths, or where such structures are undercut by the excavation, the entire back fill to the sub-grade of the structures shall be made with sand or cement concrete in accordance with Para 1.6. The method of placing and consolidating the back fill material shall be prescribed by the Construction Managers / Professional Team.

3.2.9.5. CONCRETE SLABS OVER PIPES

When pipes are laid under roads and pavements subjected to heavy traffic loads the trenches may be covered with reinforced concrete slabs of suitable dimension, supported on edges to relieve the load on pipes to the adjoining earth.

3.2.9.6. SITE CLEANING ON COMPLETION OF WORK

All surplus pipes and fittings, valves, etc., and all tools and temporary structures shall be removed from the site as directed by the Construction Managers / Professional Team. All dirt rubbish and excess earth from the excavation shall be removed and transported and disposed at a suitable place as directed by Construction Managers / Professional Team and the construction site left clean to the satisfaction of the Construction Managers / Professional Team.

3.2.9.7. CONTRACTOR SHALL RESTORE SETTLEMENT AND DAMAGES

The Contractor shall at his own cost make good promptly, during the whole period that the works are in hand, any settlement that may occur on the surfaces of roads, beams, footpaths, gardens, open spaces, etc. whether public or private caused by his trenches or his other excavations and he shall be liable for any accidents caused thereby. He also shall, at his own expense and charge, repair and make good any damage done to the buildings and other properties.

3.2.9.8. DISPOSAL OF SURPLUS

The Contractor shall at his own cost dispose within the site or as directed all surplus excavated materials not required to be used in the work.

3.2.9.9. TIMBERING

The Contractor shall at all times support efficiently and effectively the sides of trenches and other excavations by finest selected timbering, piling, sheeting material, etc., at his own cost. The trenches shall be close timbered in loose or sandy strata and below the surface of the sub-soil table. All timbering, sheeting and piling with their walls and supports shall be of adequate dimensions and strength and fully braced and strutted so that there is no risk of collapse or subsidence of the walls of the trench. The Contractor shall be held accountable and responsible for the adequacy of all timbering, bracing, sheeting and piling used and for all damages to persons and property resulting from the improper quality, strength, placing, maintenance, or removing of the same.

3.2.9.10. REMOVAL OF WATER

The Contractor shall at all times during the progress of work keep the trenches and excavations free from water at his own expense which shall be disposed off by him in a manner as will neither cause injury to public health nor to public or private property, to the work completed or in progress, to the surface of any roads or streets and cause any interference with the use of the same.

3.2.9.11. TRENCH WIDTH

The width of excavated trenches shall be as per the table given below:

	Width at bottom		
Excavation upto:	**Upto 100 mm dia pipe**	**Upto 150 mm dia pipe**	**Upto 300 mm dia pipe**
900 mm depth	330 mm	330 mm	600 mm
900 to 1500 mm depth	600 mm	600 mm	900 mm
1500 to 3000 mm depth	750 mm	750 mm	1100 mm
3000 to 5000 mm depth	900 mm	1000 mm	1300 mm

3.2.9.12. PROTECTION OF EXISTING SERVICES

All pipes, water mains, cables, etc. met with during the course of excavation shall be carefully protected and supported.

3.2.9.13. ROAD CROSSINGS

All pipelines laid below roads shall be taken through suitable underground trenches. The size of trenches shall be as per drawings.

3.2.9.14. CONSTRUCTION ACROSS ROADS

All works across roads shall be carried out as per the directions of the Construction Managers / Professional Team.

4. WATER SUPPLY SYSTEM

OVERVIEW

The source of water supply is from existing Bore well, Municipal (if available) and bought out water supply.

The underground water sumps comprises raw water storage, fire service water storage and domestic treated water storage. Two manhole access holes are provided for each compartment in the tank system to provide for access into the tank for maintenance purposes. Air vents are fitted to each compartment.

The reticulation of both domestic & flushing water supply system shall be with a Gravity system to the individual floors.

4.1.1. CPVC/UPVC PIPES AND FITTINGS upto 50mm dia of pipes.

Scope

This specification covers requirements, test methods, and methods of marking for chlorinated poly (vinyl chloride) plastic hot-and cold-water distribution system components made in one standard dimension ratio and intended for water service up to and including 180F (82C). These components comprise pipe and tubing, socket-type fittings, street fittings, plastic-to-metal transition fittings, solvent cements, and adhesives. Requirements and methods of test are included for materials, workmanship, dimensions and tolerances, hydrostatic sustained pressure strength, and thermo-cycling resistance. The components covered by this specification are intended for use in residential and commercial, hot and cold, potable water distribution systems.

The values stated in either inch-pound or SI units are to be regarded separately as standard. Within the text, SI units are shown in brackets. The values stated in each system are not exact equivalents therefore each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

Suggested hydrostatic design stresses and hydrostatic pressure ratings for pipe, tubing and fittings are listed in Appendix XI. Design, assembly and installation considerations are discussed in Appendix X2.
Reference Documents

ASTM Standards:

D 1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
D1399 Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings.

D1784 Specification for Rigid PoIy (VinyI Chloride) (UPVC) Compounds and Chlorinated Poly(Vinyi Chloride) (CPVC) Compounds

F 402 Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings2

F 493 Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings

4.1.2. TERMINALOGY

Definitions:

The abbreviation for chlorinated poly(vinyl chloride) is CPVC. Plastic tubing denotes a particular diameter schedule of plastic pipe in which the outside diameter of the tubing is equal to the nominal size plus 1/8 in. (3.18 mm).

Standard material designation code—the chlorinated poly(vinyl chloride) material designation code shall consist of the abbreviation CPVC followed by two digits indicating the ASTM type and grade in Arabic numerals. Where necessary, a third and fourth digit shall be added to indicate the hydrostatic design stress for water at 73F [23C] in units of 100 psi [0.69 MPa].

Materials

Basic Materials Description—Chlorinated poly(vinyl chloride) plastics used to make pipe, tubing, and fittings meeting the requirements of this specification are categorized by two criteria; namely, basic short-term properties, and long-term hydrostatic strength Classification Pipe, Tubing, and Fittings—This specification classifies CPVC 4120 pipe, tubing, and fittings by a single standard dimension ratio which shall be SDR II, by a maximum continuous use temperature which shall be 180F [82C] and by nominal pipe or tubing diameters from 3/8 in.[9.5 mm] through 2 in. [50 mm].

Plastic-to-Metal Transition Finings—This specification classifies CPVC plastic-to-metal transition fittings intended for use up to and including 180F [82C] as CPVC-I80F on the basis of resistance to failure by thermo-cycling. Solvent Cements and Adhesives— This specification classifies solvent cements and adhesives meeting the requirements contained herein as CPVC Solvent Cement or CPVC Adhesive.

4.1.3. REQUIRMENT FOR PIPE, TUBING & FITTINGS

Dimensions and Tolerances:
General:

Wall Minimums—Table 1 and Table 2 show wall thickness minimums. Calculated SDR 11 tubing wall thickness that fall below 0.068 in. [1.73 mm] shall be arbitrarily increased to that value. Calculated SDR 11 fitting wall thickness that fall below 0.102 in. [2.59 mm] for the fitting socket bottom, or 0.I28 in. [3.25 mm] for the fitting body, shall be arbitrarily increased to these values.

Interference Fit—The diameters and tolerances in Table I and Table 2 provide for socket-type joints having an interference fit based on the major diameter of pipe and tubing having a degree of out-of-roundness. This does not necessarily imply interference based on the minor diameter of the pipe or tubing.

Out-of Roundness—The maximum out-of-roundness requirements shown in Table 1 and Table 2 for pipe, tubing, and finings apply to the average measured diameter.

4.1.4. PLASTIC-METAL TRANSITION FITTINGS:

Bask Dimensions—Plastic parts of plastic to metal transition fittings shall meet the dimensional requirements of Table 1 and Table 2 where applicable with the following exceptions. Such parts shall be exempted from the requirements for inside diameter (waterway) and wall thickness tolerance.

Thread Dimensions—Transition fittings that rely on interference fit and sealant shall be threaded with American National Standard Taper Pipe Threads meeting the dimensional requirements.

Thread Tolerance— The manufacturing tolerance on CPVC threads, measured with a ring gage, shall be a maximum variation of 1½ turns large or small when measured in accordance with Test Method D 2122.

Starting Threads—The entering ends of external CPVC threads shall have a Blunt Start produced by making the width of the thread at the start approximately 50 to 75% of the full thread. The Blunt Start provides for easy entrance and protection of the thread, and shall be included in the measurement of thread length.

