

E-Tender for Proposed Sewage Treatment Plant at National Insurance Academy, Balewadi, Baner Road, NIA P.O., Pune-411045, on Design, Engineering, Procurement and Construction (Turnkey) Basis.

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CONDITIONS OF CONTRACT

1. INTERPRETATIONS:

- 1.1 In construing the Conditions, the Specifications, the Priced Schedule of Quantities submitted by the contractor, Tender and Agreement, the following words shall have the meanings herein assigned to them except where the subject or context otherwise requires:
- 1.2 “Employer” shall mean **National Insurance Academy (NIA)** and his (their) heirs, legal representatives, assignees and successors.
- 1.3 “Director” shall mean the person occupying the post of head of the National Insurance Academy.
- 1.4 “Officer-in-Charge” shall mean such representative of the Director, National Insurance Academy and/or Representative of NIA, who shall from time to time be appointed by the Director for supervising the work carried out by the Contractor or for any purpose in connection therewith:
- 1.5 The term “Site Engineer” shall mean the person appointed and paid by the Employer, acting under the order of the NIA to superintend the work.
- 1.6 The Contractor shall mean the individual, firm or company whether incorporated or not, who is awarded the contract & shall include the legal representative of such individual or the persons composing such firm or company or the successors of such individual, firm or company & the permitted assignees of such individual, firm or company.
- 1.7 The “Site” shall mean the lands and/or other places on, in, into or through which work is to be executed under the contract or any adjacent land, path or street which may be allotted or used for the purpose of carrying out the contract.
- 1.8 “This Contract” shall mean the Articles of Agreement, Conditions of contract , the General Instructions to Contractor, Appendix to Condition of Contract, Special Conditions, Scope of work, Specifications, Drawings provided by NIA, drawings submitted by Contractor and approved by NIA, Detailed Quantity Estimation & price schedule submitted by Contractors based on drawings (both drawings provided by NIA and submitted by Contractors), Stages of payment and allied documents pertaining to works provided by NIA and other related correspondence, etc.
- 1.9 “Act of Insolvency” shall mean any act of insolvency as defined by the Presidency Towns Insolvency Act, or the Provincial Insolvency Act or any amending Statute.
- 1.10 “Notice in Writing” or written notice shall mean a notice in written, typed or printed characters, sent (unless delivered personally or otherwise proved to have been received) by registered post to the **last known** private or business address or registered office of the addressee and shall be deemed to have been received when in the ordinary course of post, it would have been delivered.
- 1.11 Words importing persons include Firms and Corporations, words importing the singular also include the plural and vice versa where the context so requires.
- 1.12 The titles of the Clauses shall not affect or alter the meaning of Clauses and are solely for the purpose of facilitating reference.
- 1.13 Wherever the words “approved”, “directed”, “as required”, “selected” or words of like effect are used, it is to be understood that the approval/direction, requirement or selection of the NIA’s representative are intended unless otherwise specified.

1.14 The words “as described” shall mean the description in the scope of work, Specifications, Special conditions, general Instructions, drawings both supplied by NIA and submitted by the Contractors of this tender.

1.15 The words “allow” shall mean that the Contractor shall include in his rates for the particular matter referred to.

2. SCOPE OF CONTRACT:

2.1 The Contractor shall carry out and complete the works in every respect in accordance with this Contract and in accordance with the directions, **Detailed Scope of work given Separately, Specification and Drawings** and to the satisfaction of the Director, NIA. NIA may issue further written instructions, details, directions and explanation in regard to:

- a. The variation or modification of the Design, quality of works or the addition or omission or substitution of any work.
- b. Any discrepancy in the **scope of work, Specifications and Drawings provided by NIA and drawings, Estimations and priced schedule of quantities submitted by the contractor.**
- c. The removal from the site of any materials brought thereon by the Contractor and the substitution of any other material thereof.
- d. The removal and/or re-execution of any work executed by the Contractor.
- e. The dismissal from the work of any persons employed thereupon.
- f. The opening up for inspection of any work covered thereupon.
- g. The amending and making good of any defects **under relevant Clause** giving details of defects after completion.

2.2 The Contractor shall forthwith comply with and duly execute all works comprised in such Instructions subject to the provisions of relevant specific conditions of the Contract. In the event of any dispute or difference of opinion the contractor shall refer the matter within 7 (seven) days of the issue of such instruction to the Director, NIA whose decision shall be final & binding.

3. DISCREPANCIES:

3.1 If there are varying or conflicting provisions made in any one document forming part of Contract, the Director, NIA shall be the deciding authority with regard to the intention of the document and his decision shall be final and binding on the contractor.

3.2 The several documents forming the Contract are to be taken as mutually explanatory of one another and the order of precedence shall be as follows.

- a) Special conditions
- b) specifications of the work
- c) General instructions
- d) Conditions of contract

3.3 In case of discrepancies between **the specification of work given by NIA and detailed vetted drawings submitted by the contractor** the following order of precedence shall be observed:

- (a) **Detailed Drawings**
- (b) **Detailed specification**
- (c) Indian Standard Specifications of ‘BIS’

4. DRAWINGS AND SCHEDULE OF QUANTITIES:

- 4.1 NIA will provide only the Schematic Drawing/Plan of NIA premises with the Bid Documents. The Contractor to verify the drawing with the Scope of work and Technical Specifications and generate all the working drawings required for execution of work including shop drawings, fabrications drawings in accordance with latest relevant BIS Codes / National Building Code. The Contractor needs to get acceptance of NIA to all the working drawings before actual commencement of work at Site. The Structural Drawings and any other drawings as specified elsewhere shall be vetted by NIA through a Consultant before acceptance of NIA. The drawings accepted by NIA shall only be used in the execution of work.

The Contractor Shall provide Four Sets of all the working Drawings with Soft Copy in AutoCAD to NIA before commencement of work. The Contractor shall maintain the secrecy as regards to Drawings and shall not share the drawings to any third party without prior approval of NIA.

On successful completion of the work, the Contractor to submit all the copies of Drawings to NIA. All the Drawings will be property of NIA.

- 4.2 As mentioned elsewhere in the Tender Document, the Contractor shall prepare and submit the Schedule of Quantities and cost of works of all the items required for execution of the work in totality as per Scope of work, Drawings, Specifications and in compliance of requirements of all the Statutory Authorities. The Rates shall be taken from latest CPWD DSR with applicable Cost Index. For non-DSR Items the Contractor shall prepare the Rate Analysis based on market rates of materials and labour wages etc. with 15% Contractor's profit on actual execution basis. The rate analysis shall be supported with Budgetary Quote/ Quotation of Specialized Agencies/ OEM etc. for Specialized work.

5. CONTRACTOR TO PROVIDE EVERYTHING NECESSARY FOR EXECUTION OF WORK:

- 5.1 Contractor shall provide everything necessary for the proper execution of the work according to the intent and meaning of the Drawings, Priced Schedule of Quantities and Specifications taken together, whether the same may or may not be explicitly shown or described therein provided that the same can reasonably be inferred there from and if the Contractor finds any discrepancy therein he shall immediately and in writing refer the same to the Director, NIA whose decision shall be final and binding on the Contractor.

- 5.2 The Contractor shall supply, fix and maintain at his cost during the execution of any work all the necessary Centering, Scaffolding, Staging, Planking, Timbering, Strutting, Shoring, Pumping, Fencing, Boarding, Watching and Lighting by night as well as by day, required not only for the proper execution and protection of the said work but also for the protection of the Public and the safety of any adjacent Roads, Streets, Cellars, Vaults, Ovens, Pavements, Walls, Houses, Buildings and all other erections, matters or things and the Contractors shall take down and remove any or all such Centering, Scaffolding, Staging, Planking, Timbering, Strutting, Shoring, etc., as occasion shall require or when ordered to do so and shall fully reinstate and make good all matters & in compliance of requirements of all the Statutory Authorities and things disturbed during the execution of the work to the satisfaction of the NIA.

6. AUTHORITIES NOTICES AND PATENTS:

- 6.1 The Contractors shall conform to the provisions of any Acts of the Legislature relating to the work and to the Regulations and Bye-Laws of any Authority and or any Water, Lighting and other Companies and/or Authorities with whose system the structure is proposed to be connected and shall before making any variations from the Drawings

or Specifications that may be necessitated by so conforming give to the NIA written notice specifying the variations proposed to be made and the reasons for making them and apply for instructions thereon. In case the Contractor shall not within 7 (seven) days receive such instructions, he shall proceed with the work conforming with the Provisions, Regulations or Byelaws in question. The Contractors shall have to place the requirement to the Director, NIA for the details required at least 15 days before to comply the provisions of any Acts of the Legislature/ local bodies relating to the work.

- 6.2** In particular, the Contractors shall be responsible to Register themselves under the Contract Labour (Regulation & Abolition) Act 1970 and Rules there under and any amendment thereto; they must comply with and carry out all the provisions and obligations under the said Act and Rules and furnish all information to Employer as may be required by it and shall indemnify the Employer against any penalties/claims arising from any default on their part.
- 6.3** The Contractor shall arrange to give all notices required by the said Acts, Regulations or Byelaws to be given to any Authority and to pay to such Authority or to any Public Office all fee that may be properly chargeable in respect of the work and lodge the receipts with the Employer.
- 6.4** The Contractors shall indemnify the Employer against all claims in respect of patent, rights and shall defend all actions arising from such claims **unless informed to NIA before any such infringement and received his permission** to proceed and shall himself pay all royalties, licence fees, damages, costs and charges of all and every sort that may be legally incurred in respect thereof.
- 6.5** The Contractor should observe that his work shall not cause any nuisance to the Public in general and to the neighboring occupants in particular.
- 6.6** Should the Contractor desire to work on Sundays, Holidays and during night hours, permission in writing from the NIA must be obtained in time. It shall be the responsibility of the Contractor to obtain permission from Civil Authorities, if necessary. However, NIA at its' own discretion may or may not give permission and for which delay in progress of work will not be counted.
- 6.7** Any how, the Contractor shall conform to the provisions of any Govt., electricity, Municipal and any other Authority rules, regulation and laws/bylaws relating these works. The Contractor shall on behalf of NIA, do act and give all notices required by the said acts, etc., and pay all fees payable. If due to violation of any of the above rules/regulations etc., by the Contractor, NIA has to incur any expenses to meet any claims etc., the same will be deducted from any moneys payable to the Contractor.

7. SETTING OUT WORK:

- 7.1** The Contractor shall set out the work and shall be responsible for the true and perfect setting out of the same and for the correctness of the positions, levels, dimensions and alignment of all parts thereof. If at any time any error shall appear during the progress of any part of the work, the Contractor shall at his own cost rectify such error, to the satisfaction of the NIA. The Contractor must not commence work until the outlines and Centre line layout have been pegged out and approved by the representative of NIA.

8. CONTRACTOR IMMEDIATELY TO REMOVE OFFENSIVE MATTER:

- 8.1** All soil, filth or other matter of an offensive nature taken out of any trench, sewer, drain, cesspool or other place shall not be deposited on the surface but shall be at once carted away by the Contractor to Contractor's own pit /place or pit/place provided by the statutory authority (to be arranged by the contractor) or as per norms of statutory authority. No amount towards this shall be paid by NIA.

9. MATERIALS AND SAMPLES:

- 9.1** All the materials, stores and equipments required for the full performance of the Contract must be provided through normal trade channels and must include applicable import duties and all applicable taxes and other charges if any. They shall be of approved quality and the best of their kind available and the Contractor must be entirely responsible for the proper and efficient carrying out of the work. The Contractor shall order all materials required for the execution of the work from local as well as from outside sources if situation warrants so as early as necessary to the satisfaction of the Officer-in-Charge and to ensure that such materials are on site well ahead of requirement for use in the work. Non availability of materials in local market will not be an issue behind slow progress of work.
- 9.2** Before ordering such materials, the Contractor shall get samples of the materials approved well in advance. Preference shall be given to ISI marked products and approved brands of requisite quality as mentioned in the tender. For materials, which are neither approved brands nor ISI marked, the same shall be got tested from approved laboratories at the Contractor's cost before approval. Approved brand and ISI marked product will also be tested if desired by the Officer-in-Charge and if the test results are satisfactory, the cost of testing shall be borne by the Employer otherwise by the Contractor. No claim will be allowed for delay to the progress of work caused by test. Hence, contractor has to estimate the time required for testing and accordingly proper materials to be procured for testing well in advance. If called upon by the Officer-in-Charge the Contractor shall produce proof for having arranged for the supply of materials well in time.
- 9.3** The Contractor shall furnish well in time before work commences at his own cost, any samples of workmanship that may be called for by the Officer-in-Charge for his approval and any further samples in case of rejection until such samples are approved. Such samples when approved shall be the minimum standard for the work to which they apply. In case of items like suspended ceiling, partitions, etc. typical sample panels or proto types shall be erected in position for approval before undertaking work. Rates quoted shall cover for such preliminary work.

10. ACCESS:

- 10.1** Any of the representative of NIA or their authorised persons shall at all reasonable time have free access to the work and/or the workshops, factories or other places where materials are being prepared or constructed for the Contract and also to any place where the materials are lying or from which they are being procured/obtained and the Contractor shall give every facility to all of them necessary for inspection and examination and test of the materials and workmanship. Except the representatives of the Public Authorities, no person shall be allowed on the work at any time without the written permission of the Officer-in-Charge.

If any work is to be done at a place other than the site of the work, the Contractor shall obtain the written permission of the Officer-in-Charge for doing so and allow inspection of the same.

11. CONTRACTOR'S SUPERVISION AND MINIMUM REQUIREMENT OF TECHNICAL STAFF:

- 11.1** The Contractor shall either himself supervise the execution of the contract or may appoint a Competent Agent approved by the Officer-in-Charge to act in his stead.
- 11.2** Where the contractor is not a qualified Engineer or even if he is so qualified, he cannot in the opinion of Officer-in-Charge, give his full personal attention to the works, he shall at his own expense employ person(s) possessing the qualification and experience as described hereunder as his accredited agent to supervise the works and to receive instructions from Officer-in-Charge. Any directions, instructions or notices given by the Officer-in-Charge to such supervisor(s) shall be deemed to be given to the contractors.

A qualified resident Engineer having a Government recognised Diploma in Civil Engineering and minimum of 2 years' experience on building construction site.

The Director, NIA may vary any of the above qualification/ experience at his discretion, if so warranted by conditions prevailing and applicable to any particular work.

e. RECOVERY FOR NON-DEPLOYMENT OF ENGINEER/S AT THE SITE

If the contractor fails to employ suitable person(s) to supervise the work or fails to appoint replacement(s) when necessitated, amount as stipulated in the Appendix to the conditions of contract shall be recovered from the contractor for each Engineer and each supervisor for the period of non-employment.

12. DISMISSAL OF WORKMEN:

12.1 The Contractor shall, on the instruction of the Officer-in-Charge, immediately dismiss from the work any person employed thereon, who may, in the opinion of the Officer-in-Charge, be unsuitable or incompetent or who may misconduct himself and such person shall not be again employed or allowed on the work without the permission of the Officer-in-Charge.

13. DATES OF COMMENCEMENT AND COMPLETION:

13.1 The "Date of Commencement" shall be as stated in the Work Order and the Contractor shall thereupon and forthwith begin the work and shall regularly proceed with and complete the same on or before the "Date of Completion" stated in the Work Order, subject to the provisions for extension of time hereinafter contained.

14. ASSIGNMENT:

14.1 The whole of the work included in the Contract shall be executed by the Contractor and the Contractor shall not directly or indirectly transfer, assign or underlet the Contract or any part, share of interest therein nor shall he take a new partner without the written consent of the Officer-in-Charge and no subletting shall relieve the Contractor from the full and entire responsibility of the Contract or from the active superintendence of the work during its progress.

15. DEVIATION, VARIATION, EXTRA/DEVIATED ITEMS

15.1 The tender is strictly on Lump sum basis as per the scope of works stipulated in the tender. The quantities in the schedule of quantities submitted by the contractor is considered to be approximately indicative of the total extent of work and no variation i.e. addition, omission or subtraction shall vitiate the contract. No liability shall attach to employer for any error therein or variation therefore. In other words it is intended to convey herewith that building has to be completed and made functional in the quoted price as per the scope of work, detailed specification and drawings provided by NIA.