4.1.5. HYDRSTATIC SUSTAINED PRESSURE:

General — Pipe, tubing, and fittings (tested as assemblies) shall meet the minimum hydrostatic sustained pressure requirements of both test conditions shown in Table 5 when tested in accordance with TEST METHODS FOR PIPE, TUBLING AND FITTINGS given below

Pipe and Tubing Quality—Test condition B shall be termed the primary sustained pressure test for pipe and tubing and shall be used for quality control. Test condition A shall be termed the secondary sustained pressure test for pipe and tubing and shall be used for periodic performance qualification. Failure to pass either test is cause for rejection.

Fitting Quality—Test condition A shall be termed the primary sustained pressure test for fittings and shall be used for quality control. Test condition B shall be termed the secondary sustained pressure test for fittings and shall be used for periodic performance qualification. Failure to pass either test is cause for rejection.

Thermo cycling — Plastic-to-metal transition fittings (other than metal socket-type transitions for use with adhesives assembled according to the manufacturer's instruc-tions, shall not separate or leak when thermo cycled 1000 times between the temperatures of 60F and 180F [16C and 82C] in accordance with TEST METHODS FOR PIPE, TUBLING AND FITTINGS given below

4.1.6. REQUIREMENTS FOR SOLVENT CEMENT & ADHESIVE JOINTS

CPVC Solvent Cements:

Note 6—CPVC solvent cements may exist which meet the requirements of the specification when used in accordance with the manufacturer's recommendations, without a primer or cleaner. It is recommended that those CPVC solvent cements which may be used without a primer or cleaner be dear or yellow in color. Otherwise, it is recommended that CPVC solvent cement requiring the use of 3 primer or cleaner be orange in color. Color identification is recommended to facilitate cement recognition to prevent the misuse of the cement and to the minimize the unintentional use of other cements that may fail at elevated service temperatures.

General—CPVC solvent cements, for use in CPVC 41, plastic-to-plastic, socket-type joints shall meet the requirements set forth in Specification F 493.

Hydrostatic Burst Strength—2-in. [50-mm] CPVC solvent cement joints shall exceed the minimum hydrostatic burst strength requirements given in Table 6 after a maximum drying interval of 2 h when tested, Failure to pass the burst requirement at either temperature is cause for rejection.

Hydrostatic Sustained Pressure Strength—½-in. [I5-mm] CPVC solvent cement joints shall meet the requirements, when tested in accordance with TEST METHODS FOR PIPE, TUBLING AND FITTINGS given below.

CPVC Adhesives:
General—CPVC adhesives (other than CPVC solvent cement), shall qualify for use in CPVC socket-type joints by a rigorous simulated use testing program as further defined below. CPVC adhesives shall be tested in the largest size joint and in the exact type of joint for which they are intended; that is, 2-in. [50-mm] plastic-to-metal or 2-in. [50-mm] plastic-to-plastic.

Hydrostatic Sustained Pressure Strength—Socket-type CPVC adhesive joints, made and cured according to the adhesive manufacturer's recommended procedure, shall not separate or leak when tested in accordance with TEST METHODS FOR PIPE, TUBLING AND FITTINGS

Thermo-cycling—Socket-type CPVC adhesive joints, made and cured according to the adhesive manufacturer's recommended procedure, shall not separate or leak when thermo-cycled 10000 times between the temperatures of 600F and 1800F [160C and 820C] in accordance with TEST METHODS FOR PIPE, TUBLING AND FITTINGS given below.

4.1.7. Workmanship, Finish, and Appearance

The pipe shall be homogeneous throughout and essentially uniform in color, opacity, density, and other properties. The inside and outside surfaces shall be semi-matte or glossy in appearance (depending on the type of plastic) and free of chalking, sticky or tacky material. The surfaces shall be free of excessive bloom, that is slight bloom is acceptable. The pipe walls shall be free of cracks, holes, blisters, voids, foreign inclusion, or other defects which are visible to the naked eye and which may affect the wall integrity. Holes deliberately placed in perforated pipe are acceptable. Bloom or chalking may develop in pipe exposed to direct rays of the sun (ultraviolet radiant energy) for extended periods and consequently these requirements do not apply to pipe after extended exposure to direct rays of the sun.

Table 2 Tapered Socket Dimensions for CPVC 41, SDR 11, Plastic Pipe and Tubing Fittings

Table 3 Minimum Dimensions from Center to End of socket (Laying Length) for CPVC 41, SDR 11, Plastic Pipe and Tubing Fittings

or Pipe Size		Average	Tolerance on Average	Max Out-of-Round[C]	Average	Tolerance on Average	Max Out-of-Round[C]
3/8 Tube	[10]	0.508 [12.90]	±0.003 [±0.08]	±0.003 [±0.08]	0.494 [12.55]	±0.003 [±0.08]	±0.003 [±0.08]
1/2 Tube	[15]	0.633 [16.08]	±0.003 [±0.08]	±0.004 [±0.10]	0.619 [15.72]	±0.003 [±0.08]	±0.004 [±0.10]
3/4 Tube	[20]	0.884 [22.45]	±0.003 [±0.08]	±0.005 [±0.13]	0.870 [22.10]	±0.003 [±0.08]	±0.005 [±0.13]
1 Tube	[25]	1.135 [28.83]	±0.003 [±0.08]	±0.006 [±0.15]	1.121 [28.47]	±0.003 [±0.08]	±0.006 [±0.15]
1 1/4 Tube	[32]	1.386 [35.20]	±0.003 [±0.08]	±0.007 [±0.18]	1.372 [34.85]	±0.003 [±0.08]	±0.007 [±0.18]
1 1/2 Tube	[40]	1.640 [41.66]	±0.004 [±0.10]	±0.008 [±0.20]	1.622 [41.20]	±0.004 [±0.10]	±0.008 [±0.20]
2 Tube	[50]	2.141 [54.38]	±0.004 [±0.10]	±0.010 [±0.25]	2.123 [53.92]	±0.004 [±0.10]	±0.010 [±0.25]
1 1/2 Pipe	[40]	1.918 [48.72]	±0.004 [±0.10]	±0.008 [±0.20]	1.900 [48.26]	±0.004 [±0.10]	±0.008 [±0.20]
2 Pipe	[50]	2.393 [60.78]	±0.004 [±0.10]	±0.010 [±0.25]	2.375 [60.33]	±0.004 [±0.10]	±0.010 [±0.25]

C Socket Length, min[A], in. [mm]	D Inside Diameter, min[D], in. [mm]	Wall Thickness, min[D], in. [mm]			Entrance: min EW EX EZ, in. [mm]
		(E_a) Socket Entrance	(E_b) Socket Bottom	F	
0.500 [12.70]	0.364 [9.25]	0.068 [1.73]	0.102 [2.59]	0.128 [3.25]	0.034 [0.86]
0.500 [12.70]	0.489 [12.42]	0.068 [1.73]	0.102 [2.59]	0.128 [3.25]	0.034 [0.86]
0.700 [17.78]	0.715 [18.16]	0.080 [2.03]	0.102 [2.59]	0.128 [3.25]	0.034 [0.86]
0.900 [22.86]	0.921 [23.39]	0.102 [2.59]	0.102 [2.59]	0.128 [3.25]	0.034 [0.86]
1.100 [27.94]	1.125 [28.58]	0.125 [3.18]	0.125 [3.18]	0.156 [3.96]	0.042 [1.07]
1.300 [33.02]	1.329 [33.76]	0.148 [3.76]	0.148 [3.76]	0.185 [4.70]	0.049 [1.24]
1.700 [43.18]	1.739 [44.17]	0.193 [4.90]	0.193 [4.90]	0.241 [6.12]	0.064 [1.63]
1.375 [34.92]	1.494 [37.95]	0.173 [4.39]	0.173 [4.39]	0.216 [5.49]	0.058 [1.47]
1.500 [38.10]	1.933 [49.10]	0.216 [5.49]	0.216 [5.49]	0.270 [6.86]	0.072 [1.83]

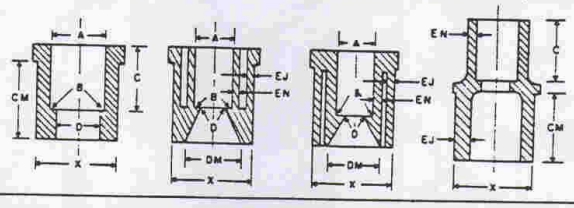
TABLE 1 Outside Diameters, Wall Thicknesses, and Tolerances for CPVC 41, SDR 11, Plastic Pipe and Tubing[A]

Nominal Tube or Pipe Size		Outside Diameter, in. [mm]			Wall Thickness, in. [mm][C]	
		Average	Tolerance on Average	Max Out-of-Round[B]	SDR 11	
					Min	Tolerance
3/8 Tube	[10]	0.500 [12.7]	±0.003 [±0.08]	±0.003 [±0.08]	0.068 [1.73]	+0.020 [+0.51]
1/2 Tube	[15]	0.625 [15.9]	±0.003 [±0.08]	±0.004 [±0.10]	0.068 [1.73]	+0.020 [+0.51]
3/4 Tube	[20]	0.875 [22.2]	±0.003 [±0.08]	±0.005 [±0.13]	0.080 [2.03]	+0.020 [+0.51]
1 Tube	[25]	1.125 [28.6]	±0.003 [±0.08]	±0.006 [±0.15]	0.102 [2.59]	+0.020 [+0.51]
1 1/4 Tube	[32]	1.375 [34.9]	±0.003 [±0.08]	±0.007 [±0.18]	0.125 [3.18]	+0.020 [+0.51]
1 1/2 Tube	[40]	1.625 [41.3]	±0.004 [±0.10]	±0.008 [±0.20]	0.148 [3.76]	+0.020 [+0.51]
2 Tube	[50]	2.125 [54.0]	±0.004 [±0.10]	±0.010 [±0.25]	0.193 [4.90]	+0.023 [+0.58]
1 1/2 Pipe	[40]	1.900 [48.6]	+0.006, −0.002 [+0.15, −0.05]	±0.008 [±0.20]	0.173 [4.39]	+0.021 [+0.53]
2 Pipe	[50]	2.375 [60.7]	+0.006, −0.002 [+0.15, −0.05]	±0.010 [±0.25]	0.216 [5.49]	+0.026 [+0.66]

Nominal Tube or Pipe Size		G Min[D], in. [mm]	J Min[D], in. [mm]	N Min[D], in. [mm]
3/8 Tube	[10]	0.359 [9.12]	0.174 [4.42]	0.102 [2.59]
1/2 Tube	[15]	0.382 [9.70]	0.183 [4.65]	0.102 [2.59]
3/4 Tube	[20]	0.507 [12.88]	0.235 [5.97]	0.102 [2.59]
1 Tube	[25]	0.633 [16.08]	0.287 [7.29]	0.102 [2.59]
1 1/4 Tube	[32]	0.758 [19.25]	0.339 [8.61]	0.102 [2.59]
1 1/2 Tube	[40]	0.884 [22.45]	0.391 [9.93]	0.102 [2.59]
2 Tube	[50]	1.134 [28.83]	0.495 [12.57]	0.102 [2.59]
1 1/2 Pipe	[40]	1.022 [25.96]	0.448 [11.38]	0.102 [2.59]
2 Pipe	[50]	1.260 [32.00]	0.547 [13.89]	0.102 [2.59]

 Signature & Seal of the Bidder

TABLE 4 Dimensions of Reducer Bushings for CPVC 41, SDR 11, Socket-Type, Plastic Pipe and Tubing Fittings[A,B,C,D]



[A] Tubing socket dimensions, *A*, *B*, and *C*, and tolerances on these dimensions shall be the same as in Table 2. The minimum length of the male end of the bushing or coupling, *CM*, shall be the same as *C* in Table 2, but in any case the male end shall bottom in the mating fitting. Minimum waterway dimensions, *D* and *DM*, shall be the same as *D* in Table 2. Minimum wall dimensions, *EJ* and *EN*, apply to the larger and smaller sizes joined respectively, and shall be the same as the corresponding values for E_b in Table 2.

[B] The minimum socket wall thickness for reducing bushings shall be 102 in. [2.59 mm]. Reducing bushings may be cored if the socket wall thickness would otherwise exceed the total of *EJ* and *EN* calculated from the appropriate E_b values in Table 2. Where coring is used, the inner socket shall be reinforced from the outer wall by a minimum of three ribs extending the full depth of the coring.

[C] The transition from *D* to *DM* may be straight, tapered as shown, or radiused, at the discretion of the manufacturer.

[D] A taper on the male end of a bushing is optional. If a taper is used, it shall be a positive taper in the same direction as the taper in the socket. Whether a taper is used or not, all diameters *X* shall conform to the diameter and tolerance for the corresponding size of tubing shown in Table 1.

Table 5 Minimum Hydrostatic Sustained Pressure Requirements for CPVC 4120,SDR 11, Pipe, Tubing and Fitting Assemblies Tested in Either Water or Air Bath External Environment at 82 Degree

Test Condition	Test Duration	Hydrostatic Test Pressure	
		Water Bath	Air Bath
A	6 min	521 psi [3 590 kPa]	551 psi [3 800 kPa]
B	4 h	364 psi (2 510 kPa)	403 psi [2 780 kPa]

[A] Test conditions were calculated from the following experimentally derived, 95 % confidence, rupture pressure versus time relationships for CPVC 41, SDR 11, pipe and tubing at 180°F [82°C]. Pressure, *P*, and time, *t*, are in psi and h respectively. The 50 % confidence relationships are given for information only.

$\log P = -0.085155 \log t + 2.726805$ (50 % confidence in air)
$\log P = -0.085155 \log t + 2.656225$ (95 % confidence in air)
$\log P = -0.097269 \log t + 2.690464$ (50 % confidence in water)
$\log P = -0.097269 \log t + 2.619884$ (95 % confidence in water)

Table 6 Minimum Hydrostatic Sustained Burst Strength Requirements for Nominal 50 mm CPVC Solvent Cemented Joints after 2 hour Drying at Test Temperature

Temperature	Burst Pressure
73.4°F [23°C]	400 psi [2 760 kPa]
180°F [82°C]	200 psi (1 380 kPa)

Table 7 Minimum Hydrostatic Pressure Requirements for CPVC Socket Type Adhesive Joint Assemblies Tested Either in the Water Bath or Air Bath External Environment at 82 Degree

Test Duration, h	Test Pressure	
	Water Bath	Air Bath
10 000	170 psi [1 170 kPa]	207 psi (1 430 kPa)

Table 8 Minimum suggested Drying Time for Drying Solvent Cemented fitting Assemblies in AIR at 82 Degree

Test Condition (from Table 5)	Suggested Drying Time at 180°F [82°C], h
A	4
B	16

4.1.8. Assembly

Solvent Cemented Joints:

Interference Fit—Components meeting the dimensional requirements of this specification are designed 10 having interference fit. Before making a cemented joint, ii is advisable to check for interference dry-fit. A good interference dry-fit exists when the pipe or tubing makes contact with the fitting socket wall between one third and two thirds of the way into the socket

Cutting— Pipe and tubing may be cut to length with tubing cutters. Tubing cutters with thin cutting wheels designed specially for plastic are recommended. Where tubing cutters are not available, a saw and meter box may be used. Burrs and ridges caused by handling or cutting must be removed before assembling a joint.

Solvent Cleaning—When recommended by the cement manufacturer, organic liquids can be used as a cleaning solvent for CPVC 41 components. These organic liquids should have a low solvation power for CPVC, to prevent mistaken use of the cleaning solvent for a cement Uncemented joints with a good solvent THF for instance, will pass the usual cold water pressure check but are likely to fail later in hot water service.

Step-by-Step Assembly—Correct assembly consists of the following steps; (1) cut the pipe square; (2) remove burrs; (S) check for interference fit; {4) clean both pipe end and fitting socket with a recommended CPVC cleaner or by light sanding, or both; (5) apply a liberal coat of CPVC solvent cement to the pipe and apply a light coat of cement to the fitting socket; (6) assemble immediately by bottoming the pipe in the socket and rotating a quarter turn as the joint is assembled; and (7) remove excess cement from the joint. If a joint has been properly made, a small bead of cement will always appear at the juncture between the pipe of tubing and the fitting.

Adhesive Joints—Assemble according to the manufacturer's instructions paying particular attention to whether sanding of the pipe or tubing is recommended to eliminate the interference fit

Plastic-to-Metal Transitions—Assemble in accordance with the manufacturer's instructions. Union and compression type transition fittings are likely to include ferrules or O-rings, or both, which form an essential pan of the fitting assembly and should not be omitted. Plastic socket-to-male threaded adapters should be installed with a recommended thread sealant.