15.2 The contractor may when authorized and shall when directed, in writing by the Officer-in-Charge or the representative, whom the Director, NIA may for that purpose appoint, add to, omit from, make alterations in, substitutions for, or vary the works shown upon the vetted drawings submitted by the contractor and approved by the employer or described in specifications provided by Employer or included in priced Schedule of Quantities submitted by the contractor but the Contractor shall make no additions, omissions, alterations, substitutions or variations without such authorization or direction. A verbal authority or direction by the Officer-in-Charge, if confirmed by the contractor in writing within 7 (seven) days, be deemed to have been given in writing. The addition, deletion, substitution in the project may be *necessitated due to unforeseen circumstances and/or due to change in regulation etc.*

15.3 The rates of such altered, additional or substituted works shall be determined in accordance with the following.

- a. If the rate for altered, additional or substituted item of work shall be priced on the basis of co-efficient of labour and materials as given in the latest CPWD rate analysis handbook and rates for labour and materials wherever applicable shall be the market rate prevailing at the time of execution subject to that the labour rates are not less than minimum wages declared by Government of India.
- b. Where such co-efficient are not available in C.P.W.D. rate analysis, the actual Labour/Materials involved and recorded by the Officer-in-Charge in executing the items shall be considered.
- c. Where extra work cannot be properly measured or valued, the Contractor shall be allowed "Day Work" prices at the net rates stated in the Tender or the Priced Schedule of Quantities or, if not so stated, then in accordance with the local "Day Work" rates and wages for the district, provided that in either case vouchers specifying the date and time (and if required by the Officer-in-Charge the names of workmen employed) and materials incorporated be delivered for verification to the Officer-in-Charge or his representative at or before the end of the week following that in which the work has been executed. The Officer-in-Charge is not bound to recognize the cost of materials furnished in vouchers; the Officer-in-Charge at his discretion will fix the price of such materials based upon market value.
- d. While fixing rates of extra items 15% (Fifteen percent only) shall be allowed over and above the basic rates of material (without GST), T & P, water charges and labour to cover all supervision, as overheads and profits and all other applicable taxes /cess. GST on works contract will be paid separately.
- e. For all extra items of work, the contractor should submit to the concerned Officer-in-Charge the necessary particulars along with his analysis and the rate he proposes to claim for consideration within a period of 4 (four) weeks from the time of cropping up of any authorized extra / deviated item. He shall also ensure that all the authorized claims are included in the final bill. If the contractor fails to submit his claim within the stipulated period or the period duly extended by the Officer-in-Charge, then the Officer-in-Charge shall proceed to fix the rate for the item(s) and the same shall be final and binding on the contractor. However, extra items for which co-efficient are not available in C.P.W.D. rate analysis, the actual Labour/Materials involved and to be recorded, the rate analysis shall be submitted after completion of the work only.
- f. The Contractor shall note that Extra/Deviated items claim and/or any other claim whatsoever if submitted after submission of his Final Bill, will not be entertained and considered by the Employer. The Contractor shall not be allowed to make any Additions/ Alterations/ Revisions / Changes/ Modifications/ Variations in the final bill, after the final bill is submitted by him.

16. THIRD PARTY LIABILITY, DAMAGE TO NEIGHBOURING PROPERTY, LOSS OF MATERIAL AND WORKMEN'S COMPENSATION:

- 16.1** The Contractor shall be responsible for all injury to persons, animals or things, and for all damage to structural and/or decorative part of property which may arise from the operations or neglect of himself or of any Sub-contractor/ his Workman or any of his Sub-Contractor's employees, whether such injury or damage arise from carelessness, accident or any other cause whatsoever in any way connected with the carrying out of his Contract. This Clause shall be held to include inter-alia, any damage to Building, whether immediately adjacent or otherwise and any damage to roads, streets, footpaths, bridges, or ways as well as all damage caused to the building, and the works forming the subject of this Contract by frost, rain, wind or other inclemency of the weather. The Contractor shall fully indemnify the Employer and hold him harmless in respect of all and any expenses arising from any such injury or damage to persons or property as aforesaid and also in respect of all and any claim made in

respect of injury or damage under any acts of Government or otherwise and also in respect of any award or compensation or damages consequent upon such claim.

- 16.2** The Contractor shall fully indemnify the employer against any loss, damage or deterioration for whatever reason, of all materials brought at site and especially material supplied by or paid for partly or wholly by the employer.
- 16.3** The Contractor shall reinstate all damage and loss of every sort mentioned in this Clause so as to deliver up the whole of the Contract works complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damage to the property of the third parties.
- 16.4** The Contractor shall fully indemnify the Employer against all claims which may be made against the Employer by any member of the Public or other third party in respect of anything which may arise in respect of the works or in consequence thereof.
- 16.5** The contractor shall at his own expense arrange to effect from the date of commencement & maintain till the date of virtual completion of contract, with any licensed general insurance company, a **POLICY OF INSURANCE (Contractor's All Risk Policy)** to cover all such risks detailed above viz. loss, damage & third-party liability etc. The policy shall be of an amount as mentioned in **Appendix to Conditions of Contract** and in the joint names of the employer & contractor and shall be deposited with the employer and renewed as required from time to time during the currency of the contract.
- 16.6** The Contractor shall also fully indemnify the Employer against all claims which may be made upon the Employer, whether under the **WORKMEN'S COMPENSATION ACT** or any other **STATUTE** in force during the currency of this Contract or at Common law in respect of any Employee of the Contractor or any Sub-Contractor and shall at his own expense effect and maintain until the Virtual completion of the work, with "licensed General Insurance Company" a **POLICY OF INSURANCE** of adequate amount in the joint names of the Employer and the Contractor against such risks and deposit such policy or policies with the employer & renew the same as required from time to time during the currency of the Contract.
- 16.7** The Contractor shall be responsible for anything, which may be excluded from the Insurance Policies above referred to, and also for all other damage to any property arising out of or incidental to the negligence or defective carrying out of the Contract.
- 16.8** The amount of insurance to be taken for the above policies will be jointly **decided between the contractor and the employer** before issue of acceptance letter based on the tendered cost, nature of work, location of site, local hazards etc.

RECOVERY FOR NON-EXTENSION OF INSURANCE POLICIES (WORKMEN'S COMPENSATION AND CONTRACTOR'S ALL RISK POLICY INCLUSIVE OF THIRD-PARTY LIABILITY)

- 16.9** In default of the Contractor insuring as provided above or having insured, failing to renew the same, as required, the Employer, on his behalf may so insure/renew and may deduct the premiums paid from any monies due or which may become due to the Contractor together with penalty amounting for each extension of such policy.
- 16.10** The Contractor shall also fully indemnify the Employer in respect of any costs, charges or expenses arising out of any claim or proceedings at law and also in respect of any award of compensation of damages arising there from.
- 16.11** The Employer shall be at liberty and is hereby empowered to deduct fully the amount of any damages, compensation costs, charges and expenses arising or accruing any such claim of damage from any sum or sums due or to become due to the Contractor.

17. DELAY AND EXTENSION OF TIME:

- 17.1** If the works be delayed due to any of the following:
- (a) by force majeure,
 - (b) by reason of any exceptionally inclement weather,
 - (c) by reason of proceedings taken or threatened by or disputes with adjoining or neighboring owners or public authorities,
 - (d) by reason of any additional work or instruction ordered by the employer,
 - (e) by reason of Civil commotion, local commotion of workmen or strike or lock-out affecting any of the building trades, -
 - (f) in consequence of the Contractor not having received in due time necessary instructions from the Officer-in-Charge for which he shall have specifically applied in writing,
 - (g) from other causes which the Officer-in-Charge may certify as beyond the Control of the Contractor,
 - (h) by reason of non-payment of interim certificate within seven days beyond specified time,
- then upon the happening of any such event causing delay the contractor shall immediately give notice thereof in writing to the Employer, shall nevertheless use constantly his best endeavors to make up this delay.
- 17.2** Request for extension of time shall be made by the contractor at the earliest of the event causing delay.
- 17.3** In case of strike or lockout the Contractor shall give written notice thereof to the Officer-in-Charge as soon as possible he shall nevertheless constantly use his endeavors to prevent delay and shall do all that may reasonably be required to the satisfaction of the Officer-in-Charge to proceed with the work.
- 17.4** The Officer-in-Charge shall make a fair and reasonable assessment of the delay and grant extension of time accordingly. Such extension shall be communicated to the contractor by the Officer-in-Charge immediately within 30 (Thirty) days of the date of receipt of request for extension. Non-application by the contractor for extension shall however not be a bar for giving fair and reasonable extension which shall be as decided by the Officer-in-Charge.
- 17.5** The decision of the Director as communicated by the Officer-in-Charge to the contractor on the extension of time shall be final & binding.
- 17.6** No claim in respect of compensation or otherwise, howsoever arising, as a result of extension granted under the above conditions shall be admissible.

18. COMPENSATION IN THE FORM OF PENALTY FOR DELAY OF WORK & REWARD FOR EARLY COMPLETION:

18.1 COMPENSATION IN THE FORM OF PENALTY FOR DELAY OF WORK.

The contractor shall submit a Time and Progress Chart (CPM/PERT/Quantified Bar Chart) within 10 (Ten) days from the date of issuance Letter of intent and get it approved by the Officer-in-Charge. The Time and Progress/ Milestone Chart shall be prepared as produced below in direct relation to the time stated in the contract documents for completion of items of works. It shall indicate the forecast (milestones) of the dates of commencement and completion of various items, trades, sections of the work and may be amended as necessary by agreement between the Director, NIA and the Contractor within the limitations of time

stipulated in the Contract documents-

In case the required progress is not achieved to meet the above time deadlines of the completion period and/ or milestones of time and progress chart provided always that the total amount of compensation in the form of Penalty for delay to be paid under this condition shall not exceed 10 % of the tendered value of work mentioned in bid documents.

Compensation in the form of Penalty for delay of work @ 1.5 % of tendered value of work per month of delay to be computed on per day basis.

19. FAILURE BY CONTRACTOR TO COMPLY WITH CE'S INSTRUCTIONS:

- 19.1 If the Contractor after receipt of written notice from the Officer-in-Charge, requiring compliance with such further Drawings and/or his instructions, fails within 7 (seven) days to comply with the same the Officer-in-Charge may employ and pay other persons to execute any such work whatsoever as may be necessary to give effect thereto and all additional costs incurred in connection therewith shall be deducted from any money due or to become due to the Contractor.

20. MEASURING OF THE WORK EXECUTED

- 20.1 Contractor need to provide all detailed working drawings* with measurements satisfying the overall dimension. These detailed drawings have to be compared with work executed at site to ascertain whether works have been executed as per the drawings. These verifications have to be jointly carried out by authorized representative of the Contractor and employer. After verification, copy of these drawings which are used for verification shall be jointly signed by the authorized representatives of the contractor and Employer. This joint verification shall be carried out from time to time during the progress of work. If any observation recorded during verification of works are objected by any one of the parties a note shall be made to that effect with reason, signed by both parties and referred to Employer's representative whose decision in the matter shall be final and binding.

Note: Detailed working drawing shall also include bar bending scheduled proposed for reinforcement of various concrete element

- 20.2 The Contractor shall, without any extra charge provide all assistance with every appliance, labour and other things necessary for carrying out verification by any person authorised by the Employer.
- 20.3 All hidden/concealed items of work such as work in foundations including masonry, concrete etc. steel in all R.C.C. work, pipe to be encased, cable / wire or any item to be covered etc. shall be jointly verified by the Officer-in-Charge or his authorised representative and the Contractor's Site Engineer, before they are covered up. Immediately, after the work is ready for inspection, Contractor will give specific notice to the Officer-in-Charge for such verification. For all hidden work /concealed work certification to be done in writing with joint signature of Contractor's and NIA's Authorized Representative before concealing of the work. Adequate number of Photographs to cover all the concealed work shall be taken and submitted to NIA.

21. PAYMENTS:

- 21.1 The Contractor shall be paid by the Employer, from time to time, by installment under Interim Certificate to be issued by the Officer-in-Charge to the Contractor for the work executed, as mentioned in the Appendix to the Conditions of Contract; however, **as per stage wise payment mentioned elsewhere in this tender** subject to recoveries under this Contract. The Interim Certificate shall be based upon Interim Bills or Running Account Bills to be prepared by the Contractor and supported by the detailed measurements. Adequate references, sketches and cross references wherever

necessary are also to be provided with detailed measurements. Officer-in-Charge may allow inclusion in the Interim Certificate such amount as he may consider proper on account of materials delivered upon the site by the Contractor for use in the work but not incorporated in it.

- 21.2** Provided always that the issue by the Officer-in-Charge of any Certificate during the progress of the works or after their completion shall not relieve the Contractor from his liability in cases of fraud, dishonesty or fraudulent concealment relating to the work or materials or any matter dealt with in the Certificate in case of all defects and insufficiencies in the work or materials which a reasonable examination would not have disclosed. No Certificate of the Officer-in-Charge shall in itself be conclusive evidence that any work or materials to which it is related are in accordance with the Contract.
- 21.3** Payment upon the Officer-in-Charge's Certificate shall be made within the periods named in the Appendix "Period for honouring Interim Certificate" after such a Certificate has been delivered to the Employer. However, in certain case it may relate clause 17.1 (i)
- 21.4** The NIA shall have power to withhold any Certificate if the work or any parts thereof are **for any inferior quality of work based on valuation as per rates in priced schedule of quantities submitted by the contractor or based on DSR latest Revision if it is not covered in priced schedule of work submitted by the contractor**. However, if the final certificate is not issued within the period as mentioned under Clause No.21.5, 24, the amount involved for such items of deficient work as decided by Officer-in-Charge would be withheld. The same would be allowed as agreed upon the Officer-in-Charge and the final certificate would accordingly be issued and final bill be passed.
- 21.5** **The verifications and valuation in respect of contract shall be completed within the period of final verification** stated in the Appendix or if not so stated then within six months of the completion of the contract works as defined in Clause (24) hereof. No further claim shall be made by the contractor after submission of the final bill and these shall be deemed to have been waived and extinguished.
- 21.6** The final certificate shall be based on the submission of overall execution of entire works as per drawings (drawings submitted by the contractor), priced schedule of quantities submitted by the contractor, additional works as directed by Employer, Submission of certificates and warranty / guarantee of all infrastructures provided in the project, submission of details of fittings and fixtures provided in the building along with working manual. Final certificate shall be issued if the Testing and commissioning is completed. The Officer-in-Charge may direct the Contractor to resubmit details if the same are found incomplete to issue the final certificate and his decision to accept the details is final and binding on the Contractor.

Final Certificate shall be issued by the Officer-in-Charge after the conditions are met with as per 21.4, 21.5, 21.6 and 24 and contractor's submission of **No Claim certificate cum receipt** as per the Proforma given in Appendix to Conditions of Contract.

a. SUBMISSION OF BILLS:

The Contractor shall submit their bill conforming to the accepted joint measurements in triplicate to the Director, NIA after joint inspection and recording of measurement.

b. EXTRA ITEMS:

- a) The rates of Extra item/s, which may crop up during the execution of works and not provided in the Schedule of rates shall be fixed as per C.P.W.D. rate analysis. Necessary bills/vouchers (original) to be submitted immediately by the contractor.

b) But due to variation of quantity, no extra item will be considered.

22. UNFIXED MATERIALS AND EQUIPMENTS:

22.1 All tools, plants and materials brought to the site by the Contractor shall vest in the Employer and shall not be removed from the site of works without permission of the Officer-in-Charge in writing. The Employer shall have a lien on these materials and plants.

23. REMOVAL OF IMPROPER WORK:

23.1 The Officer-in-Charge shall during the progress of the work have power to order in writing from time to time the removal from the work within such reasonable time or as may be specified in the order, of any materials, which in their opinion are not in accordance with the Specifications or instructions, the substitution of proper materials and the removal and proper re-execution of any work executed with materials or workmanship not in accordance with the Drawings and Specifications or Instructions and the Contractor shall forthwith carry out such an order at his own cost. In case of default on the part of the Contractor to carry out such an order, the Officer-in-Charge shall have the power to employ other persons to carry out the same and all expenses consequent thereon or incidental thereto as certified by the Officer-in-Charge shall be borne by the Contractor and may be deducted from any amounts due or that may become due to the Contractor.

24. VIRTUAL COMPLETION:

24.1 The work shall be completed in accordance with the Contract and to the entire satisfaction of the Director, NIA. All unused materials, tools, plants, scaffoldings, temporary structures, hutments and things belonging to the Contractor shall be removed and the site of works cleared of rubbish and all waste materials by the contractor at his own expenses and delivered up tidy to the employer. After completion of the work, the contractor will serve a written notice to the Officer-in-Charge to this effect. The Director, NIA after satisfying himself shall thereupon approve the virtual completion. The Defect Liability Period shall commence from the date of such certification and after handing over the Sewage Treatment Plant as a whole.

Virtual Completion shall be issued on overall completion of Work and after testing and commissioning of the Plant along with other necessary infrastructure as need be and handing over the same. The Defect Liability Period specified in Appendix to Conditions of Contract shall be issued from the date of Virtual Completion issued on overall completion of and after testing and commissioning of the Plant with other necessary infrastructure as need be and handing over the plant.

The contract shall be deemed to be enforcing from the date of work order till the completion of the defects liability period. Separate work order shall be issued if Operation and Maintenance work is awarded to the bidder.

25. DEFECTS AFTER COMPLETION:

25.1 The defects, shrinkage, settlements or other faults, which may appear within “the Defects Liability Period, stated in the “Appendix to the Conditions of Contract” or if not stated then, within 12 (twelve) months after virtual completion of the work, arising on account of materials or workmanship not in accordance with the Contract shall, upon the directions in writing of the Officer-in-Charge and within such reasonable time specified therein, be amended and made good by the Contractor at his own cost unless the Officer-in-Charge shall decide that he ought to be paid for such amendment and for making good and in case of default, the Officer-in-Charge may employ and pay other persons to amend and make good such defects, shrinkage, settlement or other

faults and all damages, losses and expenses consequent thereon or incidental thereto, shall be recovered from any monies due or that may become due to the Contractor. The Officer-in-Charge may in lieu of such amending and making good by the Contractors, deduct from any money due or that may become due to the Contractor, a sum to be determined by the Officer-in-Charge equivalent to the cost of amending such work. Should any defective work have been done or materials supplied on the work, who has been nominated or approved by the Officer-in-Charge as provided the Contractor shall be liable to make good in the same manner as if such work or material had been done or supplied by the Contractor and been subjected to the provisions of this Clause and Clause No.2 hereof. The Contractor shall remain liable under the provision of this Clause notwithstanding the payment of any Certificate or the passing of any accounts.

26. OTHER PERSONS ENGAGED BY THE EMPLOYER:

26.1 Officer-in-Charge reserves the right to execute any work not included in this Contract, which he may desire to have carried out, by other persons and the Contractor shall allow all reasonable facilities and the use of his scaffolding and plant for the execution of such work but is not required to provide any special plant or materials for the execution of such work except by special arrangement with the Employer. Such work shall be carried out in such manner as not to impede the progress of the work included in the Contract and the Contractor shall not be responsible for any damage or delay which may happen to or be occasioned by such work.

27. SUSPENSION BY THE CONTRACTOR:

27.1 If the Contractor except on account of any legal restraint upon the Employer preventing the continuance of the work, shall suspend the work or in the opinion of the Officer-in-Charge shall neglect or fail to proceed with due diligence in the performance of his part of the Contract or if he shall make default in respect of Clause No.2, the Employer shall have the power to give notice in writing to the Contractor requiring that the work be proceeded within a reasonable manner and with reasonable dispatch. **Such Notice shall purport to be a notice under this clause.** After such notice is given, the Contractor shall not be at liberty to remove from the site of the work or from any ground contiguous thereto any plant or materials belonging to him, which shall have been placed thereon for the work and the Employer shall have a lien upon all such plant and materials to subsist from the date of such notice being given until the notice shall have been complied with. If the Contractor shall fail for 7 (seven) days after such notice given to proceed with the work as therein prescribed, the Officer-in-Charge may proceed as provided in Clause No.28.

28. DETERMINATION OF CONTRACT BY EMPLOYER:

28.1 If the Contractor (being an individual or a firm) commit any "Act of Insolvency" or shall be adjudged as Insolvent or shall make an assignment or composition of the greater part in number or amount of his creditors or shall enter into a deed of assignment with his creditors, or being an Incorporated Company shall have an order made against him or pass an effective resolution for winding up either compulsorily or subject to the supervision of the Court or Voluntarily or if the official Assignee of the Contractor shall repudiate the Contract or if the official Assignee or the Liquidator in any such winding up shall be liable **within 7 (seven) days** after notice to him requiring him to do so, to show to the reasonable satisfaction of Officer-in-Charge that he is able to carry out and fulfill the Contract and if required by the Officer-in-Charge to give security therefore or if the Contractor (whether an Individual Firm or Incorporated Company) shall suffer execution to be issued or if the Contractor shall suffer any payment under this Contract to be attached by or on behalf of any of the creditors of the Contractors or if the contractor shall assign or sublet the Contract without the consent in writing of the

Officer-in-Charge first obtained or if the Contractor shall charge or encumber this Contract or any payment due or which may become due to the Contractor there under, or if the Officer-in-Charge shall certify in writing that in his opinion the Contractor,

- a. has abandoned the Contract, or
- b. has failed to commence the work, or has without any lawful excuse under these conditions suspended the progress of the work for 7 (seven) days after receiving from the Officer-in-Charge written notice to proceed, or
- c. has failed to proceed with work with such due diligence and failed to make such due progress as would enable the work to be completed within the time agreed upon, or
- d. has failed to complete the work within the stipulated date including authorised extensions or
- e. has failed to remove the materials from the site or to pull down and replace the work within 7 (seven) days after receiving a written notice from the NIA that the said materials or work were condemned or rejected or
- f. has neglected or failed persistently to observe and perform all or any of the acts, matters, or things, by this Contract to be observed and performed by the Contractor for 7 (seven) days after written notice shall have been given to the Contractor requiring the Contractor to observe or perform the same, or
- g. has to the detriment of good workmanship or in defiance of the Officer-in-Charge's instructions to the contrary sub-let any part of the Contract.

then and in any of the said causes, the Officer-in-Charge notwithstanding any previous waiver, after giving 7 (seven) days' notice in writing to the Contractors, determine the Contract, but without thereby affecting the powers of the Officer-in-Charge or the obligations and liabilities of the Contractor, the whole of which shall continue to be in force as fully as if the contract has not been so determined and as if the work subsequently executed had been executed by or on behalf of the Contractor. And further, the Employer, his agents or servants, may enter upon and take possession of the work and all plant, tools, scaffolding, sheds, machinery, steam and other power, utensils and materials, lying upon the premises or the adjoining lands or road and use the same as his own property or may employ the same by means of his own servants and workmen in carrying on and completing the work or by employing any other Contractors or other person or persons to complete the work, and the Contractor shall not in any way interrupt or do any act, matter, or thing to prevent or hinder such other Contractor, other persons or person employed for completing and finishing or using the materials and plant for the work. When the work shall be completed or as soon thereafter as convenient, the Officer-in-Charge shall give a notice in writing to the Contractor to remove his surplus materials and plant and should the Contractor fail to do so within a period of 14 (Fourteen) days after receipt thereof by him, the Employer may sell the same by public auction and shall give credit to the Contractor for the amount so realised. The Officer-in-Charge shall thereafter ascertain and certify in writing under his hand what (if anything) shall be due or payable to or by the Employer for the value of the said plant and materials so taken possession of by the Employer and the expense or loss which the Employer shall have been put to in getting the work to be so completed, and the amount, if any, owing to the Contractor and the amount, which shall be so certified shall thereupon be paid by the Employer to the Contractor or by the Contractor to the Employer, as the case may be and the Certificate of the Officer-in-Charge shall be final and conclusive between the parties.

29. TERMINATION OF CONTRACT BY CONTRACTOR:

- 29.1** If payment of the amount payable by the Employer under any Certificate of the Officer-in-Charge shall be in arrears as **unpaid for 60 (sixty) days** after notice in writing

requiring payment of the amount with interest of aforesaid shall have been given by the Contractor to the Employer, or if the work be stopped for six months under order of the Officer-in-Charge or by any injunction or other order of any Court of Law, then and in any of the said cases, the Contractor shall be at liberty to determine the Contract by notice in writing to the Employer and he shall be entitled to recover from the Employer payment for all the work executed and for any loss, he may sustain upon any plant or material supplied or purchased or prepared for the purpose of the Contract.

- 29.2** In arriving at the amount of such payment, the net rates contained in the Contractor's original tender shall be followed or where the same may not apply, valuation shall be made in accordance with **Clause No.15** hereof.

30. DETERMINATION OF CONTRACT DUE TO ABANDONMENT OR REDUCTION IN SCOPE OF WORK:

- 30.1** If at any time after the acceptance of the tender, the Employer shall for any reasons whatsoever not require the whole or any part of the works **to be carried out**, the Officer-in-Charge shall give notice in writing to the Contractor who shall have no claim to any payment of compensation or otherwise whatsoever on account of any profit or advantage which he might have derived from the Execution of the whole of the works.

The Contractor shall be paid at contract rates for the full amount of work executed and in addition:

- a.** The cost at site of all surplus approved materials collected for incorporation in the work, which the Contractor does not wish to retain, and which shall thereafter become the property of the Employer due to reduction in scope of work or other reasons.
- b.** Where the Contractor desires to retain the surplus of approved materials due to reduction in scope of work or other reasons (excepting materials supplied by the Employer or obtained in Employer's name, which shall, in any case, be returned to the Employer) the cost of handling and cartage charges for removal from the site to a reasonable distance not exceeding 25 kms.
- c.** If upon the determination of the Contract under this condition, the Contractor is of the opinion that he **has suffered hardship by reason of the operation of these conditions**, he may refer the circumstances with full details to the Director, NIA, who on being satisfied that such hardship exists or has existed, shall make such allowance, if any as in his opinion is reasonable and his decision shall be final, conclusive and binding.

31. DISPUTES TO BE FINALLY DETERMINED BY THE DIRECTOR, NIA:

- 31.1** The Instruction, Decision, Opinion, Direction, Certificate or Valuation of the Director, NIA with respect to all or any of the matters **under Clause (2), (3), (5), (6), (9), (14), (15), (17), (25), (27), (28) and (30)** hereof shall be final and conclusive and binding on the parties hereto and shall be without appeal. Any other Decision, Opinion, Direction, Certificate or Valuation of the Director, NIA or any refusal of the Director, NIA to give any of the same shall be subject to the right of **Arbitration** and review **as given under Clause No.33**.

32. SECURITY DEPOSIT AND PERFORMANCE GUARANTEE AND EMD:

- 32.1** Amount towards Security deposit shall be calculated as per details given of "APPENDIX TO CONDITIONS OF CONTRACT" of the tender.

The Security Deposit is to be submitted only in the form of Bank Guarantee. The Contractor shall furnish one Bank Guarantee (BG) for full amount of Security deposit valid till end of defects liability period **with an additional validity of further six**

months for claim period OR, Two Bank Guarantees of like amounts each equal to half the Security deposit; one valid till virtual completion and the other till end of defects liability period **with an additional validity of further six months for claim period**. Hence, if time extension is awarded to the contractor the BG/stowards Security Deposit shall be renewed **with an additional validity of further six months for claim period** so that the same is valid throughout the currency of contract. In case of brake in continuation of validity of BG/s penalty shall be imposed up to the amount same as EMD as per discretion of the Officer-in-Charge.

- 32.2** Amount towards Earnest Money deposit (EMD) shall be deposited as per details given in “APPENDIX TO CONDITIONS OF CONTRACT” in the tender. If the lowest Bidder withdraws his tender before the expiry of validity period or before the issue of letter of Acceptance, whichever is earlier, or makes any modification in the terms and conditions of the tender which are not acceptable to the department, then the department shall, without prejudice to any other right or remedy, be at liberty to forfeit 25% of earnest money absolutely and to refund the balance. EMD of unsuccessful Bidders shall be returned without interest within a week of opening of tenders.
- 32.3** The Bank Guarantee/s shall be from any Nationalised / Scheduled Bank approved by the Officer-in-Charge, which is located at Pune.
- The Officer-in-Charge may also permit the contractor to furnish the Bank Guarantee/s from a location other than the above.
- 32.4** Bank Guarantee/s (BGs) against Security Deposit (SD) shall be executed as per the specimen pro-forma **at Annexure B**. The Bank Guarantee/s against Security Deposit (SD) shall be submitted within 21 (twenty-one) days from the date of issuance of letter of acceptance or within 21 (twenty-one) days from the extended date as may be extended by the Officer-in-Charge.
- 32.5** If one Bank Guarantee in lieu of total Security Deposit is furnished, the same will be released only after the successful completion of Defects Liability period subject to any appropriations as aforesaid.
- 32.6** If two Bank Guarantees in lieu of Security deposit are furnished, the First Bank Guarantee will be released after the certificate of Virtual completion is issued to the contractor and second shall be released after the satisfactory completion of Defects Liability Period subject to any appropriations as aforesaid.
- 32.7** Bank Guarantees towards Performance Guarantees (where applicable) shall be released after **issuance of** the virtual completion.
- 32.8** Contractor shall keep the Security Deposit and Performance Guarantee, where applicable, replenished to its full value whenever any recovery or appropriation there from occurs. The employer reserves the right to do so from any money(s) due to the contractor lying with them.
- 32.9** The Contractor should note that no interest will be allowed on any part of the Security deposit.
- 32.10** No deductions will be effected from the bills when the total security deposit is paid in the form of Bank Guarantee(s) and the E.M.D shall be refunded after acceptance of Bank Guarantee(s).
- 32.11** In the event of failure by the contractor to submit Bank Guarantee(s) by the specified / extended date, recovery of Security deposit shall be effected from the R.A Bills.
- 32.12** In all cases of Bank Guarantees, there shall be **further provision of claim period of 6 months**. If the contract period gets extended for any reason whatsoever, the contractor shall obtain the required extensions to the Bank Guarantee(s).

33. SETTLEMENT OF DISPUTES, ARBITRATION:

33.1 All disputes and differences of any kind whatsoever arising out of or in connection with the Contract or the carrying out of the work (whether during the progress of the work or after its completion and whether before or after determination, abandonment or breach of the Contract) shall be referred by the Contractor to the Director, NIA within 15 (fifteen) days of any such matter arising. The Director, NIA shall upon receipt of such reference convey his written instructions or decision within 30 (Thirty) days to the contractor.

If the Contractor be dissatisfied with the decision of the Director, the Director, NIA shall within 30(Thirty) days shall make efforts to resolve the dispute through mutual discussion by an independent Departmental Committee constituted by the Director, NIA.

If the Contractor is still unsatisfied with the conclusion based on the committee's report on any matter, then and in such case, the contractor shall within 30(Thirty) days after receiving notice of such decision, give a written notice to the Employer requiring that such matters in dispute be arbitrated upon.

Such written notice shall specify the matters which are in dispute or difference of which such written notice has been given and no other shall be and is hereby to be referred to the Arbitration. In case the Contractor fails to serve the written notice on any or all the issues in dispute within 30 (Thirty) days, the decision conveyed by the Director, NIA shall be taken as final, binding and conclusive and shall not be open to arbitration.

33.2 Any disputes or differences that the employer may have with the contractor shall also be referred to Arbitration.

33.3 All disputes between the parties to the contract (other than those for which the decision of the Director, NIA or any other person is by the contract expressed to be final & binding) shall after written notice by either party to the contract to the other of them be referred to sole arbitration by an Arbitrator to be appointed by the Director, NIA, which shall be final and binding.

33.4 If the arbitrator so appointed resigns his appointment or vacates his office or is unable or unwilling to act due to any reason whatsoever, the appointing authority shall appoint a new arbitrator in his place.

33.5 Unless both the parties agree in writing, reference of such disputes to arbitration shall not take place until after the completion or alleged completion of the work or termination or determination of contract.

33.6 The Sole Arbitrator shall determine all matters in disputes, which shall be referred to the Sole Arbitrator.

33.7 The Arbitration shall be conducted in accordance with the provisions of the Arbitration and Conciliation Act 1996 or any statutory modifications thereof.

33.8 The Contractor hereby also agrees that Arbitration under this Clause shall be a condition precedent to any right of action under the Contract.

34. MATERIALS TOOLS ETC.:

- 34.1 The Contractor shall provide all materials and/or labour of every description and all tools, tackles, plants, storage and transport necessary for the day to day carrying on, execution and completion of the work to the satisfaction of the Director, NIA or his representative and the cost shall be covered in the rates quoted.
- 34.2 Unless otherwise mentioned the materials/workmanship of all kinds shall be of first quality and comply with the I.S. specifications.
- 34.3 The Contractor shall order all materials, required for the execution of works, from local/outside sources and ensure that such materials are on site well ahead of requirement for use in the works. Manufacturer's certificate and other shall be submitted to the Director, NIA or his representative.

35. MODE OF MEASUREMENT:

Mode of measurement shall be generally in accordance with the current Indian Standard Method of measurement of Building works unless otherwise stated in the Tender. Where otherwise stated, the provisions made in this contract shall hold good, in particular, unless otherwise stated.

36 RATES:

- 36.1 Rates quoted by the Contractor shall be firm throughout the currency of Contract (including extension of time, if any, granted) and are to cover for charges for materials, labours, scaffolding, shuttering, curing etc., cost of transportation, loading/unloading at all points, barricading of footpaths if required, water supply, electric supply, temporary work etc., any kind of taxes, fees duties and insurance etc., that are payable, making good the damages to match with the existing finish, removal of all sort of debris from the worksite to the Contractor's own dump. All rates should hold good for execution of the works at any place irrespective of the floor and height throughout the currency of the Contract. Rates shall be inclusive of supplying/providing and fixing/applying as per context and to cope with all the conditions mentioned and for working beyond office hours/holidays if required.

36.2 NON-ATTENDANCE OF WORKS:

If the Contractor upon receiving intimation of work verbally or in writing does not undertake the work within 7 days, the E.M.D. will be forfeited as per clause as mentioned elsewhere in the tender document.

36.3 SUPERVISION:

The Contractor should keep a competent supervisor to maintain close contact for receiving instruction from the officer-in-charge of the works concerned every day and arrange for any servicing immediately under intimation to the Director, NIA or his representative. An amount of Rs.3000/- per month shall be recovered from contractor's bill due to non-employment of technical staff.

36.4 DAMAGE TO PROPERTY:

The Contractor shall be responsible for all damages to NIA, and adjoining properties and for injury caused by the work or workmen to persons, animals, things or to the work of other trades and he shall effect any insurance necessary and shall take all necessary precautions and hold the NIA entirely free from all responsibilities in this respect.