4.1.9. Installation

Storage and Handling—CPVC pipe, tubing, and fittings should be stored under cover to avoid unnecessary dirt accumulation and long-term exposure to sunlight Pipe and tubing should be stored with continuous support in straight, uncrossed bundles. Care should be used in handling to ensure that unnecessary abuse such as abrasion on concrete or crushing is avoided.

Installation Temperature—Extra care must be taken at temperatures of40F or lower and 110F or higher. Always follow the manufacturer's installation instructions carefully.

Pressure Testing—CPVC piping systems made of ½ h through 2-in. sizes in accordance with this specification, and utilizing a solvent cement requiring a primer or cleaner. can be pressure tested (using cold tap water only) at line pressure (150 psi maximum) after the solvent cement joints have cured for at least the following amount of time:

4.1.10. TEST METHODS FOR PIPE, TUBLING AND FITTINGS

Sampling - A Sufficient quantity of Pipe, tubing or fittings, as agreed upon between the purchaser and the seller, shall be selected from each lot or shipment and tested In the case of no prior agreement, random samples selected by the testing laboratory* shall be deemed adequate.

Test Specimens—Not less than 50% of the test specimens required for any pressure test shall have at least a pan of the marking in their central sections. The central section is that portion of pipe, which is at least one pipe diameter away from an end closure.

Flattening—Flatten three specimens of the pipe. 2 in. [50-mm] long, between parallel plates in a suitable press until the distance between the plates is 40 % of the outside diameter of the pipe or the walls of the pipe touch, whichever occurs first. The rate of loading shall be uniform and such that the

compression is completed within 5 min. upon removal of the load, examine the specimens for evidence of splitting, cracking, or breaking.

4.1.11. Hydrostatic Sustained Pressure

Summary of Test Method—This test method describes a pass-fail test for CPVC 41 pipe, tubing, or fittings (tested as assemblies) subjected to a constant internal hydrostatic pressure for a predetermined period of time. Test conditions are based on known rupture pressure versus time relationships for standard CPVC 41 components (see footnote to Table 5). The external test environment may be either water or air. However, test pressures differ depending on the environment selected (see Table 5).

Apparatus:

Pressurizing System—A pressure source capable of rapidly and continuously applying a constant hydrostatic pressure, controlled to ±10 psi [±69 kPa] or better, to the test specimens.

Timing Device — Any clock capable of accuracy to within 1 % of the total test time.

Closure Fittings—Any suitable specimen closure at allows "free-end" mounting, is free of leaks, and will not contribute to end failures.

Sampling and Specimen Preparation:

Pipe and Tubing—Select at random specimens of at least seven times the nominal diameter in length, but in any case not shorter than 10 in. [250 mm]. Take three specimens for quality control testing. Take six specimens for qualification or referee testing..

Fittings—Select specimens at random. Take three specimens for quality control testing. Take six specimens for qualification or referee testing. Assemble the fittings, individually or collectively, using suitable lengths of CPVC 41 Pipe or tubing and CPVC solvent cement or CPVC adhesive. Use only pipe or tubing and solvent cement or adhesive meeting the requirements of this specification. Assemble the joints in accordance with the recommended procedure by the manufacturer Allow solvent-cemented fitting assemblies to dry at elevated temperature, up to 180F [82C] maximum, in a forced-air oven until all joints are sufficiently strong to eliminate joint failures during the test. Minimum suggested drying times are shown in Table 8. Cure assemblies prepared with CPVC adhesives according to the adhesive manufacturer's recommended procedure until the adhesive joints are sufficiently strong to eliminate joint failures during the test In no case, however, should adhesive joints be cured at a temperature higher than 180F [82C].

Procedure—After curing all cemented or adhesive joints used, attach suitable end closures where necessary. Fill the specimen with water, making certain to avoid entrapment of air. Condition the test specimen at 180 ± 1.8F [82± PC] for a minimum of 30 min if using a water bath, or 4h if using an air bath. Attach the specimen to the pressure source, and place it on test at 180 ± 1.8*F [82 ± i*C] under the proper hydrostatic pressure selected from Table 5. Start the timer immediately. Hold the test pressure and temperature as close as possible to the specified values, but in any case to within ±10 psi [±69 kPa] and 1.8F [1CJ respectively. At the end of the specified minimum time interval, isolate the specimen from the pressure source and check for any continuous loss of pressure resulting from transmission of water through the specimen. Any such continuous loss of pressure, resulting from bursting or weeping of the test specimens as defined in Test Method D 1598. Shall constitute failure. If joint leakage or joint separation has occurred, the test should be repeated using a longer joint drying or curing cycle.

4.1.12. Tests for Solvent Cement and Adhesive Joints

Test for Solvent Cement Joints:

Hydrostatic Burst Strength—Determine the minimum hydrostatic burst strength for CPVC solvent-cemented joints according to manufacturers recommendation. Except as herein specified. Test assemblies containing at least six nominal 2in. [50-mm] solvent cemented joints prepared for CPVC 41 pipe or tubing and fittings meeting the requirements of this specification. Assemble the joints in

accordance with the recommended solvent cementing procedure as per manufacturers recommendation. After attaching end closures, fill the specimen assembly with water and condition in water at the test temperature for 2 h maximum. Then test immediately. Increase the internal pressure

at a constant rate so as to reach the minimum burst 'requirement in 60 to 70 s. Leakage or separation at any of the joints tested at less than the minimum hydrostatic burst requirement specified in Table 6 shall constitute failure in this test.

Test for Adhesive Joints:

General— Prepare a test assembly containing at six adhesive joints of the largest nominal Diameter and the exact type (plastic-to-plastic, or plastic-to-metal) for which the adhesive is intended to qualify- Make and cure the adhesive joints in accordance with the adhesive manufacturer's recommended procedure, but in no case above 180F [82C. The CPVC 41 pipe or tubing and fittings used in the assembly shall meet the requirements of this specification.

Hydrostatic Sustained Pressure for Adhesive Joints
Any evidence of leaking or separation at the adhesive joint or adhesive-related bursting, weeping, or ballooning of the CPVC 41 components adjacent to the joint, shall constitute failure. Failure of any one of six joint specimens tested shall constitute failure in this test.

5. VALVES, STRAINERS AND PRESSURE GAUGES

5.1.1. GENERAL

This section deals with different type of valves like butterfly valves, gate valves, ball valves, check valves, balancing valves and Strainers and pressure gauges. The contractor shall refer to the approved make of materials specified herein and the drawings.

Valves shall be provided on branch pipe connections to mains and at connection to equipment where indicated. All valves are to be located for easy access. All valves shall be supported wherever necessary with MS brackets. Valves shall comply with IS 780 (Class I) for C.I sluice valves and IS 778 for G.M valves.

Pressure gauges shall have outer diameter not less than 115mm with 10mm BSP full thread, brass body syphon and gauge cock of size10mm. Dial gauges shall have adequate response for the pressures encountered within the specified (Range 0-15Kg/sq.cm).

5.1.2. VALVES

Gate valves or butterfly valves for shut-off or sectionalizing service, globe or ball valves for flow modulation. For on-site control, use gate valves. Specialty valve shall be employed where appropriate, such as check valves on a pump discharge, pressure regulating valves for equipment requiring lower-than-available system pressure, solenoid valves, etc. Flanged or threaded end valves are preferred. Locate valves in accessible locations, not more than six feet above the floor, if frequently used, and with a union on the downstream side of threaded end valves.

Provide each valve with brass, aluminum or plastic disc not les than 32mm diameter engraved with numbers, piping service and normal operating position (i.e. NO, NC) corresponding to valves shown on the diagram. Fasten disc to valve with 14gauge brass wire or 16gauge jack chain.

5.1.3. GATE VALVE

The primary function of a gate valve is for starting and stopping of flow. It has a disc actuated by a stem screw and hand wheel, moves up and down at right angles to the path of flow of fluid and seats against two faces to shut of flow. As the disc of the gate valve presents a flat surface to the direction of flow, this valve is only for starting and shutting the flow in the pipe.

These valves are of Gun Metal (GM) make. Supplying, fixing and testing correspond to IS 778-1984, Specifications for Copper Alloy Gate, Globe and Check Valves for Water Works.

All globe and check valves shall have working parts suitable for hot and cold water, as required. Valves shall be tagged with permanent label under hand wheel indicating type or duty.

All valves should have manufacturer's test certificate indicating the date of shop test and other quality control tests with the material used for the same.