36.5 SITE CLEARANCE:

Unserviceable material, all sorts of debris etc., will have to be removed from the worksite to Contractor's own dump at his cost and risk immediately and site left clean during

execution and on completion of the work to the satisfaction of the Director, NIA, failing which, NIA, reserves the right to remove the same through any other agency and deduct the costs thereof from any amount due to the Contractor without any reference to him.

36.6 COMPLETION CERTIFICATE:

After completion of work, the Contractor shall obtain certificate about the satisfactory completion of work from the Competent Authority and submit the same along with the bills.

37. CEMENT AND STEEL:

Cement & Steel will have to be supplied by the Contractor and of approved brand/agency. Empty cement bags will be the Contractor's property.

38. TERMINATION OF THE CONTRACT:

The Director, NIA may due to adequate reason as he deems fit, terminate the Contract by giving one months' notice. The Contractor should then leave the premises in a descent and workable condition. Any defect or damage found shall be made good at his cost or otherwise the defects will be rectified through some other agencies and the cost involved will be deducted from his bill and/or Security Deposit lying pending with NIA.

39. VALIDITY OF TENDER:

The tender shall be valid for **three** months from date of opening of tender.

GENERAL INSTRUCTIONS TO CONTRACTORS

This is a time bound project and has to be completed within scheduled. As such the Contractor will have to employ sufficient men, tools and plant and resources and submit a programme of planning of its resources before commencement of work.

1. **DRAWINGS:** Drawings and design of STP along with infrastructure shall be prepared by the STP contractor.

2. **INSPECTION OF SITE:**

2.1 The Bidder shall visit and examine the site of work and ascertain about the facilities / hindrance and generally obtained his own information on matters effecting the execution of the works and satisfy himself as to the nature of the existing roads or other means of communication, the character of the soil and of the excavations, the correct dimensions of the work and facilities for obtaining materials and shall obtain generally his own information on all matters affecting the execution of the work. No extra charge made, in consequence of any misunderstanding or incorrect information on any of these points or on the grounds of insufficient description will be allowed. All expenses incurred by the Bidder in connection with obtaining information for submitting this tender including his visits to site and efforts in compiling the Tender shall be borne by the Bidder and no claims for reimbursement thereof shall be entertained.

3. **WHOLE WORK TO BE COMPLETED IN THE SPECIFIED COMPLETION PERIOD:**

3.1 The whole work is to be completed within the completion period stated in the Appendix to Conditions of Contract or the extended date of completion, if any. The Contractor will be required if necessary, to work overtime to complete the work by the stipulated date. No extra will be allowed on the Contract sum for such overtime work.

4. TIME AND PROGRESS CHART:

4.1 A Time and Progress Chart is attached to this Contract for guidance. The Contractor shall submit a time and progress chart (CPM/ PERT/ Quantified Bar Chart) fitted within the specified overall period of completion (as stated in Appendix to Conditions of Contract) within 10 (Ten) days of the communication of letter of Intent, to the Officer-in-Charge. In case the Contractor does not come forward for any change in the Time and Progress Chart as provided in the General Instructions to the Contractors, it shall be presumed that the Time and Progress Chart is accepted in full in letter and spirit to maintain the pace of the progress of Work.

4.2 Ancillary work should be so started that all such work is completed before the specified overall contractual period of completion.

4.3 The Contractor shall assume full responsibility for any delay in delivery of materials by Merchants not having completed the work in accordance with the Time and Progress Chart. Such excuses shall not form any criterion for extension of time, or any claims by the Contractor.

5. BENCHES:

5.1 The Contractor is to construct and maintain proper benches to indicate the intersection of all main walls in order that the lines and levels may be accurately checked at all times. The Contractor shall provide suitable stones with flat tops and build the same in concrete for temporary or permanent benchmarks. All the pegs for setting out the work and fixing the necessary levels required for the execution thereof shall, if desired by the Officer-in-Charge likewise, be built in masonry at such places and in such a manner as the Officer-in-Charge may determine. Contractors' rates shall cover for these factors.

6. DRAWINGS ON SITE:

6.1 The Drawings maintained on the site are to be carefully mounted on boards of appropriate size and covered with a coat of approved transparent varnish or laminated at the cost of the Contractor. They are to be protected from the ravages of termites, ants, silver fish and other insects.

7. ORDER OF WORK:

7.1 The Director, NIA reserves the right to fix the order in which the various items of work involved in this Contract is to be executed and Contractor shall comply with the same. There shall be no extra claims on account of this.

8. WORKMANSHIP:

8.1 The Work calls for a high standard of workmanship combined with speed.

9. REJECTED WORKMANSHIP OR MATERIALS:

9.1 Any workmanship, or materials not complying with the specific requirements or approved samples, or which have been damaged, contaminated or deteriorated, must be removed immediately from the site and replaced at the Contractor's expense as directed.

10. QUOTED RATES:

10.1 Contractor should note that unless otherwise stated the tender is strictly on Lump sum basis as per the scope of work and his attention is drawn to the fact that the quoted lump sum amount should be correct, workable and self-supporting.

11. WATCHING AND LIGHTING:

11.1 The Contractor from the time of being placed in possession of the site must allow for watching, lighting and protecting the work, the site and surrounding, properly by day and night on all days including Sundays or other holidays, at his own cost.

12. WATER:

12.1 The rates quoted by the Contractors shall include for providing all water required for the work including that required by special tradesmen and pay all charges required by Local /Municipal or other Authorities. Water must be clean, fresh, pure and free from earth, vegetable or organic matters, acid or alkaline substance in solution or suspension. The Contractors shall make their own arrangements for water supply. If supply from the Municipality or other local bodies be inadequate, the Contractor should provide tube well or wells or open well at his own cost. The Contractors must execute any temporary plumbing and pay all fees and charges. All health regulations in force shall be strictly observed by the Contractor and pay all necessary charges.

However, water is available in surplus with NIA, the same may be permitted for use in work and in such case necessary recovery will be effected from contractor's bill as detailed below:

Recovery of water charges from Contractors bill if used from NIA source @ 0.25% of the Gross value of work done.

13. ELECTRICITY:

13.1 The Contractor shall arrange with the concerned Electric Supply Authorities for a temporary meter and supply to the site and shall provide all temporary wiring, power and lighting points for the whole of the works and clear away when no longer required. He shall pay all charges for the same and for electricity consumed, including that consumed by Sub-Contractors. The Contractor should submit disconnection and no dues certificate from the supplying authority along with his final bill.

However, Electricity is available in surplus with NIA, the same may be permitted for use in work and in such case necessary recovery will be effected from contractor's bill as detailed below:

Recovery of water charges from Contractors bill if used from NIA source @ 0.25% of the Gross value of work done.

14. OFFICE ACCOMMODATION FOR CONTRACTOR'S STAFF:

14.1 The Contractor shall, at his cost, provide, fit-up and maintain in an approved position proper office accommodation for his representative and 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.

15. SECURITY AND PROTECTION:

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

15.2 During inclement weather, the Contractor shall suspend concreting or plastering for such time as Officer-in-Charge may direct and shall protect such work in course of execution from damage by approved measures.

15.3 Should the work be suspended by reason of rain, strike, lock-outs or any other cause, the Contractor 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.

15.4 The Contractor shall at his expense cover-up and protect from injury 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 of Sub-Contractors and any damage caused must be made good by the Contractor at his own expense.

15.5 All fences, trees, shrubs, grasses, lawn and other surfaces around 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 Contractor's expense.

15.6 The Contractor shall, at his expense, protect all projecting all concrete work, wood work and joinery and the like from injury during the progress of the work.

15.7 The Contractor shall at his cost, protect joinery and make good all damages to the same from any cause whatsoever during the performance of the Contract and leave perfect to the satisfaction of the Director, NIA at completion. Before giving possession, the Contractor must see that all the works are in smooth and functional condition and accordingly shall make all necessary adjustments for such smooth working.

16. SANITATION:

16.1 The Contractor shall at his cost provide adequate latrine facilities and keep the same in a clean and hygienic condition to the satisfaction of the Public Health Authorities and shall cause such latrine and night soil to be cleared away whenever necessary and shall make good all works disturbed by these conveniences.

17. MINIMUM WAGES ACT:

17.1 The Contractor shall pay rates of wages and observe hours of work and conditions of employment to existing rules under Minimum Wages Act. Further, it shall be Contractor's responsibility to ensure that he pays his workmen wages, which are not lower than the minimum prescribed by the Union Government and State Government in which area this Contract, is being operated.

18. SHEDS FOR MATERIALS:

18.1 The Contractor shall at his cost provide and maintain proper approved sheds for the storage and protection of materials etc. and other work that may be executed on the site including the tools and materials of Sub-Contractors and remove on completion. Sheds for storage of Cement are to have floors raised from the ground.

19. TEMPORARY ROADS:

19.1 The Contractor shall, at his expense, provide such temporary roads on the site as may be necessary for the proper performance of the Contract and for his own convenience but not otherwise. Upon completion, such roads shall be broken up and levelled at Contractor's expense unless the Officer-in-Charge shall otherwise direct.

20. OBJECTS OF VALUE AND ANTIQUITY FOUND ON SITE:

20.1 All objects of value or antiquity found on the site shall remain the property of the Employer and such findings shall be immediately reported to the Director, NIA.

21. WORKS AND SITE TO BE KEPT AND DELIVERED UP CLEAN:

21.1 All shavings, cuttings and other rubbish as it accumulates from time to time during the progress of the work and at completion, including that of Sub- Contractor and special

tradesman to be cleared and carted away. All rejected materials shall be removed. Contractor's quoted rates shall allow for these factors.

22. USEFUL EXCAVATED MATERIALS:

22.1 Any sand, gravel, moorum or rock taken from excavation will remain the property of the Employer and in the event of it not being allowed to use in the work, the Employer reserves the right to dispose it off in any way he wishes or to direct the Contractor to cart it away as ordinary materials.

22.2 Should suitable sand or gravel or moorum or rock be found in the excavations and the Contractor be allowed to use the same in the work, in place of materials to be brought by him from outside he will be required to pay the Employer the full market value of the same.

23. SIGN BOARD AND HOARDINGS:

23.1 The Contractor shall not affix or place any placards or advertisement of any description or permit the same to be affixed or placed in or upon any hoarding, gantry, buildings or structure other than that approved by the Officer-in-Charge.

24. SCIENTIFIC AND MEASURING INSTRUMENTS:

24.1 Theodolite, levels, prismatic compass/chain, steel and metallic tapes and all other surveying instruments found necessary on the works, shall be provided by the Contractor at his expense for the due performance of this Contract as instructed by the Officer-in-Charge.

25. TOOLS FOR MASONS:

25.1 Every bricklayer or plasterer on the work shall be provided with suitable level, battens, trowels, wooden floats and breaking hammers for cutting bricks and templates, to enable him to carry out the work in a neat and workman like manner and each gang of brick layers or plasterers not exceeding six in number shall be provided with a suitable measuring rule, a plumb bob, a spirit level and a square in addition to the above mentioned, all to be to the approval of the Officer-in-Charge.

26. CONTRACTOR'S MISTERIES AND SUPERVISORS:

26.1 The Contractor's Misteries/ Masons and the Supervisors on the works shall carry with them a suitable measuring rule, a measuring tape, a spirit level, a plumb bob and a square and shall check the work of the bricklayer, plasterers, and carpenters and joiners to see that the work is being done according to the Drawings and Specifications. The Officer-in-Charge /Supervising Staff will use any and all measuring instruments or tools belonging to the Contractor as he chooses, while checking the work executed or being executed on the works.

27. NO OVERLOADING OF SLABS:

27.1 Floors of any structure under construction shall not be loaded by stacks of materials during construction without the prior approval of Officer-in-Charge. It is important that no load comes on the reinforced concrete floors until they are at least three weeks old and at no time must the load placed upon them exceed the load for which they are designed.

28. ATTENDANCE ON SUB-CONTRACTORS:

28.1 Co-ordination: The Contractor shall be responsible for the co-ordination of all the work including that of Sub-Contractors, for arranging runs of all services and working to the requirements and layout of the specialist trades, in all matters necessary for the complete execution of the work.

28.2 Rates quoted by the Contractor shall be inclusive of all attendance on Sub-Contractors or other Contractors nominated by the Employer. Contractor must allow for provision of the use of his scaffolding to Sub-Contractors and for its retention until such time all relevant Sub-Contract works are completed.

28.3 The Contractor shall accept liability for and bear the cost of the supply of all necessary water, electricity, lighting, watching etc. for the Sub-Contractors work.

28.4 The Contractor must allow in his rates for making good any holes and chases left by the Sub-Contractors or other Contractors nominated by the Employer before the work is completed and handed over.

28.5 The Contractors shall, at all times, give access to workmen employed by the local or other authorities or any men directly employed on work and to provide such parties with proper, sufficient, and if required, special scaffolding, hoists and ladders and provide them with water and lighting, and leave or make any holes, grooves etc. in any work directed by the Officer-in-Charge, as may be required, to enable such workmen to lay or fix pipes, electric wiring, special fittings etc. Contractor's quoted rates shall allow for these factors.

30. OCCUPATION BY EMPLOYER:

30.1 The Employer reserves the right to occupy the works by sections as completed, as may be considered by the Director, NIA both practicable and reasonable and without hindrance to the Contractor's progress.

31. TAXES, DUTIES, LEVIES AND DEDUCTION AT SOURCE:

31.1 The contractor shall be responsible to pay all statutory levies/taxes imposed by the State and Central Government from time to time. It is deemed that the rates quoted by the contractor for each item of works includes all applicable taxes except GST on Works Contract which shall be reimbursed by NIA as applicable from time to time as per notification of Govt. of India.

31.2 Deduction at source of Income Tax, all other statutory taxes as applicable shall be made by NIA as per statutory provisions prevailing from time to time, from the Running Account/ Final Bills and remitted to the concerned Taxation Authorities/ State Government on behalf of the contractor.

SCOPE OF WORK FOR THE TURNKEY CONTRACT

The Bidder is advised to visit the Site and ascertain condition before submission of the tender. The site is in Pune. National Insurance Academy, Pune has it's own infrastructure for it's Employees and the students. The proposed Sewage Treatment Plant work shall be done as per site conditions with least inconvenience to the occupants and neighbors and general public. Contractor shall have to arrange material, labour, T& P and other resources keeping in mind the site conditions. Nothing extra shall be admissible on this ground. The scope of work shall include the features / requirements to be incorporated in the design as well as construction to mitigate such site condition to achieve the target levels as per site requirement.

The Bidders shall prepare their detailed designs and drawings inconformity with the local Bye-laws.

The scope of work includes construction of new underground Sewage Treatment Plant as per Local / Statutory Authorities' norms. Besides these, infrastructure and all related utilities and otherwise taking into consideration with respect to all local /statutory regulations as required for development are also included in the scope of work.

The Contractor shall be responsible for:

- Fabrication of Plant in factory.

- Transportation of Plant to site.
 - Temporary storage and protection of Plant on site.
 - Assembly / erection on site, including concrete foundation pads.
 - Cabling, wiring and electrical panels including connections to main cable and earthing.
 - Suction piping, interconnecting piping and delivery piping up to gate valves including all valves.
 - All foundation plates, bolts, anchors, tanks, sludge beds etc.
 - Testing and Commissioning, including providing water for testing.
 - Painting, cleaning and handing over.
 - Obtaining approval for Sewage Treatment Plant process and plant design, if required by authorities.
 - Obtaining Completion Certificate for STP from Environmental Dept. and from Local Municipal approving authority-if and as applicable
 - Training of Employer's representative(s) for a period of 3 months after commissioning of Plant.
 - Incidental items necessary for installation.
 - Submission of all Working drawings for necessary civil work.
 - For all ancillary Civil works like necessary FRP/PP/R.C.C. Tanks etc, detail working drawing shall be submitted by STP vendor and the civil works shall also be executed under their scope.
- 1.1 The contractor will execute the entire work on LUMP SUM on item rate basis for supply & installation of all electro-mechanical components, execution of all civil works, commissioning, start-up and getting successful test result from authorized lab / agency, based on accepted shop drawings & detailed calculations. The contractor shall be completely responsible for the design of all components, structural details & supervision of the civil works at no extra cost.
 - 1.2 The contractor shall bear responsibility for the characteristics of the final effluent and shall make any addition/alterations to the equipment or plant, if the same fails to meet the required standard, without any extra cost.
 - 1.3 Work under this contract shall consist of furnishing all labour, materials, equipment and appliances necessary and required together with shop drawings and required details to construct, erect and commission, a Sewage Treatment Plant, completely in accordance with the specifications and drawings enclosed with this tender generally comprising but not limited to the items mentioned in the following sections.
 - 1.4 Construction of all elements of the plant including Civil works excavation for pipelines, gravity lines, manholes chambers etc as per statutory requirement.
 - 1.5 Interconnecting piping between all units, valves, gates and all other appurtenances and devices as required.
 - 1.6 All mechanical equipments duly protected against corrosion.
 - 1.7 All electric drives, motor control centers, power and control cable (except main incoming feeder and lighting)
 - 1.8 All instrumentation, control cabling, panels complete in all respects.
 - 1.9 The contractor shall work out detailed layout and flow scheme with levels, ensuring that the basic design data conforms to standard practice and specification applicable to electro coagulation type STP units.

1.10 The contractor shall pump out and the sewage & its' liquids if any of the existing old STP to the nearby Municipal sewer line, if required, which will be included in the quoted cost.

2. Process Description for development of STP

2.1 Technology shall be Moving Bed Bio-film Reactor (MBBR)

2.2 Population details as follows:

- i. Confirmed Population -1120 Nos.
- ii. Floating Population -284 Nos.

2.3 Capacity of STP shall be calculated based on population given subject to minimum capacity of 200KLD.

2.4 Inlet Parameter:

Influent Characteristics

- i. BOD: 800mg/lit
- ii. COD: 600mg/lit
- iii. SS: 300mg/lit
- iv. O&G: 50mg/lit.
- v. PH: 7 to 8

Above details are tentative. However, bidder has to check the actual inlet parameter from NIA site. Amongst the inlet parameter observed, the stringent parameter observed shall be adopted in design.

2.5 Outlet Parameter:

- i) BOD less than 10 mg/l
- ii) COD less than 50 mg/l
- iii) SS less than 10 mg/l
- iv) TDS less than 2100 mg/l
- v) pH in between 6.5-8.0

The above outlet parameter shall be compared with norms of Maharashtra Pollution Control Board and Central Pollution Control Board. The stringent amongst above three outlet parameters shall be taken into consideration for design.

2.6 The total STP plants including its ancillary structures except electrical panel (existing old Electrical Panel Room shall be used) shall be under ground.

2.7 The treated water coming out of the STP plan shall be pumped to the garden. The pumping arranged shall be provided by the contractor.

2.8. The lowest bidder shall get the design of STP so proposed, including its size vetted through IIT or any Govt. Engineering Collage.

2.9 The Contractor has to install suitable size underground 4 core Aluminium armored XLPE cable of about 250 Mtrs. length for catering entire load of proposed STP including additional load of about 20 H.P. for catering power to bore-well submersible pump sets.

Provision of 6 Nos. of feeders suitable for connecting four core cable of 3 HP submersible pumps excluding starters should also be made in the control panel.

ANNEXURE – ‘A’

**PROFORMA FOR
ARTICLES OF AGREEMENT**

ARTICLES OF AGREEMENT made at..... this..... day of..... 20..... between National Insurance Academy, having its establishment at Balewadi, Baner Road, NIA P.O., Pune-411045 in the State of Maharashtra hereinafter called the Employer (which expression shall include its successors and assignees wherever context or meaning shall so require or permit) of the one part and M/s (hereinafter called "**The Contractor**") of the other part.

WHEREAS the Employer is desirous of constructing the.....

and has prepared **schematic** drawings **and Specification** which have been signed by or on behalf of the parties hereto.

AND WHEREAS the Contractor has agreed to execute upon and subject to the conditions and instructions set forth herein (hereinafter referred to as "**the said Conditions**") the works shown upon the said drawings and /or described in the said Specifications therein set forth amounting to the contract sum of Rs..... hereinafter referred to as "**the said contract Amount**".

NOW IT IS HEREBY AGREED AS FOLLOWS:

1. In consideration of the said Contract Amount to be paid at the times and in the manner set forth in the said conditions, the contractor shall upon and subject to the said Conditions execute and complete the works shown upon the said Drawings and described **and Specification.**
2. The Employer shall pay the contractor the said Contract Amount or such other sum as shall become payable in the manner hereinafter specified in the said conditions.
3. The said Conditions and Appendices thereto shall be read and construed as forming part of this Agreement, and the parties hereto shall respectively abide by and submit themselves to the conditions and perform the Agreement in their part respectively in such conditions contained.
4. All disputes arising out of or in any way concerned with this Agreement shall be deemed to have arisen in **Pune** and only the Courts in **Pune** shall have jurisdiction to determine the same.
5. The contract comprises: -
 - i) Tender Documents Serial Pages.....
 - ii) Subsequent Correspondence Serial Pages.....
 - iii) Architectural Drawings Serial Pages
6. Only (.....) alterations have been made in these documents and as evidence that these alterations were made before the execution of Contract Agreement, they have been initialed by the contractor and

..... the Director, National Insurance Academy, having its establishment at Balewadi, Baner Road, NIA P.O., Pune-411045 in the State of Maharashtra..... The said officer is hereby authorized to sign and initial on the Employer's behalf, the documents forming part of this contract.

7. IN WITNESS WHEREOF THE Official Seal of the National Insurance Academy, Pune, was thereto affixed and signed on its behalf by the Director, NIA and by _____ on behalf of the Contractor/s on the dates respectively mentioned against their signatures in the presence of the witnesses whose signatures are also appended.

In the presence of

THE DIRECTOR
 FOR AND ON BEHALF OF
 NATIONAL INSURANCE ACADEMY

Signature:

Name:

Address:

Date :.....

2. Signature:
- Name:
- Address:
- In the presence of

1. Signature: FOR AND ON BEHALF OF THE
- Name: CONTRACTOR
- Address: M/S
- Date :.....

2. Signature:
Name:
Address:

ANNEXURE – ‘B’

NATIONAL INSURANCE ACADEMY

(Refer Conditions of Contract)

FORM OF BANK GUARANTEE IN LIEU OF SECURITY DEPOSIT
IN INDIVIDUAL CONTRACTS

To
NATIONAL INSURANCE ACADEMY

In consideration of the National Insurance Academy, having its establishment at Balewadi, Baner Road, NIA P.O., Pune-411045 in the State of Maharashtra (hereinafter called ‘NIA’ which expression shall unless repugnant to the subject or context include its successors and assignees) having agreed under terms and conditions of contract (vide its acceptance letter No. _____ dated _____) made between _____ *

(hereinafter called the said Contractor) and NIA in connection with _____ (hereinafter called ‘the said contract’) to accept a Deed of Guarantee and Indemnity as herein provided for

Rs. _____ from the
_____ in lieu of the Security Deposit to
be made by the contractor and/or in lieu of the deduction to be made from the Contractor's
bills, for the due fulfillment by the said contractor of the terms and conditions contained in the
said contract, we the _____
(hereinafter referred to as **'the said Bank'**) and having our office at _____
do hereby undertake and agree to
indemnify and keep indemnified NIA from time to time to the extent of Rs. _____
(Rupees _____ only) against any loss or damage,
costs, charges and expenses caused to or suffered by or that may be caused to or suffered
by NIA by reason of any breach or breaches by the said contractor in respect of the said
contract or of any of the terms and conditions contained in the said contract, or in respect of
all its claims for money and / or material found due and recoverable from the said contractor
and to unconditionally pay the amount claimed as such by NIA on demand and without demur
to the extent aforesaid.

2. We, the said Bank further agree that NIA shall be the sole judge of and as to whether
the said contractor has committed any breach or breaches of any of the terms and conditions
of the said contract and the extent of loss, damage, costs, charges and expenses caused to
or suffered by or that may be caused to or suffered by NIA from time to time on account
thereof and the decision of NIA in this respect shall be final and binding on us.

3. NIA shall have the fullest liberty without affecting in any way the liability of the Bank
under this Guarantee or Indemnity from time to time to vary any of the terms and conditions
of the said contract or to extend time of performance by the said contractor, or to
postpone for any time and from time to time any of the powers exercisable by it against the
said contractor and either to enforce or forbear from enforcing any of the terms and conditions
governing the said Contract or securities available to NIA and the said Bank shall not be
released from its liability under these presents by any exercise by NIA of the liberty with
reference to the matters aforesaid or by reason of time being given to the said contractor or
any other forbearance, act or omission on the part of NIA or any indulgence by NIA to the
said contractor or of any other matter or thing whatsoever, which under the law-relating to
sureties would but for this provision have the effect of so releasing the Bank from its liability.

4. It shall not be necessary for NIA to proceed against the contractor before proceeding
against the Bank and the Guarantee and Indemnity herein contained shall be enforceable
against the said Bank, notwithstanding any security which the NIA may have obtained or
obtain from the contractor shall at the time when proceedings are taken against the Bank
hereunder be outstanding or unrealized.

5. Notwithstanding anything contained in any of the foregoing clauses the liability of the
Bank under this Guarantee shall not exceed Rs. _____ (Rupees
_____ only). The guarantee shall
remain in force till _____. If any extension of time be granted to the contractor,
we undertake to extend the guarantee with the consent of the contractor. Unless a claim or
demand under this guarantee is made or presented to the Bank within six months from the
expiry date, all the rights of NIA under this Guarantee shall cease, and the Bank shall be
released and discharged from all liability hereunder.

6. We, the said bank lastly undertake not to revoke this guarantee and indemnity during its
currency except with the previous consent of NIA in writing and agree that any change in the
constitution of the said contractor or the said Bank shall not discharge our liability hereunder.

For and on behalf of the Bank

(Name and Designation)

The above Guarantee is accepted by the
NATIONAL INSURANCE ACADEMY

For and on behalf of the NIA

(Name and Designation)

Dated:

Note No.1 * : FILL IN AS APPLICABLE

A) For Proprietary concerns: -

Shri _____ son of _____ resident
of _____ carrying on business under the name and style of
_____ at _____
(hereinafter called **'the said contractor'** which expression shall unless the context requires
otherwise include his heirs, executors, administrators and legal representative).

OR

B) For Partnership concerns: -

1. Shri _____
son of _____
resident of _____

2. Shri _____
son of _____
resident of _____

carrying on business in partnership under the name and style of
_____ of _____ at
_____ (hereinafter collectively called **'the contractor'** which
expression shall unless the context requires otherwise include each of them and their
respective heirs, executors, administrators and legal representatives)

OR

C) For companies: -

M/S / Shri _____ a company under the Companies
Act 1956 and having its registered office at _____ in the state of
_____ (hereinafter called **'the said contractor'** which expression shall
unless the context requires otherwise include its successors and assignees).

Note No.2:

**** Please fill in the name and address of Bank.**

**NATIONAL INSURANCE ACADEMY
LETTER TO BIDDER FROM THE DIRECTOR, NIA**

To,

.....
.....
.....
.....
.....

Dear Sir / Sirs,

SUB: E- Tender for Proposed Sewage Treatment Plant at National Insurance Academy, Balewadi, Baner Road, NIA P.O., Pune-411045, on Design, Engineering, Procurement and Construction (Turnkey) basis.

1) We hereby publish the TENDER on e-Tendering Portal (Website) through <http://www.tenderwizard.com/NIA> in **Electronic Mode** hereinafter referred as "eTendering" and consisting of following:

- (a) BID I: E.M.D. BID
- (b) BID II: PREQUALIFICATION BID

(c) BID III: FINANCIAL BID

Please note that copy of above e-Tender can be downloaded from above portal (website) and should be mandatorily submitted in **Online Electronic Mode** hereinafter referred as “**Online Offer**”. The submission of Online offer duly Encrypted & Digitally Signed on above portal should be in prescribed Electronic Forms (Online) available on above portal for respective tender in Online Envelope(s) on or before **As per the Key Dates mentioned in the tender document and online portal for above tender.**

- 2) The drawings for the work will be available for inspection at the following Office:
 - (a) Office of the Director, National Insurance Academy, at Balewadi, Baner Road, NIA P.O., Pune-411045
- 3) The bidders should submit the required **Tender Fee of Rs.1000/-+ 18% GST (non-refundable) in the form of Demand Draft/ Pay order in favour of “National Insurance Academy” payable at Pune** and Earnest Money Deposit (EMD) as mentioned in e-Tender in a Physical Envelope accompanied by **Earnest Money Deposit of in the form of Demand Draft/ Pay order in favour of “National Insurance Academy” payable at Pune**. In case the BG submitted by the Bidder is not genuine, the Bidder will be barred from participating in the tender of the NIA for 5 years and the information will be shared with other Government Organizations including Banks & other financial institutions and to their previous/present employers etc.
- 4) **BIDs** will be received at the office of the Director, NIA at above address **on or before As per the Key Dates** and the e-Tenders will be opened at **as per the Key Dates** in the presence of contractors or accredited representatives, who wish to attend the online Tender Opening process. The bidders can view the Tender Opening details through their respective Login IDs on the above-mentioned e-Tender portal (Website). The Bidder should ensure that his Bid is received **Online Electronically** on or before the due date and time as specified in “**Key Dates**” in the Tender Document and above-mentioned Portal (website). **Please note that above e-Tendering System is an automatically time locked system which will be locked immediately as soon as due date and time is over and will not accept any offer after that. So, the Bidders are strictly advised to complete their process well before the due date and time to avoid any such instances as no such reasons shall be entertained.**
- 5) The guidelines to submit the tender on Electronic Tendering System is part of BID-I of the tender document. The Bidders are advised to carefully read the above document for understanding of e-Tendering System.
- 6) The NIA does not bind itself to accept the lowest or any tender.

Encl: As above

DIRECTOR, NIA

NATIONAL INSURANCE ACADEMY

LETTER FROM BIDDER TO THE DIRECTOR NIA

TO BE SUBMITTED ON OR BEFORE **As per the Key Dates**

Date:

To,
The Director,
National Insurance Academy,
Balewadi,
Baner Road,
NIA P.O.,
Pune-411045

SUB: E-Tender for Proposed Sewage Treatment Plant at National Insurance Academy, Balewadi, Baner Road, NIA P.O., Pune-411045, on Design, Engineering, Procurement and Construction (Turnkey) basis.

Dear Sir,

We, the undersigned, declare that:

- (a) We have examined and have no reservations to the Bidding Documents, including addenda issued in accordance with Instructions to Bidders.
- (b) We offer to execute in conformity with the Bidding Documents the following Works:
Construction of 200 KLD Sewage Treatment Plant for National Insurance Academy, Pune using MBBR Technology.
- (c) Our Bid shall be valid for a period of **90days** from the date fixed for the Bid submission deadline in accordance with the Bidding Documents and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
- (d) We understand that this Bid, together with your written acceptance thereof included in your Letter of Acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed; and
- (e) We understand that you are not bound to accept the lowest evaluated Bid or any other Bid that you may receive.
- (f) We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in any type of fraud and corruption.
- (g) Having examined the Enrolment Form, Selection Criteria , Technical Specifications, Scope of work , Drawings, Specifications, Conditions of Contract etc. included in the tender document for the Lump sum EPC Contract relating to the above work, having visited/examined the site of the existing premises, having acquired the requisite information relating thereto as effecting the tender invited by you on behalf of the NIA, I/We, the undersigned hereby offer to carry out the above mentioned work on Lump sum amount basis in strict accordance with the Contract Conditions and Specifications.

1. I/We, undertake to complete and deliver the whole of the works within a period as specified in Appendix to the Conditions of Contract from the date of issue of intimation from you that the tender has been accepted and upon receiving possession of the site. I/We shall be under the

obligation to complete the entire work within the period of completion failing which to pay the sum as stated in the Appendix to the Conditions of Contract for every week that the works shall remain incomplete, damages as compensation subject to the conditions of contract relating to extension of time.

2) I/We enclose herewith my/our tender with an Earnest money remittance of

- a) **Tender Fee of Rs.1000/-+ 18% GST (non-refundable) in the form of Demand Draft/ Pay order in favour of “National Insurance Academy” payable at Pune.**
- b) **EMD of Rs. 35,000.00 (Rupees Thirty-Five Thousand only) in the form of Demand Draft/ Pay order in favour of “National Insurance Academy” payable at Pune.**

I/We hereby agree that part of this sum shall be forfeited by the National Insurance Academy in the event of my/our tender being accepted and I/We fail to execute Contract when called upon to do so.

3) In the event of the tender being accepted, I/We, agree to furnish a lump sum Security Deposit amounting to 5% of Estimated Cost put to Tender by NIA or Accepted Tender Amount whichever is higher in the form of Bank Guarantee/s from **any Scheduled commercial Bank only (i.e. Indian or Foreign Banks included in Second Schedule of Reserve Bank of India Act 1934 excluding Co-operative Banks or Regional Rural Banks) and not from Scheduled Co-Operative bank** as per specimen given in Annexure "B" to Conditions of Contract, within 21 (Twenty One) days from the date of issuance of acceptance of tender or within 21(Twenty One) days from the extended date as may be extended by the Director, NIA.

4) I/We note that the Earnest Money Deposit of **Rs. 35,000.00 (Rupees Thirty-Five Thousands only)** would be refunded to me/us.

a. On expiry of the validity of the tender or earlier at the discretion of The Director, NIA in case my/our tender is not accepted and

b. In case my/our tender is accepted, after I/We, furnish Bank Guarantees as mentioned above.

5) I/We, agree,

a) In case my/our tender is withdrawn before expiry of the validity period or before the issue of letter of acceptance, whichever is earlier, or make any modifications in the terms and conditions of the tender which are not acceptable to the Department, in such case 25% of the EMD will be forfeited by the department.

b) In case my/our tender is accepted and we fail to complete formalities like taking Insurance policies, Labour License and fail to take over the site for commencement, 50% of the EMD will be forfeited automatically without any notice.