5.1.4. BALL VALVE

The ball valve shall be of high-pressure type and shall be of sizes as specified and/or shown in the drawings the normal size of a ball valve shall be that, corresponding to the size of the pipe to which it is fixed. Ball valves shall have body of carbon steel. The ball and the shaft shall be of stainless steel. The seat shall be of PTFE. The valve shall be complete with socket weld ends and the float of copper sheet. The minimum thickness of copper sheet used for making the float shall be 0.45mm for a float exceeding 115mm dia. The body of the high-pressure ball valve when assembled in working condition with the float immersed to not more than half of its diameter shall remain closed against a test pressure of 3.5kg/sqcm.

The ball valve shall generally conform to IS specification No.1703: 1977. The weight of ball cock and the size of the ball cock shall be as per IS specification.

5.1.5. FOOT VALVES

Foot valves are provided with cast iron body with brass disc and strainer of approved quality as shown in drawings and/or specified herein. The foot valve shall be of spring loaded or flapper type depending on the requirement. The valves should be tested physically for free operation before being mounted or assembled to the pipeline.

5.1.6. BUTTERFLY VALVES

Butterfly valves shall be slim seal, short wafer type with standard finish. The valves shall be suitable for mounting between flanges drilled to ANSI 125. The valve body shall be cast iron. The disc shall consist of disc pivot and driving stem shall be in one piece centrally located. The disc shall move in bearings on both ends with 'O' ring to prevent leakage. The seat shall be moulded with black nitrile rubber or nylon and shall line the whole body. The spindle shall be AISI 41 steel. The valve shall be suitable for a working pressure of 16.5 kg/sq.cm and shall be

complete with flow control lever and notches, factory machined companion flanges and bolts and nuts. These valves conform to BS 5155 with electro steel nickel coated SG Iron (N) and seat material EPDM3.

5.1.7. CHECK VALVES

Check valves are designed to prevent reversal of flow. These are also called Non-return valves or reflux valves to avoid reversal of flow. Check valves shall be Dual Plate check valves with CI body, aluminum bronze plate SS 316 hinge pins and springs and Buna-N seals to ANSI series 125. They can also conform to IS 778-1984, Specifications for Copper Alloy Gate, Globe and Check Valves for Water Works.

5.1.8. STRAINERS

"Y" strainers up to 50mm shall be of gunmetal and above 50mm shall be of cast iron body. Strainers shall incorporate a removable bronze screen with 3.175 mm (1/8") perforations and a permanent magnet. Strainers shall be provided with flanges at both inlet and outlet. They shall be designed to enable blowing out of accumulated dirt and facilitate dirt and facilitate removal and replacement of the screen without disconnection of the main pipe.

All strainers shall be provided with equal size isolating "Slim Seal" butterfly valves of approved brands as shown in drawings so that the strainer may be cleaned without draining the system

5.1.9. FLANGES AND UNIONS

Sufficient number of flanges and unions shall be provided as required to facilitate maintenance work after the piping is installed. Mild steel flanges shall be used for pipes. The flanges shall be connected to the pipeline by screwing or welding depending on the requirement. The flanges shall conform to the relevant ASTM standard for the particular material used for its manufacture. The flanges shall also conform to IS 5211.

5.1.10. PRESSURE REDUCING VALVE

Pressure relief valves are provided to keep the pressure in the line below a given value within the reasonable limits in the downstream side of the pipeline when the pressure builds up beyond the design value. Pressure reducing valves shall be of high-pressured type of specified sizes. The valves should be suitable for mounting between flanges and threading connections also. The valve body shall be of bronze / SS as specified. The valve shall be of spring loaded, direct operation, metallic diaphragm type, as required for the particular usage.

The pressure reducing valves should be manufactured in conformance with ASA-150,300,600,800,900 and 1500, or to BS10- table – D, E, F, H or DIN- ND-16 & ND-40.

5.1.11. BRASS BIB COCK AND STOP COCK

A Babcock is a draw off tap with a horizontal inlet and free outlet and stopcock (stop tap) is a valve with a suitable means of connections for insertion in a pipeline for controlling or stopping the flow. They shall be of specified size and shall be screw down type. The closing device should work by means of a disc

carrying a renewable non-metallic washer, which shuts against water pressure on a seating at right angles to the axis of the threaded spindle, which operates if. The handle shall be either crutch or butterfly type securely seated pattern. The cocks (taps) shall open in anticlockwise direction.

The bibcock and stopcock shall be polished bright (Chrome plated). The minimum finished weights of bib tap (cock) and stop tap (cock) as given in the IS specification are reproduced in the table**:**

Size	Minimum finished weight Bib tap	Stop tap
Mm	kg.	Kg.
8	0.25	0.25
10	0.30	0.35
15	0.40	0.40
20	0.75	0.75

5.1.12. LEVEL SENSORS

Level sensor shall consist of control unit, preamplifier and one full insulated probe-mounted vertically or two part insulated probe mounted from tanks side wall adjustable switching system for pump control application, the same to be housed in stove enamel painted cast aluminum weather proof suitable for black panel / wall mounting etc.,

The enclosure of probes shall be manufactured with SS316 material. The least count of the central unit with amplifier should be +/- 0.10mm for response value of 30 seconds. Level sensors shall be provided with controls housed in control panel of the pumps.

5.1.13. ANTI FLOOD NON-RETURN VALVES FOR SEWERAGE CONNECTION

These valves are used for eliminating flood risk from the sewerage system. These valves should conform to the Building Regulations (H1- A13) and British standard BS 8301-1985.The valve should suit every angle without restricting the internal cross-section of the pipe. The valves shall be suitable for maintenance in accordance with CDM regulations, 1994. The valve is to be installed in level. For valves installed for depths more than 1 meter require brickwork or concrete construction in accordance with BS 5955- Part6 – 1980.The valve is to be suitable installed as per the manufacturer's instruction.

4.14 RELIEF VENTS

Drainage systems, especially those in tall buildings, are frequently found to develop extremely high and objectionable pneumatic effects in several specific portions of such piping. Special air pressure relief vents are recommended to control, within tolerable limits.

The air pressure relief vent, at least one-half the diameter of the building drain, should be provided at the top of vertical offset so as to supply such additional air to the drain as may be required by the sudden increase in liquid velocity in the vertical offset Where a building trap or other sharp change in flow direction is

provided in the building drain downstream from the vertical offset, an air pressure relief vent should be provided at the base of, and within 3 ft (0.900m) of, the vertical offset. Lower relief vent should be branch –connected to the upper relief vent at a sufficient height.

The recommended provision for soil and waste stacks more than ten stories in height is to provide a yoke relief vent at each tenth story of the drainage stack, counting downward from the top story. The lower end of the yoke relief vent should connect to the drainage stack by means of a Y located below the horizontal branch drain serving fixtures in that story, and the upper end should connect to the vent stack by means of a T or inverted Y located at least 3 ft (0.900m) above the floor level as shown in the drawing.

5.1.14. INSTALLATION OF VALVES

Valves should be installed in true tolerance of +/-5mm with respect to the centreline of the pipe. Where threaded joints are encountered the threads should be initially sealed with PVC tape to avoid leakage due to improper tightening and leakage from threading.

Proper care has to be taken in welded installation so that the centerline of valve should not deviate from the pipe causing uneven load on the pipe and further stress during its operation. The welding should be done only after proper inspection of the joint by the Construction Managers / Professional Team in the tacked position of the joint.

Before putting the line in operative mode the valves should be checked for free and easy operation of the hand wheel. Any burrs or foreign materials should be removed by flushing before final operation so that no choking in the valves should occur which might damage the valve seating.

5.1.15. WATER HAMMER ARRESTORS

The effective fluid hammer which result in breaking of pipeline caused due to series of hydraulic shock should be arrested by means of a water hammer arrestor. The arrestor shall be capable of withstanding pressures up to 30 Kg/Sq.cm. and temperatures in the range of –400F to 2120F (-540C to +1000C). It shall be maintenance free with a companion flange to suit in the pipeline. The following materials are used for its manufacture

Barrel – MS Class C (heavy class) pipe
Cap - Malleable cast iron fittings attached to Barrel.

The sealed chamber type shall be installed upstream of flush valves or quick closing valves. The size to be as recommended by manufacturers recommendation submitted for approval.

6. PUMPS

6.1.1. DIFFERENT TYPES OF PUMPS:

The pump set offered shall be generally horizontal / vertical centrifugal pump, single stage or multistage or monobloc pump to satisfy the duty conditions stipulated. The pump set shall conform to IS 8034-1972, IS 5120-1968 for

handling water, IS 8034-1976 for submersible pump sets and IS 5600-1970 for pumping storm water and sewage.