Yours faithfully,

(SIGNATURE OF THE CONTRACTOR)

Name and Seal

NAME OF THE PARTNER OF THE FIRM OR

NAME OF THE PERSON HAVING POWER OF

ATTORNEY TO SIGN THE CONTRACT

(CERTIFIED TRUE COPY OF THE POWER

OF ATTORNEY SHOULD BE ATTACHED

APPENDIX TO CONDITIONS OF CONTRACT

SUB: E-Tender for Proposed Sewage Treatment Plant at National Insurance Academy, Balewadi, Baner Road, NIA P.O., Pune-411045, on Design, Engineering, Procurement and Construction (Turnkey) basis.

ESTIMATED COST : Rs. 70 lakhs.
PERIOD FOR COMPLETION : Three Months
EARNEST MONEY DEPOSIT :Rs 35,000.00

Sl. No.	Description	Remarks
1(a)	Minimum requirement of Technical staff	As provided in annexure I
1(b)	Recovery for Non Deployment of Engineer/s at the Site	As provided in annexure I
2	Date of commencement	Either 21(Twenty-one) days from the date of acceptance letter issued to the contractor OR The day on which contractor is instructed to take possession of the site, whichever is earlier .
3	Date of completion	3 Months from the date of commencement (20days for Planning (Detailed Engineering) works and 70days for construction)
5	Compensation in the Form of Penalty	Compensation in the form of penalty for delay of the work: Quantum of compensation: 1.5% per month of delay to be computed on per day basis as mentioned in clause 19.1 , not to exceed 10% of the tendered value of work.
6	Period of final measurement/ assessment	60 (Sixty) days
7	Interim certificate	Monthly (As per the satges of payment mentioned elsewhere in the tender)
8	Period of honouring interim certificate	20 (Twenty) days
9	Period of honouring final certificate	90 days from the date of submission of final measurements/assessment with details.
10	Security Deposit	Rs 3.50 lakhs (Rupees Three lakhs fifty thousand only) or 5% of the accepted tender amount whichever high as Security Deposit.

11	Recovery of Security Deposit	In form of Bank Guarantee from Scheduled commercial Bank only (i.e. Indian or foreign banks included in second schedule of Reserve Bank of India Act 1934 excluding Co-operative banks or Regional Rural banks) and not from Scheduled Co-operative bank. The Contractor shall furnish one Bank Guarantee for full amount of Security deposit valid till end of defects liability period OR, Two Bank Guarantees of like amounts each equal to half the Security deposit; one valid till virtual completion and the other till end of defects liability period.
	Liquidated Damages:	Quantum of Liquidated Damages: 1.00 % of the contract sum per week subject to a maximum of 10%.
13	Contractor's All Risk Policy inclusive of Third-Party Liability	"Conditions of Contract"
14	Workmen's Compensation Policy	As per mutual agreement.
15	Recovery for non-Extension of Insurance Policies (Workman's Compensation and Contractor's All Risk Policy inclusive of Third Party Liability)	Date for submitting the renewed Insurance policy if any will be 15 working days before the last date of the existing policy, failing which NIA may insure/ renew insurance and apply penal cont on the Contractor i.e. Premium Charges + Rs. 10,000/- as Admin Charges and Rs.25,000/- as penalty
16	Defects Liability Period	One year from the date of handing over of the Plant as a whole
17	No Claim Certificate	To be given on Contractor's letter head

Note: TAXES, DUTIES, LEVIES AND DEDUCTION AT SOURCE:

- The Contractors Quoted rates shall be exclusive of GST on Works Contract. The GST on Works Contract shall be reimbursed to the Contractor as pre-Notifications of Govt. Of India.
- Penalty on account of non-renewal of Insurance, Compensation in the form of Penalty if imposed will attract GST if any at applicable rates during contract period.

NO CLAIMS CERTIFICATE CUM RECEIPT

Received Rs. _____ (Rupees _____)
being the amount against my/our final bill dated _____
for _____ (Name of Work) in full and
final settlement of bill.

Contractor

(Signature of Contractor on Revenue stamp)

Rubber stamp/seal of the contractor /company

REFUND OF EARNEST MONEY DEPOSIT

The EMD will be refunded to the unsuccessful bidders within 6 workings days (excluding gazette holidays, Saturday, Sundays and any other holiday for NIA) of opening of the price bid.

FORFEITURE OF EARNEST MONEY DEPOSIT

- 1) If the lowest tender withdraws his tender before the expiry of validity period or before the issue of letter of acceptance whichever is earlier or makes any modification in the terms and conditions of tender which are not acceptable to department, then the department shall, without prejudice to any other right or remedy be at liberty to forfeit 25% of the earnest money and to refund the balance.
- 2) In case my/our tender is accepted and we fail to complete formalities like taking Insurance policies, Labour License and fail to take over the site for commencement, 50% of the EMD will be forfeited automatically without any notice.
- 3) In case of forfeiture of earnest money as prescribed above, the tenderer shall not be allowed to participate in the tendering process of the work

Advance Security Form

To
The Director
National Insurance Academy
Balewadi, Baner Road
NIA P.O.
Pune-411045
Maharashtra

Name of Works: Proposed Sewage Treatment Plant at National Insurance Academy, Balewadi, Baner Road, NIA P.O., Pune-411045, on Design, Engineering, Procurement and Construction (Turnkey) basis.

Capacity:200 KLD Sewage Treatment Plant

Technology: using MBBR Technology

UNDERTAKING FOR GUARANTEE

I/WE GUARANTEE THAT

1. I / We will replace, repair and adjust free of all charges, to the employer any part of work which fails to comply with the specifications or amendment to such specifications as referred to in our specifications attached to tender, fair wear and tear accepted until the completion and a period of One year from the date of handing over of the Sewage Treatment Plant along with all infrastructure as a whole.
2. All the work will be reliable.
3. All the work will be of type which has been proved in service, to be suitable for the duty required by the specifications and will be manufactured and tested in accordance with appropriate standard specifications approved by the Officer-in-charge.
4. I / We accept and abide by the clause relating to quality and guarantee of work.

Thanking you,

Yours faithfully

Signature of Contractor
with stamp

Name of the person duly
authorized to sign the Bid
on behalf of the Bidder.

Designation of the person
signing the Bid

Date:

SPECIAL CONDITIONS:

1. PHOTOGRAPHS OF THE WORK

- 1.1 The contractor shall submit 3 sets of the prints with negatives of the photographs size 4" x 6" to LIC of India on the following stages:
- Before commencement of the work.
 - During progress of work.
 - Completion before handing over the building.

The photographs can also be submitted in CD/DVD in lieu of printed photographs.

- 1.2 The quoted rates shall include for the same and no extra is payable to contractor on this account.
- 1.3 Contractors shall note that the site is in the working & Residential area. Hence, contractor shall take in to account this aspect and quote their Lump Sum rate accordingly.
- 1.4 Contractors are advised to inspect the site before quoting their **LUMP SUM RATE**. The contractors shall also note that they have to co-operate with the other agencies carrying out the work (s) of LIC of India in the same site.

2. OTHER CONDITIONS:

- Labours may allow at site only after showing photo I Card issued by the agencies and duplicate of which is to be submitted to our office.
- Gate pass for daily labour may be issued.
- Every efforts should be made to restrict the movement beyond working area.
- Contractor should be aware of the restrictions in movement of vehicle as per rule of Local/ Statutory/Traffic authority. So information regarding entry of materials to our building should come to us well in advance.
- Materials can be taken away only after getting gate pass from NIA.
- If work is to be carried out at night. Prior permission is to be obtained by the agencies.
- Well co-ordination should be maintained with other vendors if any.
- Every day, before the starting of the activities of the institution common area should be cleaned in all respect if this area is used anyway for the work.
- NIA is no way responsible for issuing way bill or C – form to any agencies.

3. Contractor has to arrange all necessary measures for carrying out the work with the permission of Municipal council/Corporation/heritage/Police or any other authority if requires to do so during total currency of work execution. The rates are inclusive of the same without any extra cost to NIA.

4. During the execution of the work, the cleaning of pavements to be done on day-to-day basis.
5. The work is to be carried out in the Institutional working and Residential area with least disturbance to the occupants/staff and therefore the work may have to be carried out in phased manner, but entire work is to be completed within stipulated time limit. No consideration shall be given for extension of time limit on account of work taken in phases.
6. The contractors has to depute sufficient number of supervisory staff for making all arrangements and to ensure no disturbance to occupants.
7. It is responsibility of the contractor to adhere to all security measures for the workers.
8. The Contractors has to ensure protection to buildings/ structures and other assets including parked vehicles in the campus. In case of any damages caused due to work or due to ignorance of ant worker, contractor has to make good the damages and / or compensate NIA for the damages done.
9. Contractor is advised to inspect the site before submitting the tender and examine all parts of the work.
10. Contractor shall purchase the material as per approved samples on getting approval from the NIA for the source and the rates.

The material shall be inclusive of all costs up to the site of work, including purchase price, all Statutory taxes, transportation charges including loading and unloading charges at all points, transit insurance but does not include any incidental expenses incurred by the contractor for arranging to take delivery, transportation or payment of octroi charges etc., which shall be solely to the account of the contractor and shall be included by the contractor in his quoted rates. Even, all other costs such as unloading the material at site, handling, stacking, storing, providing watch and ward arrangement, loss due to pilferage, theft, damages if any including wastage etc. shall be to contractor's account.

Before Commencement of the work, the L-1/ accepted Contractor has to submit the "Non-Disclosure Agreement" on Rs. 100/- Stamp paper as per the Performa given in **Annexure" A"**.

11. Performance Period (Operation & Maintenance Period):

The Maintenance period shall be 36 months i.e., including period of (Operation & Maintenance) O & M. During this period the contractor shall supervise the operation & maintenance work by deputing one supervisor from the contractor. During this period, the plant will be run by contractor and sample testing / electrical energy and other consumable charges shall be reimbursed to the contractor on production of proof of payments. The special security deposit of 1% of contract amount shall be recovered through R.A. Bills towards Maintenance /performance and same will be refunded after expiry of Maintenance /performance period.

12. Defect Liability Period

The contractor shall stand guarantee for the successful operation and maintenance of the whole plant for a period of 3 years after defect liability period of one year, which includes maintenance /performance period, period of commissioning and Defect Liability Period

(DLP) from the date of starting of the maintenance/performance period, during which time any defects and shortcomings noticed due to defective construction will have to be made good to the entire satisfaction of NIA without claiming any extra cost. During Defect Liability Period NIA will bear the cost of chemicals and energy. Balance of security deposit will be released after end of defect liability period.

For Operation and Maintenance the contractor shall quote separately.

Fresh Bank Guarantee shall be provided @ 5% for value of Operation and Maintenance cost towards Operation and Maintenance work for three years.

13. OPERATION AND MAINTAINING STP FOR 3 YEARS

- i. On completion of STP, the Contractor should commission the scheme to its rated capacity, including cost of all labour items, attending execution defects noticed, including cost of material and labour for the period of three years
- ii. The Contractor should employ necessary staff. It should be the responsibility of the Contractor to see the regular Functioning of STP is maintained and NIA is made aware of day-to-day maintenance. The running charges exclude the cost of electrical bills and consumable items like chemicals etc. (to be provided by NIA). The defects noticed during this period, arising out of defective workmanship should be attended by the Contractor, without any extra cost.
- iii. The Contractor should maintain necessary logbook of pumping and wastewater sampling Reports etc. up to date.

The Operation & Maintenance (O & M) shall be done in consultation with technology provider.

14 MEASUREMENT OF WORK DONE

14.1 The Officer-in-Charge shall, except as otherwise provided, ascertain and determine, by the value of Works done in accordance with the Contract. All items having financial value shall be recorded so that a complete record is obtained of all Works performed under the Contract, which will be assessed jointly by the Officer-in-Charge or his authorized representative and by the Contractor or his responsible agent from time to time during the progress of the Works and such recorded documents shall be signed and dated by the Officer-in-Charge and the Contractor or their representatives as token of their acceptance.

14.2 The Contractor shall, without extra charge, provide all assistance with every instrument, labour and other things necessary to verify the completed work.

14.3 If any part of Works shall be covered up or placed beyond the reach without notice been given to the Officer-in-Charge or without his consent being obtained in writing, the Works shall be uncovered at Contractor's expense or in default thereof no payment or allowance shall be made for such Works or the materials with which the same was executed.

14.4 It is also a term of this Contract that recording of any completed Works and/or its payment in the interim 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 Contractor from liabilities or defects noticed till completion of the defects liability period.

15. PAYMENTS OF RUNNING BILLS

15.1 The payment of running bill for the Works shall be released in 30 days from the date of recording of pay order. **All the payment shall be made as per Major Cost Centre & Its' SOP.**

15.2 It shall be the contractual obligations on the part of the Contractor to submit with each running bill photocopies of the:

- (i) Tax Invoice for the main items purchased for the Works.
- (ii) Guarantee/ warranty certificates/NOC, wherever applicable.

15.3 Payment of Final Bill

The final bill shall be submitted by the Contractor within three months of Completion Date or within one month of the date of issue of Completion Certificate furnished by the Officer-in-Charge whichever is earlier. In case commissioning is delayed from the Physical Completion of the Works, the final bill shall be reckoned submitted on the date of successful commissioning. No further claims shall be made by the Contractor after submission of the final bill and these shall be deemed to have been waived and extinguished. Payments of those items of the bill in respect of which there is no dispute and of items in dispute, for quantities and rates as approved by Officer-in-Charge, will as far as possible be made within the period specified herein under, the period being reckoned from the date of receipt of the bill by the Officer-in-Charge or his representative, complete.

15.4 Withholding and lien in respect of sums due from Contractor

Whenever any claim or claims arises out of or under the Contract **against the Contractor**, the Employer shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from any sum or sums found payable or which may at any time thereafter become payable to the Contractor under the Contract. In the event such sums being insufficient to cover the claimed amount, the Employer shall be entitled to withhold and have a lien to retain to the extent of such claimed amount from the security deposit, or any other amount due to contractor. Further, for the purpose of this clause, the Employer shall be entitled to withhold and also have a lien to retain to the extent of the claimed amount or amounts, from any sum or sums found payable or which may at any time thereafter become payable to the Contractor for finalization of adjudication of any such claim.

16. RATES INCLUDES

The Lump-sum tendered rate of the Works shall be considered inclusive of all leads and lifts, unless otherwise specified, skilled or unskilled labour & material required for working at all heights and depths, making any shape of the masonry/RCC as required (as per design& drawings prepared by the contractor of STP & it's infrastructure), royalty fee, taxes, octroi, entry tax etc. besides other taxes payable by the Contractor such GST applicable on the goods/material. Nothing extra shall be paid unless otherwise given in the description of item and no extra claim shall be entertained due to any reasons whatsoever on this account.

17. FORECLOSURE OF CONTRACT DUE TO ABANDONMENT OR REDUCTIONS IN SCOPE OF WORK:

17.1 If at any time after issuance of Work Order, the Employer decides to abandon or reduce the scope of the Works for any reason whatsoever and hence not require the whole or any part of the Works to be carried out, the Officer-in-Charge shall give notice in writing to that effect to the Contractor and the Contractor shall act accordingly in the matter. The Contractor shall have no claim to any payment of compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from

the execution of the Works in full but which he did not derive in consequence of the foreclosure of the whole or part of the Works.

17.2 The Contractor shall be paid at Contract rates full amount for works executed at Site as certified by the Officer-in-Charge. For the items, which could not be utilized on the Works to the full extent in view of the foreclosure or any expenditure incurred on preliminary site work, e.g., temporary access roads, temporary labour huts, site office, storage accommodation and water storage tanks, materials supplied no payment shall be made.

18. CHANGES IN CONTRACT PRICE- NOT APPLICABLE

No Payments due to variation in prices of material and labour after receipt of tender for Lump sum rate Contract is allowed.

19. It is proposed to undertake the construction of Sewage Treatment Plant at National Insurance Academy, Balewadi, Baner Road, NIA P.O., Pune-411045, on Design, Engineering, Procurement and Construction (Turnkey) basis.

i. Wastewater shall be treated in STP. Treated wastewater shall be fully reused for landscaping, car washing etc. The Contractor should ensure Zero discharge of treated sewage.

ii. Reuse of treated wastewater should be carried out.

20. The lowest bidder (Contractor) is required to prepare working drawings based on stipulation of Pollution Control norms, NBC, MOEF or other required guidelines and any other Authority whose stipulations have bearing on the Project.

Being the EPC tender, bidder is advised to work out the detailing as per requirement given in tender documents and considering the same along with the relevant IS codes, NBC-2016, MOEF guidelines, CPHEEO Manual and latest technology etc.

The bidders, before quoting the tender are deemed to have studied, Technical specifications and scope of work. The contractor shall submit their detailed estimate along with rates along with drawings.