The pumps shall be selected having their maximum efficiency at average operating conditions. The maximum speed at which a pump shall run is determined by the net positive head available at the pump, the quantity of liquid being pumped and the total head.

6.1.2. MATERIAL OF CONSTRUCTION FOR CENTRIFUGAL PUMPSETS:

Material of construction for different parts of pump set shall be as per IS 5120. Following are indicated for guidance for pumps handling clear, cold fresh water

Bronze fitted pump Casing	Cast iron – grade 20 of IS 210-1970
Impeller, casing ring, impeller ring, shaft sleeve	Bronze – grade V of IS 318-1962
Shaft	Steel
All cast iron	Grade 20 of IS 210-1970
All bronze	Grade V of IS 318-1962
Standard fitted Casing	Cast iron – grade 20 of IS 210-1970
Impeller, casing ring, impeller ring, shaft sleeve	Bronze – grade V of IS 318-1962

The material of construction for different classes of construction shall be generally as follows:

All cast iron pump	All bronze	Bronze fitted	STD. Fitted
Casing	Cast iron gr.20	Bronze	Cast iron
Cast iron	Impellers	Cast iron gr.20	Bronze
Bronze	Bronze	Impeller wearing	
Rings & bush	Cast iron gr.20	Bronze	Bronze	Bronze
Shaft	Steel	Steel	Steel	Steel
Shaft sleeve	Mild steel	Bronze	Bronze	Bronze
Sleeve nuts	Mild steel	Bronze	Bronze	Bronze
Gland	Cast iron / GM	CI / GM	CI / GM	CI / GM

6.1.3. MATERIAL OF CONSTRUCTION FOR SUBMERSIBLE PUMPSETS: generally, confirm to IS: 8034-1976

Bearing sleeve	Grade 3,4 or 5 of IS: 318-1962
Casting wear ring	Grade 3,4 or 5 of IS: 318-1962 or gr. FG 200 of IS:210-1978
Discharge casing	Grade FG 200 of IS: 210-1978.
Impeller	Grade 2 of IS: 318-1962 or grade FG 200 of IS:210-1978.
Pump bowl	Grade FG 200 of IS: 210-1978.
Pump shaft	12 percent chromium steel (grade 04 or 13, 12 or 13 and 20 or 13) conforming to IS: 1570 (Part-V)-1972 or grade C40 or C45 of IS: 1570-1961 'Schedules for wrought steels for general engineering purposes.
Suction casing	Grade FG 200 of IS: 210-1978.

6.1.4. GENERAL REQUIREMENTS:

Since the motor and the pump are directly coupled or close coupled, the manufacturer shall indicate the minimum size of the sump in which the submersible pump can be erected and suspended freely.

For smooth and efficient working of the submersible pump set, the manufacturer shall recommend the minimum submergence.

6.1.5. SUBMERSIBLE MOTOR:

The submersible motor shall be squirrel case induction motor.

The windings shall be wet or dry type.

The motors shall be suitable for operation on voltages and the frequency conforming to IS: 585-latest edition voltage and frequency for AC transmission and distribution systems (revised).

The earthing of the motor shall comply with IS: 3043-latest edition 'code of practice for earthing'.

The thrust bearing shall be of adequate size to withstand the weight of all rotating parts as well as the imposed hydraulic thrust. These shall be lubricated suitably.

The motor shall be protected by means of cable glands, rubber seals, etc., from ingress of bore well water, sand and other foreign matter.

The rotor shaft shall be provided with shaft protecting sleeves having a surface finish conform to IS: 3073-latest edition. However, for short length of shaft made of stainless steel, protecting sleeves may not be provided.
The motor shall be made of corrosion resisting materials or suitably treated materials to resist corrosion under normal conditions.

The motor shall have a nameplate giving the following information:
Induction motor
Name of manufacturer
Manufacturer's number and frame reference
Type of duty
Frequency in Hz
Number of phases
Rated output in KW
Rated voltage and winding connections
Current, approximate, in amperes at rated output and
Speed in revolution per minute at rated output.

There shall also be an indication to identify a motor with its pump.

The cable used for submersible motors shall conform to IS: 694 (Part-I)-1964 – Specification for PVC insulated cables with copper conductors.

Material of construction for other parts of pumps shall be as per IS: 5120 for pumps handling clean cold fresh water.

Material of construction for handling sewage shall be as per IS: 5600-1970.

All cast iron fitted – grade 20 of IS: 210-1962.

All stainless steel - Schedule I of IS: 1570-1961.

6.1.6. GASKETS, SEALS AND PACKINGS:

The gaskets, seals and picking are used in special purpose pumps shall be suitably chosen so as to withstand the effect of liquid being pumped.

Liquid pumped	Material for seals.
Clear cold fresh water	Mechanical seal.
Sewage	Mechanical seal.

6.1.7. ACCESSORIES:

Essential for pump set used for pumping water.

Oil lubricator with oil level indicator if the pump is lubricated.
Grease cup for grease lubricated bearings.
Flanged ball valve/Gate valve on suction side if there is positive suction.
Flanged ball valve/Gate valve on delivery side.
Flanged horizontal/vertical check valve on delivery side.
Pressure relief valve.
Pressure gauge (for delivery pipe) and vacuum gauge (for suction pipe) with copper tubing and vinch cock.
Priming funnel with separate or integral air cock.
Float switches or automatic level operated control switch.
Base plate.
Foundation bolts and nuts.

Essential for pump set used for pumping storm water/sewage.
Vacuum pump if there is no positive suction.
Flanged sluice valve on suction side if there is a positive suction.
Flanged reflux valve on delivery side.
Flanged sluice valve on delivery side.
Pressure relief valve (for high head pumps)
Coupling.
Pressure (for delivery pipe) and vacuum gauge (for suction pipe) with brass/copper tubing and vinch cock.
Base plate.
Foundation bolts and nuts.
Ball type air relief valve.
An automatic level operated control switch may be provided as an optional accessory.

6.1.8. Essential design features:

The pumps shall have suitable features properly designed to ensure satisfactory performance. In particular design features, such as the following shall be incorporated.

For water pump sets:

In case of more than one duty point, the performance range is to be indicated and the prime mover should be of sufficient power to take the entire load in this range. Head (restrictions) shall be indicated in the nameplates to avoid overloading of the prime mover.

For working in parallel pumps should be with stable head capacity characteristics.

Arrangement for cooling of bearings where required.

Balancing water leakage connection should be provided in case of multistage pumps with balancing discs.

Thrust bearing of adequate size.

For sewage pump sets:

The size of solids should be at least up to 80% of the outlet width of the impeller.

Casing and impeller should be so designed to allow free passage of the specified max size of solid.

Hand holes should be provided in the casing one to allow early access to the impeller eye, and one close as possible to the casing throat.

On account of the abrasive nature of sewage, provision should be made on stuffing boxes to ensure clear water supply or grease lubrication to the glands shall be provided from external source according to the directions of the manufacturer.

Information to be furnished by the supplier along with tender for performance with clear cold fresh water.

Pump type.
Discharge in liters per second.

Head in meters.
Suction pipe size in mm dia.
Delivery pipe size in mm dia.
Power at shaft in Kw.
Speed in revolution per minute.
Required NPS in meters.
Performance curves.
Materials of construction.
Casing
Casing ring
Impellers
Impeller wearing rings and bush
Shaft
Shaft sleeves
Gland
Sleeve nuts
Recommended:
Suction pipe size in mm dia.
Delivery pipe size in mm dia.
Weight of the pump in Kg.
Any special instruction for installation, operation and maintenance use of special tools.
Sealing arrange:
Recommended spares for 2 years' service and cost.
Prime mover – all information corresponding to the particular in the item for satisfactory performance of the pump.

6.1.9. Pump Test:

Pump tests are made to determine the following:

The discharge against the specified head when running at the rated speed under specified suction lift or head.
The power absorbed by the pump at the pump shaft (BP) under the above-specified conditions and efficiency of the pump under the above specified conditions.

The pump has to be tested at manufacturers works and a test certificate furnished before supply and tested at site after installation.

6.1.10. PUMP INSTALLATION

INSTALLATION
Certain precautions must be observed in planning a pump installation and during the erection period. Some of these points will now be considered.

PIPING
Both the suction and discharge lines should be independently supported so as no strains will be thrown on the casing such strains may cause distortions and rubbing.