No claim on account of any discrepancies, changes in nomenclature, variation, addition, alteration, modification, left over items etc. submitted by the contractor and as actually executed at site, shall be admissible. The contractor is required to execute all the works/items and quantities as per Scope of work and to quote their amount/financial bid accordingly. In case of contravention of stipulation of this clause from any other clause/provision elsewhere in the tender document, then this clause shall have superseding effect to the extent of contravention and decision of Officer-in-charge shall be final & binding on the contractor.

21. The bidders in their design obligations minimum standards have to comply with, as per provisions of the contract.

22. The contractor is required to complete the project on Design & Build basis as specified in the Scope of Work covering the entire work /services and the contractor's quoted Lump Sum tender amount is deemed to include everything from the award of work up to & including handing over of completed project, defect liability period.

However, the contractor is required to complete works up to First Manhole for all services including further connections up to authority manhole/outlet point for Sewerage. After connection the contractor shall have to arrange his own testing commissioning of complete STP as necessary. All municipal & mandatory approvals required for occupation and completion of the work shall be obtained by the Contractor.

- a) All the design & drawings will become the property of NIA. The drawing cannot be issued to any other person, firm or authority or used by the contractor for any other project. No copies of any drawing or document shall be issued to anyone except NIA and authorized representative of NIA.
- 23.** It shall be deemed that the contractor has satisfied himself as to the nature and location of the work, general and local conditions and particularly those pertaining to transport including restriction of movement of traffic/ vehicles etc. handling, availability and storage of materials, availability of labour, weather conditions at site and general ground/sub soil conditions and the contractor has to quote his rates accordingly and nothing extra shall be payable on any reason whatsoever.
- 24.** NIA will bear no responsibility for the lack of such knowledge and also the consequences thereof to the contractor. The information and site data shown in the drawings and mentioned in the tender documents are furnished for general information and guidance only. In no case NIA shall be held responsible for the accuracy thereof or/and deductions, interpretations or conclusions drawn there from by the contractor and no claim shall be entertained whatsoever on this account, if the site conditions/information is different or otherwise incorrect. It will be presumed that the contractor has satisfied himself for all possible contingencies, situations, bottlenecks and acts of coordination which may be required between the different agencies.
- 25.** The contractor is required to submit all its submittals like Drawings, Documents, Reports, Schedules, invoice copies, etc. (whether original or revised) in 5 (Five) Hard & 5 (Five) soft (CD/DVD/Pen Drive) copies.

TECHNICAL SPECIFICATIONS.

Material and Workmanship

1. All materials brought on the site of works and meant to be used for the said project site, shall be the best of their respective kinds and to the approval of the Employer. The Employer or his Representative will accept that the materials are really the best of

their kinds, when it is proved beyond doubt that no better materials of the particular kind in question are available in the market.

2. The workmanship is to be the best available and of a high standard, use must be made of a special tradesman in all aspects of the work and allowances must be made in the rates for so doing.
3. Samples of all materials shall be got approved from the Employer and shall be deposited with them before the order for the materials are placed with the suppliers/manufacturers. The materials brought for the works shall conform in every respect with approved samples.
4. Workmanship: All works shall be to true line, level, plumb and square corners, edges and arises in all cases shall be unbroken and finished neat. Only first-class workmanship will be accepted. Contractor shall maintain uniform quality and consistency in workmanship throughout the execution of the work.
5. Skilled Mistries/tradesman for the respective trades shall be employed by the Contractors to check the work in progress and to instruct and extract the right kind of workmanship from the men employed on the works. Instructions given to such Mistries by the Employer shall be carried out with a view to get the work executed in a neat and workman like manner, according to the specifications.
6. The Employer may order the inspection of any finished work as he chooses and in a manner he decides, and the Contractors shall bear all expenses in this connection. If the results of such inspection prove that the material used and/or workmanship is not of the standard required, the work will be rejected and removed forthwith and be replaced by works of the accepted standard of quality and material.
7. The materials and items to be provided by the Contractor shall be approved by the Employer in accordance with any samples, which will be submitted for approval by the Contractor and generally in accordance with the specifications. Also, if products are specified in the specification and/or bill of brand, trade name or catalogue reference, the Contractor will be required to obtain the approval of Employer before using a material. The Contractor shall produce all invoices vouchers or receipts for any materials if called upon to do so by the Employer.
8. Samples of all materials are to be submitted to the Employer for approval before the Contractor orders or deliver the materials at site. Samples together with their packing are to be provided free of charge by the Contractor and should any materials be rejected; they will be removed from the site at the Contractor's expense. All samples will be retained by the Employer for comparison with materials, which will be required to submit specimen finishes of colours, fabrics, etc. for the approval of the Employer before proceeding with the work.

Cement

Cement to be used for the work shall comply the following and shall be used with the prior approval of Officer-in-charge.

- (a) Ordinary Portland cement conforming to the I.S.: 8112 shall be used. Independent testing of cement used shall be done by the contractor at site and in the laboratory approved by the

Officer-in-charge before use. Any cement with lower quality than that shown in the manufactures certificate shall be debarred from use. In case of finally ground cement or imported cement, the Officer-in-charge may direct the contractor to satisfy him as to the acceptability of such cement, especially with regard to creep and shrinkage effect. Any consignment or part of a consignment of cement, which has deteriorated in anyway, shall not be used in the works and shall be removed from the site by the contractor without charge to the employer. Cement shall be transported, handled and stored on the site in such a manner as to avoid deterioration and contamination. Each consignment shall be stored separately so that it may be readily identified and inspected and cement shall be used in the sequence in which is delivered at site. The contractor shall prepare and maintain proper records on site in respect of the delivery, handling storage and use of cement and these records shall be available for inspection by the Officer-in-charge at all times.

Mild Steel / H.Y.S.D. / T.M.T. Steel

High Yield Strength Cold Twisted deformed bars / TMT bars shall comply with IS: 1786 and "Mild Steel" bars shall comply with IS: 432. All reinforcement shall be free from rust loose mill scale or coats of Oil, Paints etc. which may destroy bond and protected by anti-corrosive treatment before placing in position for concreting.

The agency should use the steel manufactured by the Main Producers only. No re-rolled steel shall be permitted to be used for this work. Decision about the main producers of the steel will be given by Officer-in-charge and his decision shall be final & binding on all parties.

Rejection of Materials not conforming to specification:

Any Stock or batch of material(s) of which sample(s) does not confirm to the prescribed test and quality, shall be rejected by the then Director, NIA or his representative and such materials shall be removed from site by the contractor at his own cost. Such rejected materials shall not be made acceptable by any modifications. Materials not corresponding in character and quality with approved samples will be rejected by the Officer-in-charge or his representative and shall be removed from the site at the end of working season will not be allowed to use for any component of work in the next seasons.

Paint

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

Spray painting with approved machines will be permitted only if written approval has been obtained from the Employer/Architect prior to painting. No spraying will be permitted in the case of priming coats where the soiling of adjacent surfaces is likely to occur. The nozzle and pressure to be so operated as to give an even coating throughout to the satisfaction of the Employer/Architect. The paint used for sprayings is to comply generally with the specifications concerned and is to be specially prepared by the manufacturer for spraying. Thinning of paint made for brushing will not be allowed.

Wood preservative shall be **Solignum** or other equal and approved impregnating wood preservative and all concealed woodwork shall be treated with wood preservative.

All brushes, tools, pots, kettles, etc., used in carrying out the work shall be clean and free from foreign matter and are to be thoroughly cleaned out before used with a different type of class of material.

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

Surfaces of new woodwork, which are to be painted, are to be rubbed down, cleaned down to the approval of the Architect/Employer.

Surfaces of previously painted woodwork which are to be painted are to be cleaned down with soap and water detergent solution or approved solvent to remove dirt, grease, etc. Whilst wet the surface shall be flattened down with a suitable abrasive and then rinsed down and allowed to dry. Minor areas of defective paint shall be removed by scraping back to a firm edge and the exposed surface touched in with the primer as described and stopped with putty. Where woodwork has been previously painted or polished and is to be newly polished, scraping, burning off or rubbing down, should be carried out properly.

Surfaces of previously painted metal which shall be painted are to be cleaned down and flattened down as described in surfaces of any rust and loose scale shall be removed completely by chipping, scraping and wire brushing back to the bare metal touched in with primer as described.

SEWAGE TREATMENT PLANT

It is proposed to install a Sewage Treatment Plant, in order to conserve water, the treated sewage is to be re-used for irrigation to Garden. The sewage will be generated from the Training Centre, Hostel and staff quarters' toilets and kitchens. The sewage flow conditions will be varying throughout the day with the flow peaking in the morning & evening hrs. It is proposed to treat the sewage in Moving Bed Bioreactor (MBBR) attached growth process, not only to reduce the level of pollution in the wastewater to the limits specified by the Pollution Control Board and can also make it suitable for use Horticulture after further tertiary treatment by providing filtration plant.

STPs based on Moving Bed Bioreactor (MBBR) attached growth using PVC fill media & fine bubble non-clog type membrane diffusers. The total STP plant including it's ancillary structure except electrical panel shall be underground. Manholes can be provided to access the inside of the tank.

There will be a city sewer connection but all the sewerage generated will be fully treated within the project at the STP & wastewater is recycled. The capacity proposed STP plants will be of 200 KLD.

The STP Discharge /Overflow/ Bye-pass to be connected to the nearest available Municipal Sewer Line.

GENERAL SPECIFICATION FOR PUMPS & EQUIPMENTS

The Contractor has to install suitable size underground 4 core Aluminium armored XLPE cable of about 250 Mtrs. length for catering entire load of proposed STP including additional load of about 20 H.P. for catering power to bore-well submersible pump sets.

Provision of 6 Nos. of feeders three phase cable of suitable size for 3 HP pumps excluding starters should also be made in the control panel.

PUMP SETS:

All pump sets shall be provided in pairs with 100 % standby capacity. The two pumps in each set shall be designed for alternating duty in automatic mode with manual override.

The design and construction of pumps shall be suitable for their duty. The pumps shall have bronze or stainless-steel impellers, stainless steel shaft, studs, nuts and screws. The pump casings shall be coated externally with anticorrosive epoxy paint.

Following pumps are to be provided, each type in pair (2 nos. i.e., 1 no working+ 1 no stand by):

- a) Raw sewage submersible pumps
- b) Filter feed pumps
- c) Filter back wash pumps
- d) Solid handling pumps
- e) Treated water pump.

Raw sewage and sludge pumps shall be non-clog type of suitable capacity.

2 nos. treated water pump sets (1 working + 1 stand by) shall be provided for pumping water for irrigation, if required. The pumps shall be self-priming mono block horizontal centrifugal pumps capable of delivering required discharge at desired head –as per design requirement.

RAW SEWAGE SUBMERSIBLE PUMPS:

Each submersible pump shall be provided with a cast iron base plate discharge bend, which shall be fixed to the sump base with non-corrosive bolts. The discharge bend shall include an automatic coupling, which will lock under the weight of the pump and will unlock upon commencement of pump hoisting. Each discharge bend shall be fitted with two vertical stainless-steel wires extended up to sump level to form an easy pump alignment lifting facility. The base plate bend shall be supplied by the pump manufacturer. Each pump shall be provided with a galvanised steel lifting chain which shall extend from the galvanised steel pump lifting handle to a suitable retaining hook located just below sump cover level. Each pump shall be supplied with a suitable length of cable of a type which will not deteriorate when submerged in raw sewage for extensive periods of time.

PUMP STATION:

A pump station shall be provided, generally as specified for raw sewage pumps. **Old pump room may be used if found suitable.**

The pump station shall be provided with the requisite number of level regulators with float switches to control the pumps and to give alarm signals as specified herein. Each pump station shall be provided with following level signals:

Pump Stop
Pump Start
High Water Level
Low Water Lever

The pump station shall be provided with a pump control panel designed to comply with IEE wiring regulations, latest edition. Protection shall be provided from both direct and indirect contact by earthed equipotential bonding and earth leakage circuit breakers.

CONTROL PANEL:

Control Panel shall be weatherproof fixed on support framework, suitable for direct-on-line starting of the equipment and shall consist of the following:

Hinged front door interlocked with an isolator.

Main HRC fuses.

Triple pole thermal overload relays having inherent under voltage release.

Triple pole block type contactors having inherent under voltage release.

Rotary pattern selector switches, allowing for automatic restart in the event of power failure and manual changeover in the event of failure of duty equipment.

Flow / pressure / level switches to allow for automatic starting and stopping of the equipment in the event of failure to attain the set duty points.

Timer to prevent hunting occurring subsequent to an auto restart.

The control panel shall be complete with all necessary terminals, labels, interconnections, wiring diagrams and spare fuses. Control panel shall be constructed from sheet steel, dust and damp protected IP 54 housing with anti-condensation heater and lockable door, requiring one incoming three phase, four wire electrical supply to the main isolator. All control panel labeling shall be in both English and Hindi.

Pump sets shall be protected against dry running by means of a relay connected to the level indicator panel. A warning lamp shall be provided in the control panel to indicate when the cut-off is in operation. The pump set shall automatically resume operation when normal conditions return.

The contractor shall provide an automatic level control system to automatically start the pumps depending on the wet well levels.

When water reaches a predetermined low level, the working pump will be automatically switched off, failing which an audio-visual automatic alarm will operate and the pump shall be switched off in the manual mode. When the water rises above the low level to a predetermined height the pump shall start automatically if the service so demands.

EQUIPMENT:

All equipment shall be robustly designed with extra sacrificial metal thickness and protected with approved epoxy paint against severe corrosion. Safety guards shall be provided wherever necessary.

Individual components of equipment shall be specially selected for anti-corrosive properties and low wear and tear.

Each equipment unit shall have the manufacture's name, catalogue / model ref. no., rating etc. attached securely with an identification plate.

Hazards due to moving parts and energized electrical installation shall be prominently displayed.

PIPING AND VALVES:

All interconnecting piping shall be CPVC / HDPE. All flanges shall be slip-on type with dimensional tolerances as per ANSI B 16.5. All valves shall be Gate Valve or butterfly type as applicable. A by-pass arrangement shall be provided for pumped sewage.

TESTING AND COMMISSIONING:

After assembly in the factory the Plant shall be tested under operating conditions. All electrical equipment shall also be checked under operating conditions. Fabricated sections shall be checked for alignment of bolt-holes and structural joints.

After the completion of site installation, dry running trials shall be carried out by the contractor and the Plant shall then be commissioned after admitting water/sewage. (In case sewage is not available, commissioning may be done with water and performance tests may be carried out later on availability of sewage) Once the biological conditions are stabilised, tests shall be carried out over a period of 72 hours to prove the guaranteed performance of the plant. In case the contractor fails to achieve the guarantee parameters for the Treatment Standards, the Contractor shall make necessary adjustments in the Plant design, chemical dosages etc. and repeat the performance tests. Water required for commissioning the STP shall be supplied by the Contractor at his own cost.

FUNCTIONAL EFFICIENCY:

To evaluate the technical soundness of the design proposal and functional efficiency of the STP unit proposed by the contractors/agencies, they are advised to necessarily furnish following details-as a separate Annexure to this Technical Bid.

1. **Design basis & details of their proposals**
2. **Process flow diagram including installation diagram and detailed working drawings for all civil works.**
3. **Details of power consumption, consumable, periodicity of replacement of consumable & major spares etc. for assessment Operational cost and Maintenance cost.**
4. **Detailed specification proposed by the contractors/agencies for various constituent equipments/components of the STP unit shall be mentioned as per their design requirement.**

JOINTS

Movement joints such as expansion joints, complete / partial contraction joints and sliding joints shall be designed to suit the structure requirements. Position and design of construction joints should be pre-determined keeping in view the convenience in construction. All joints should be tested for water tightness and must be leak proof. The material used in the joints like joint filers, water bars, sealing compounds and other such materials should be resistant to chemical and biological action and require approval of Officer-in-charge and nothing extra is payable.

WATER STOPS

Water stops shall be of PVC/Neoprene as applicable (material shall be suitable for sewage/acidic liquid storage). To be supplied from approved manufacture. Samples and the test certificate shall be got approved by the Officer-in-charge before procurement for incorporation in the works. Water stops shall be either of the bar type, serrated with centre bulb and end gips for use within the concrete elements or of the surface (kicker) type for external use nothing extra is payable.

COMPLETELY / PARTLY UNDERGROUND LIQUID RETAINING STRUCTURES:

All underground or partly underground liquid retaining structures shall be designed for the following conditions:

Structure filled with liquid: Liquid depth up to full height of wall, irrespective of the actual height of liquid in the structure: no relief due to soil pressure from outside to be considered.

Structure empty: full earth pressure and surcharge pressure, as applicable, to be considered; Partition wall between dry sump and wet sump: to be designed for full liquid depth up to full height of wall including free board; Partition wall between two compartments, to be designed as one compartment empty and other full.

Structures shall be designed for uplift in empty conditions with the water table indicated by the Contractor's own investigation or approved by Officer-in-Charge prior to design, whichever is maximum. No reduction Factor for the uplift forces shall be considered. The dead weight of the empty structure should provide a safety factor of not less than 1.2 against uplift pressures during construction and in service; Walls shall be designed under operating conditions to resist earthquake forces from earth pressure mobilization and dynamic water loads; Underground or partially underground structures shall also be checked against stresses developed due to any combination of full and empty compartments with appropriate ground/uplift pressures from below to base slab.