The suction line should be as short and straight as possible. Any elbows should have large radii. For pumps operation with suction lifts no valves other than a foot –valve should be placed in it. Generally, the diameter is made one or two sizes larger than the pump flange size. All these precautions insure the maximum

available suction head on the pump. When an oversize line is used an eccentric reducer which is horizontal at top is placed between it and the pump flange size.

It is very important to have the suction line airtight and to avoid high spots at which dissolved gases or air might separate out and destroy the vacuum. After piping is installed and the pump is running all joints should be inspected with a flame, as air leakage will draw the flame to the opening. The same method can be used to determine leakage through the packing box; the eccentric reducer is used at the suction flange to avoid high spot at which the air might collect. The inlet end of the suction line i.e., submergence should be 1 to 2m below the minimum water level of the pump (not less then 1m) to prevent air from being drawn into the pipe with the water.

It is desirable to have as long a length of straight piping between the elbow and suction flange as possible to even out the flow of the water as it enters the pump. The pump should be placed to secure the greatest possible suction head and yet to be available for inspection and repair work.

A check valve and gate valve are usually placed in the discharge line. The gate valve is used to regulate the flow and the check valve prevents backflow into the pump, which might cause it to operate like a turbine and perhaps be damaged on account of over speed. The check valve is placed between the gate valve and the pump so that it may be inspected or rewired without emptying the discharge line. Each pump set shall be provided with 115mm dia. pressure gauge gunmetal isolation cock and siphon connection pipe.

FOUNDATION

The foundation with anti-vibration pads should be heavy to reduce vibrations and should be rigid to avoid any twisting or misalignment. A space of suitable height is allowed between the base plate and top of the foundation to accommodate approved make anti vibration pads.

The base plate should be drawn down evenly to avoid springing it. After this has been done the shaft is finally aligned both radically and axially with the driver by means of shims or wedges so that it turns freely. If the shaft is not properly aligned there will be vibration and excessive wear on the bearings, packing and wearing rings.

6.1.11. PUMP OPERATION

TRAIL OPERATION

The operation of centrifugal pump is quite simple and safe. There are relatively few valves and the pump will not be damaged even if the discharge valve is closed for short periods of time.

STARTING

The pump must be primed before it will deliver any fluid. Failure to prime the pump may cause the wearing, rings, rub and seize or the shaft may be scored at the packing boxes. During starting it is wise to have the vent cock in the casing open slightly to remove any dissolved air in the water.

It is best to have the discharge valve set so that the least load is thrown on the driver when the pump is started. The valve should be opened gradually to avoid throwing a large sudden load on the driver and to prevent a sudden surge in the

discharge line. The discharge valve should be fully open when starting mixed flow or propeller pumps because the brake horsepower will then be a minimum.

RUNNING
When the unit is running it requires very little attention beyond occasionally checking to see that

the journal and thrust bearings are running cool and have a sufficient supply of oil.

The packing is adjusted to permit a slight leakage to cool and lubricate it, and

the water is flowing to the water seal of the suction gland to prevent air from leaking in.

SHUTTING DOWN
When shutting down, the discharge valve should be in the same position as when starting up by closing the discharge valve gradually so that less power is dropped from the line and any sudden pressure surges in the pipe system are avoided.

INSPECTION AND MAINTENANCE
Manufacturer supply instruction books which give directions for the operations for the operation and maintenance of each pump. The following information is general.

The wearing ring clearance should be checked as they will increase with time and thus cause a decrease in efficiency. The frequency of the inspection will depend upon the liquid handled. If the liquid contains gritty materials or is corrosive, inspection may be made monthly, but if clear water is pumped it may be sufficient to check them annually. A general rule is to replace the rings when the clearance has increased 100 percent above the original.

The packing should be replaced after it becomes hard and tends to score the shaft. When the packing is being replaced the finish of the shaft sleeves should be examined for smoothness. It is essential that the lantern ring be placed directly under the water inlet when putting in the new packing to insure a circulation of the water and a satisfactory seal. The packing should be gradually compressed with the pump running. It should not be compressed too much as local heating of the shaft and consequent misalignment will result. A slight leakage will insure proper lubrication and cooling.

If the base is not too rigid the shaft alignment should be checked occasionally when the pump is at a temperature corresponding to running conditions. This must be done with the packing removed. At the same time the clearance of the journal bearings should be checked for wear.

The oil should be changed as required band at that time inspected for the presence of water. If water appears in the oil the pump casing should be examined to find the leak.

6.1.12. GUARANTEE OF PERFORMANCE

The pumps shall be guaranteed by the manufacturer/supplier against defects in material and workmanship under normal use and service for a period of at least one year from the date of issue of the Certificate of Substantial Completion.

The supplier shall indicate the working range of the pump and the efficiency of the pump shall be guaranteed at a specified point of rating only and shall not be guaranteed to cover the performance of the pump under conditions varying there from nor for a sustained performance for any period of time. If the purchaser so desires, the manufacturer shall guarantee the non-overload of the prime mover for variations in the head in the working range. In the case of pumps where acceptance tests cannot be conducted on the liquid for which the pump is designed, the manufacture shall indicate the liquid performance of the pump based on the results of the tests conducted by him on the pump with water as indicated under 13 and interpolated as explained under 14 (IS 5120). However, in these cases, the manufacture shall guarantee for the performance of the pump with water for the specified range.

TOLERANCE

A tolerance of ±2.5 percent shall be permissible on discharge. However, for small discharge up to 9000 liters per minute, a tolerance of ±2.5 percent or +24 liters per minute which ever is higher is allowed. While the negative tolerance 2.5 percent is maintained.

The pump efficiency shall be not less than the specified valve by more than 2.5 percent. This tolerance may be raised to 5 percent in case the prime mover does not get overloaded.

6.1.13. GENERAL REQUIREMENTS

The specified range shall lied on the stable portion of the head characteristic curve. This is applicable in case of parallel operations of pumps only.

SUCTION AND DELIVERY ENDS

The size of the suction end of a double suction pump should preferably be one size larger then that of the delivery. This is to offset the increased loss in the suction. Typical practices of piping used are
85/65m, 100/75m, 125/100m, 150/125m, 200/150m and 250/200m etc.,

For a high-pressure pump, a reflux valve shall be connected on the delivery side and a pressure relief valve installed in pumping main outside pump house. Need for surge control devices verified.

FLUID PASSAGES

All the liquid passages in the casing and the impeller which are inaccessible to machining shall be finished to smooth surface as for as possible.

DRAINAGE PLUGS

Tapped drain holes with plugs shall be provided for draining the fluid that may drip from the sealing arrangement. The sealing arrangement shall be sufficiently deep to provide for sufficient quantity of packing to prevent leakage of air.

LANTERN RING

In case, where a lantern ring is used in a stuffing box, it shall be sandwiched between rows of pickings and shall be easily removable.

CASING
Casing shall be of robust construction and tested to withstand 15 times the shut-off pressure or twice the rated pressure whichever is higher.

IMPELLER
The impellor shall be properly balanced along with any other un-machined rotating parts on proper balancing equipment so as not to cause any vibrations.

SHAFT
The shaft shall be finished to close tolerance at the impeller coupling, pulley and bearing diameters. The impeller, pulley and shaft sleeves shall be firmly secured to the shaft by keys or nuts of both.

SHAFT COUPLINGS
Shaft couplings, where provided, shall be properly aligned and firmly secured to the shaft by keys or nuts on both.
The size of the shaft shall be calculated on the basis of the maximum combined shear stress. This shall not exceed 30 % of the elastic limit in tension or 18% of the ultimate tensile strength.

The next higher standard size of shaft in accordance with the relevant standard shall be chosen.

The design of the shaft shall also be taken into consideration the critical speed of the shaft, which shall differ from the actual working speed by at least ten percent on either side.

BEARINGS
The bearings should be designed for a minimum life of 20,000 hours or 40,000 hours as required. The bearing housings are designed in such a manner that no liquid being pumped should enter the housing.

The bearing may be ball, roller or sleeve bearings. In the latter case, some types of thrust bearings are necessary. If sleeve bearings are used, they are to be machined for close running fit. The bearings shall be so designed as to take up the necessary radial load as well as the net hydraulic axial thrust. Bearings shall be lubricated properly.

Where there is a possibility of fluid entering the bearing the pump shall be provided with suitable preventive arrangements for example, deflectors.

STUFFING BOXES
The stuffing boxes shall be extra deep and provided with a cooling water jacket if so required. In addition, provision for tapping off the leakage liquid shall also be make. The packing materials employed shall be suitable for withstanding special conditions such as temperature, corrosion due to the fluid being handled etc. wherever possible, suitable mechanical seals may be used.

BASE PLATES
The base plates, which accommodate the pumps and the prime mover, when provided shall be rigid so that alignment is not affected under normal working conditions.

PRIME MOVER
The prime mover shall be of a such capacity a provide, under working site conditions a power which is more then maximum power required by the pump at any point in the specified range should be a specific margin be required by the customer in the power of the prime mover, he should go advise the manufacturer for obtaining the proper recommendations.

Name plate: Every pump shall have a nameplate indicating:

Name and address of the pump manufacturer.

Type, size and serial number of the pump and

Speed, total head, capacity and corresponding pump input for the duty point.

For corrosive liquids the material of the nameplate shall suitable to withstand the corrosive atmosphere.

HYDROPNEUMATIC SYSTEM (If Applicable)

SPECIFICATION FOR PRESSURISED WATER BOOSTING SYSTEM USING VARIABLE SPEED DRIVE

Supply of booster set consisting upto a maximum of six identical vertical multistage in - line pumps in cast iron GG20 pump head & base c/w cataphoresis coating, cartridge type mechanical seal, all internals in AISI 304 stainless steel, mounted on common galvanised steel base frame and controlled by variable frequency drives & a PFU (Pump Functional Unit) logic controller, which have features like application optimised software, regular optimization of operating conditions and read-out of operating data, Bus Communication possibility, Digital remote-control functions, pump & system monitoring functions, Display, Alarm & signal functions and clock programs. Panel to have 2x24 character LCD display, green & red LED's for operating & fault indication, potential free contacts for remote interfacing, an inbuilt lifetime battery backup for all clock functions.

Booster set should include non-return valves, isolating valves, pressure transmitter on discharge side, non-return valve, pressure gauge all mounted on a factory assembled SS manifolds.

Booster set should ensure constant pressure on discharge side through continuously variable adjustment of speed of one of the pumps, while the remaining pumps in operation are running on mains operating at full speed to bring about pump performance to meet consumption levels. Also provision should be made for alternate change over between pumps in operation once every 24 hours & frequency converter operation of pumps by rotation - all should be built in, cyclically, in the controls to ensure equal wear and tear of all pumps in the booster set. Means should be provided for friction loss compensation for increased consumption rate.

Booster set should incorporate following "Power saving features" as standard.

Selection of 3 basis set points for pressure relative to time.

Pipe compensation i.e. Change of set point depending on water consumption.

Compulsory change of staring of sequence, i.e. Equal operating time for pump, both for frequency control and ON/OFF regulation.

Inputs and outputs for external communication.

A small sized pressure tank, (accumulator) to provide for reducing impact of water hammer and minimize short cycling of the pumps. The accumultors are piped to allow for in service maintenance.

The functions of the Controller should incorporate the following features.,

Closed loop control .
On / Off operation at low flow.
Automatic cascade control of pumps
Selection of switching sequences , automatic pump change and pump priority.

Manual Operation.
Analog set point influence
Friction loss compensation
Set point adjustment

The remote control functions should have the following features.,
System On / Off
Set point control
Switching of individual pumps

The monitoring functions should have the following features.,
Min / Max Levels
Pre pressure
Motor protection
Water shortage monitoring

Enclosure Class : Control Box IP 54.
Motors IP 55.

7.0 TANK FITMENTS

7.1 PUDDLE FLANGES FOR RESERVOIR (INSERTS)

Inlets, outlets, interconnection sleeves and drain outlets for the reservoir Ground level and terrace level shall be made through mild steel bath galvanized puddle flanges obtained from reputed manufacturers and to be inserted at suitable levels as indicated on the drawings. The Contractor shall be responsible for placing the inserts at required level well in advance and before making the final shuttering layout for casting the walls.

7.2 MANHOLE COVERS

The manhole covers shall be of heavy-duty type (cast iron) with double seal, locking arrangement and lifting hooks. (Weight 110kgs.) manufactured as per IS-1726. The shape of the cover to be as per the drawings.

7.3 ALUMINIUM STEP LADDER

For effective maintenance of the reservoir portable aluminium stepladder to suit the depth of the tank shall be provided with necessary hooks.

8.0 WATER PIPE INSULATION

8.1 USE

Hot water supply and return pipes will be insulated with fiberglass wool. Cold water pipes embedded in walls shall be insulated with same material as embedded hot water pipe.

Cold water pipes underground shall be wrapped as detailed in this section.

8.2 CLEANING

Before proceeding with the insulation works for hot water supply and return pipes the pipe surface should be thoroughly cleaned and made free from oil, grease or any other foreign material.

8.3 GLASSWOOL

Suitable thickness of glass wool shall be provided and wrapped with 20 gauge GI lacing at 150mm center and covered with GI wire netting of 24 gauge all around the pipe insulation.

Pipes 50 mm and below shall have 25 mm thickness and 65 mm and above shall have 40 mm thickness of insulation.

The pipe shall be clad with 20gauge aluminum sheet including all bends, unions, flanges, valves etc., to complete the insulation.

The fibre glass wool shall have density = 100 Kg/m3 and K value of not less than 0.045 Kcal/m. h0 C. at 1000 C.

The manufacturer of fiberglass shall be either Owens Corning or approved equivalent.

8.4 ELASTOMETRIC INSULATION

Alternatively, high quality closed cell lightweight electrometric insulation material as manufactured by M/s Poly bond organics shall be used for both hot and cold water pipe insulation. The insulation shall be carried out as follows:

Pipe surfaces shall be thoroughly cleaned and dried before the vidoflex rubber insulation is applied and shall be free of dirt, grease and rust scale or other foreign matter. The pipe shall be cleaned mechanically.

Oil and grease, if present on the pipe surface should be removed by using suitable solvent and clean rags. The use of dirty, oil rags should not be permitted.

8.5 FIELD APPLICATION OF TAPE.

The Vido flex rubber insulation shall be wrapped in accordance with the manufacturers recommendations in a manner that shall meet the adhesion requirement. During application, care shall be taken to ensure that there are no air pockets or bubbles beneath the tape. The tape should be wrapped with an overlap of 50% of Tees. The first wrapping shall be done individually. The tape

may be cut if required to suit the profile. There shall be two layers of tape wrappings. The first layer is to be wrapped on the pipe directly after cleaning the pipe surface. The second layer is to be applied over the first layer, wrapped with 50% lap.

8.6 COLD WATER PIPES BELOW GROUND (For GI Pipes)

The cold water pipes passing below ground shall be wrapped and coated with 2mm thick up to 67mm dia and 4mm thick for higher dia with 50% overlap.

LIST OF APPROVED VENDORS / MANUFACTURERS

SL. No.	Item	Make / Manufacture or approval equivalent
A	**Interior & Civil Works**	
1.	Ordinary Portland Cement 43 Grade	Zuari, A.C.C., Birla, Ultratech.
2.	White Cement	Birla White, JK White
3.	Reinforcement Steel (TMT) & Structural Steel.	SAIL, TISCO, RINL, Vizag Ispat, Visweswaraya Iron & Steel Ltd. Bhuwalka,Indus.
4.	Ready mix concrete	RMC, Larfageg, Ultra-Tech, SVB, ACC, RDC.
5.	Paints.	Asian paints, Berger, Shalimar, Jenson & Nicholson, I.C.I., British paints, Goodlass Nerolac, Garware.
6.	Cement Paints.	Snowcem, Jenson & Nicholson, Durocem, Surfacem, Trump Snowcem.
7.	Solid & hollow concrete block	APPCO, GEM OR EQIVALENT
8.	Bricks	KBW, BRB OR EQIVALENT
9.	Structural Steel	TATA/Jindal
10.	Anchor bolts	Hilti
11.	GI Pipes	TATA/Equivalent
12.	MS pipes	TATA/ Equivalent
13.	UPVC	Pipes, Finolex, Supreme, Prince
14.	CPVC Pipes	Ashirwad Flow Guard, Prince, Astral
15.	CP fittings	Jaguar, Futura, Cera

Note: Contractor shall obtain prior approval of IIMB before procurement of the Materials listed above. If the above Brands of Materials are not available, Engineer-in-charge shall allow use of other brand material duly approved by Chief manager(infrastructure), provided they confirm to the requirement of IS as per Technical Specification/Quality Plan as enclosed with the Tender Document.