FOUNDATIONS

The minimum depth of foundations for all structures, equipment and frame foundations and load bearing walls shall be conforming to IS 1904. The foundations shall be placed on virgin soil and not on backfilled soil. The earth fill above virgin ground level till formation level shall be taken as a surcharge load and shall be added in the loads coming on foundations appropriately.

For the foundation depths and types of footings the maximum safe bearing capacity shall be appropriately computed and got reviewed and approved by the Officer-in-Charge.

Care shall be taken to avoid the foundations of adjacent buildings or structure foundations, either existing or not within the scope of this Contract. Suitable adjustments in depth, location and sizes may have to be made depending on site conditions. Plinth level of all structures shall be at least 500 mm above formation level.

DESIGN REQUIREMENTS

The Civil & Structural design shall be carried out in accordance with BIS:456, and BIS:3370. and other relevant Indian Standard Codes. For the seismic forces, the structure should be designed as per IS: 1893 and all the factors as applicable for Zone V.

The following are the design requirements for all reinforced or plain concrete structures:

- All blinding and levelling concrete shall be minimum 100 mm thick in concrete grade M15, unless otherwise specified.
- All structural reinforced concrete shall be with a maximum 20 mm stone aggregate size.
- The minimum grade of concrete shall be M-25 for RCC structures other than liquid retaining structures, for which minimum grade of concrete shall be M 30.
- The minimum reinforcements in walls, floors and roofs of liquid retaining structures in each of two directions at right angles shall be 0.3% HYSD bars.
- Minimum reinforcement and cover to the reinforcement shall be provided as per relevant IS standards.

MINIMUM THICKNESSES OF REINFORCED CONCRETE MEMBERS

The following minimum thicknesses shall be used for different reinforced concrete members, irrespective of design thicknesses:

Walls for liquid retaining structures (except for Launderers, Channels): 150 mm

Bottom slabs for liquid retaining structures: 150 mm.

Wall foundation (at junction of base slab & wall): 250 mm

Roof slabs for liquid retaining structures: 150 mm.

Launders & Channels – Base Slab & Wall: 150 mm

Floor slabs including roof slabs, walkways, canopy slabs: 100 mm.

Walls of cables / pipe trenches: 75mm

Precast trench cover: 75 mm

CIVIL WORKS:

- a) All civil works like excavation, concrete base /bed blocks etc. for fixing /supporting above tanks under the ground- as per design requirement, shall also be provided under this scope of work.
- b) Similarly housing of pumps & panels etc.-as per design requirement, shall also be provided under this scope of work, including Masonry structure /pump Room/control Room.
- c) Detailed working drawing including structural details for such civil works shall be furnished by STP contractor/agency and the rate quoted shall include for the same.

1. WORKING METHODS AND PROGRESS SCHEDULES:

1.1 The contractor shall submit within the time stipulated by the Officer-in-charge in writing the details as actual methods that would be adopted by the contractor for the execution of any items as required by Officer-in-charge at each of the location supported by necessary detailed drawing and sketches including those of the plant and machinery that would be used their locations Arrangement for conveying and handling materials etc., and obtain prior approval of the Officer-in-charge well in advance of starting of such item of works. The Officer-in-charge reserves the right to suggest modifications or make corrections in the method proposed by the contractor whether accepted previously or not at any stage of the work to obtain the desired quality of work.

1.2 Accuracy, quality and progress which shall be binding on the contractor no claim on account of such change in method of execution will be entertained so long as specification of the item remain unaltered.

1.3 The contractor shall furnish within one month of the order to start the work programme of work in quadruplicate indicating the date of actual start, the monthly progress expected to be achieved and anticipated completion date of each major item of work to be done by him also indicating dates of procurement of materials and setup of plant and machinery. The programme is to be such as practicable of achievement towards the completion of whole work in the time limit and of the particular items; if any of due dates specified in contract, planning and programme of work should be done by the mature decision between the Officer-in-charge and the contractors representative in charge of work. The progress of work shall be reviewed in every **TWO weeks** and revised programmes shall be drawn if necessary. No revised programme shall be operative without the approval of Officer-in-charge in writing. The Officer-in-charge is further empowered to ask for more detailed schedule or schedules say weekly for any item or items. In case of urgency of work as will be directed by him and the contractor shall supply the same and when asked for. Acceptance of the programme or the revised

programme by the Officer-in-charge shall not relieve the contractor of his responsibility to complete the whole work by the prescribed time or the extended time if any.

1.4 The contractor shall employ sufficient plant, equipment and labour as may be necessary to maintain the progress schedule. The working and shift hours restricted to one shift a day for operations to be done under the supervision shall be such as may be approved by the Officer-in-charge. They shall not be varied without prior approval of the Officer-in-charge. Night work which requires supervision shall not be permitted except when specially allowed by the Director, NIA on each item if required by contractor. The contractor shall provide necessary lighting arrangement etc. for night work as directed by Officer-in-charge without extra cost.

1.5 The contractor shall submit reports on progress of work in forms and statements etc. at periodical intervals in the form of progress chart, forms, statements and / or reports as may be approved by the Officer-in-charge.

1.6 The contractor shall maintain proforma, charts, details regarding the machinery, equipments, labour, materials, periodical returns thereof, proforma to be got approved from the Officer in charge.

1.7 The contractor shall have to make his own arrangement for machinery required for the work.

1.8 The contractor is advised to provide water storage tanks of adequate capacity to take care of possible shut down of water supply system.

2.0. MATERIAL SOURCES:

2.1 The contractor shall make their own independent investigation as to the availability as well as suitability of various materials required for construction as referred to in these paras.

2.2 The contractor will have to make his own arrangement for procuring quarries or the quarry permits, necessary assistance for which will be given by the department.

2.3 Lime stone shall not be permitted for any concrete work.

3. FLOODS AND ACCIDENTS:

The contractor shall take all precaution against damages by floods or from accidents etc. No compensation will be allowed to the contractor on this account or for correction and repairing any such damage to the work during construction. The contractor shall be liable to make good at his cost any plant or material belonging to NIA loss or damaged by floods or from any other cause while in his charge. The proof of occurrence of flood report with flood level will have to be furnished by the contractor. No compensation will be allowed for damages on ancillary items and equipments etc. which are brought to the site by the contractor for effecting execution of work.

4. URGENT WORK:

If any "Urgent Works" (In respect where decision of the Officer-in-charge shall be final and binding) become necessary and contractor is unable or unwilling to carry it out at once, the Officer-in-charge by his own or through the other people have it carried out as he may consider necessary. If the Urgent Work shall be such as in the opinion of the Officer-in-charge the contractor is liable under the contract to carry out at his expenses. All expenses incurred on it

by the department shall be recoverable from the contractor and be adjusted or sets off against any.

5. CONTROLLED CONCRETE:

Acceptance criteria shall be as per IS: 456 – 2000 (With latest amendments)

NORMAL MIX CONCRETE:

Acceptance criteria shall be as per IS: 456 – 2000 (With latest amendments)

CHANGE OF CEMENT CONTENT ETC.: (Applicable for OPC Cement only)

THEORETICAL CONSUMPTION OF CEMENT FOR THE CONCRETE WORK:

Sr. No	Grade of concrete	Consumption of cement in bags / Cum
1	M-10	4.40 bags
2	M-20	6.27 bags
3	M-30	7.10 bags
4	M-40	7.50 bags

Note:

- (i) The weight per bag of Cement is considered as 50 Kg.
- (ii) If contractor desires to use any other type of cement, he should obtain permission for same from Officer-in-charge. In the event he is permitted to do so, contractor should obtain mix design for the same from the laboratory approved by Officer-in-charge. No payment will be made to contractor for obtaining the mix design. No extension will be given to contractor for the time lost in getting mix design.

The rate of consumption of cement for various grades of concrete referred above is a theoretical rate of consumption assumed for the estimate purpose. The contractor will have to obtain an economic mix design for grades of concrete M-20 and above and get it approved from the Officer-in-charge.

The specification for controlled cement concrete shall be as per standard specification as per **IS 456-2000** (with latest amendments). Sum payable to him Immediately upon the receipt of the award of the contract, the contractor shall inform the Officer-in-charge the exact location of the sources of the acceptable material. The concrete mix to be used shall be got designed by Any Govt College Engineering. Laboratory or any other laboratory fully approved by Officer-in-charge, by the contractor with a optimum quantity of cement to give the specified strength in the preliminary tests and the proportion got approved by the Officer-in-charge in writing. These proportions shall be used so long as the materials continue to be of the same quality and from the same sources subject only to slight changes in the relative quantities of fine and course aggregate for the purpose of promoting workability provided the work tests also shows the required strength.

If such Mix design involves change in cement consumption up to 2 % on the higher or lower side, no adjustment in the cost of the item to be paid to the contractor shall be made. If such alterations, changes, theoretical consumption of cement by more than 2 % on the higher or lower side, the sources and quality of aggregate remaining the same, payment will be adjusted

for or against the contractor in whatever amount the total cost of cement to the contractor has been increased or decreased by more than 2 %.The amount of such increase or decrease shall be calculated on the basis of quantity of cement determined and prescribed in the above table. In adjusting the cost only the cost of cement shall be considered and not handling or other charges, which shall be treated as incidental to the item for working out the cost towards adjustments in cement consumption the basic for cement shall be star rate as indicated in clause 54. If during the progress of work the contractor wishes to change the material, the proportions shall be fixed on the basis of fresh preliminary tests to give the required strength after the Officer-in-charge is satisfied that the material satisfy the specifications. No adjustment of the cost shall be made for a change of proportions of cement fixed in the original preliminary tests. For all concrete items only trap metal shall be used.

6.0 CONTRACTOR TO INFORM HIMSELF FULLY:

The contractor shall be deemed to have carefully examined the work and site conditions including labours, the general and the special conditions and shall be deemed to have visited the site of the work and to have fully informed himself regarding the local conditions and carried out his own investigations to arrive at the rates quoted in the tender. In this regards he will be given necessary information to the best of the knowledge of Department but without any guarantee about it. If he shall have any doubt as to the meaning of any portion of these general conditions, or the special conditions to the scope of working of the specification and drawings, or any other matter concerning the contract, he shall in good time before submitting his tender set forth the particulars thereof and submit them to the Officer-in-charge in writing in order that such doubt may be clarified authoritatively before tendering. Once a tender is submitted the matter will be decided in accordance to the tender conditions in absence of such authentic clarification

7. ERRORS, OMISSION & DISCREPANCIES:

a) In case of errors, omissions and / or disagreement between written and scaled dimensions in the drawing or between the drawing and specifications etc., the following order of preference shall apply.

(i) Between actual scaled and written dimensions or description on a drawing the latter shall be adopted.

(ii) Between the written description or dimensions in the drawing and the corresponding one in the specifications, the latter shall apply.

(iii) Between the quantities shown in the schedule of quantities and those arrived at drawing the latter shall preferred

b) In all cases of omissions and/or doubts or discrepancies in the dimensions or of any item or

Specification a reference shall be made to the Officer-in-charge, whose elucidation, elaboration or

Decision shall be considered as authentic. The contractor shall be held responsible for any errors that may occur in the work through lack of such reference and precautions.

c) The contractor should not sublet any part of work without written permission of the Officer-in-charge.

8. SAMPLES AND TESTING OF MATERIALS:

(i) All materials to be used on work, such as cement, steel, stones, bricks, aggregates, asphalt, wood, tiles, etc. shall be got approved in advance from the Officer-in-charge and shall pass the tests and analysis required by him.

(ii) The contractor shall at his risk and cost make all arrangement and / or shall provide for all such facilities as the Officer-in-charge may require for collecting, preparing and forwarding required number of samples for tests or for analysis to the nearest approved laboratory and bear all charges and cost of testing. Such samples shall also be deposited with the Officer-in-charge till sent for testing. Out of total number of tests as per frequency requirement 20 % of these tests shall be carried out in Govt./renowned Laboratory.

(iii) The contractor shall if and when required submit at his cost the samples of materials to be tested or analysed and if so directed shall not make use or incorporate in the work any material represented by the samples until the required tests or analysis have been made after the test of the materials finally accepted by the Officer-in-charge

9. TESTING OF MATERIAL:

1(a) Frequency of testing of the construction material and the percentage of the testing from the Government laboratory shall be as under:

Where the field laboratory certified by the concerned Officer-in-charge is established at the work site 70% test as per total frequency required shall be carried out in the said field laboratory and 30% tests shall be carried out at the Vigilance and Quality control laboratory of NIA for the material not covered in the **annexure III** 50% tests shall be carried out in the field laboratory and remaining 50% tests need to be carried out in the vigilance and quality control laboratory of Any Regional Govt Engineering college laboratory, The entire responsibility of the sample testing as per required frequency including testing charges will be borne by the agency.

1(b) Where field laboratory is not established at the works site 100% tests as per

Frequency shall be carried out in the Vigilance and quality Any Regional Govt Engineering college laboratory,

1(c) Testing of cement and steel 100% in Vigilance and quality laboratory, Any Govt Engineering college laboratory is compulsory.

1(d) It is mandatory to submit the test reports of materials/samples used for the work as per the frequency given in the specification with the bill. If the test results are not submitted along with the bill, amount equal to five times the prevailing VQC testing charges shall be deducted from the bill. Samples for the items for which testing is not done as per frequency shall be collected and submitted for testing by the Officer-in-charge or his representative for testing and testing charges for this sample shall be paid by Officer-in-charge through the amount deducted as above and balance amount shall be remitted to revenue. Till such results are received contractor shall be paid at part rate as decided by the Officer-in-charge

- (2) Mixing of concrete shall be done with concrete mixers
- (3) The Contractor shall make field arrangements for testing of all materials for cement concrete i.e. slump test, bulkage test, etc. The concrete cube mould 3 Nos. of 15cm x15cm x 15 cm. size shall be kept at site during concreting operation. One set of six 15cm. (about 6" cubes shall be prepared from the concrete to be used in work for compression test on the first three days operation and thereafter for every 60 cubic metre of concrete of three days work whichever is less. If source of aggregate or grading is changed, one set of six test cubes shall be taken for each changed batch. Three cubes shall be tested for test at 7 days age and 3 at 28 days in Regional Testing Lab of P.W.D. OR Regional Government College Engineering All the testing charges shall be paid by the contractor. The entire responsibilities of the testing of materials will be borne by the contractor.
- (4) For providing Electric Wiring, Duct tubes of the required diameter and length shall be provided through walls, beams and floors, slabs as and when directed without any extra cost.
- (5) (a) The contractor shall make his own arrangement for receiving all materials, tools, etc. required for the work.
(b) No extra charges for carriages of water will be allowed.
(c) The rates for all items are inclusive of all charges such as carting, lifting, etc.
No extra payment for any lead and lift will be paid for any items.
(d) A frequency of testing shall be as per relevant works specification. In case such frequency is not specified in the works specification then the IS code will be referred and for other cases where IS code do not stipulated the frequency of testing, it will be as directed by Officer-in-charge and should be furnished in specified test abstract.
(e) The Contract should not be sublet without written permission of Officer-in-charge.
(f) Tender condition of tender notice will be binding on contractor and etc tender notice will form a part of agreement

10.0 VOLUME/WEIGH/ BATCHING:

The following instructions shall be followed as regards to preliminary designs of mix and methods of batching of plain cement concrete and reinforced cement concrete. The preliminary mix design and batching for various grades of concrete shall be governed by the guidelines as per I.S. 456-2000. It will be the responsibility of the contractor to obtain the mix design for various cement concrete grades at his cost from the Regional Government College Engineering.

11.0. MIX DESIGN /RMC:

11.1 The following instructions shall be followed as regards preliminary design of mix and methods of batching of plain cement concrete and reinforced cement concrete. These instructions should be treated as supplementary to the relevant provision in the specifications for the respective items contained in the book of standard specifications and will override the provisions contained therein wherever they are contrary to the following instructions.

The preliminary mix design and batching for various grades of concrete shall be governed by the following guidelines.

Concrete Grade Guidelines

1) Up to M-15	: This should only be ordinary concrete. No change may be prescribed in the present practice as regards preliminary design of mix and permitting volume batching. Only cement to be weight batched
2) M-20 to M-25:	Preliminary mix design must be carried out for these mixes. However, weigh /volume batching shall be insisted for cement only for concrete M-20 and above
3) M-25 and above	Preliminary mix design must be prepared for such mixes weigh /volume batching shall be insisted for cement fine aggregate and course aggregate

11.2 For the grades of concrete M-20 and above the preliminary mix design shall be carried out from the approved laboratory.

11.2.(1) The charges for preliminary design, of concrete mix shall be entirely borne by the contractor.

11.2 (2) For grades of concrete M-20 and above where cement is to be used by weight, the cost of extra cement required to make-up the under-weight bags shall be borne by the contractor.

11.2 (3) For the items of concrete of grades lower than M-20 and other items in the agreement, where cement is not to be used by weigh, the cement bags as received from the manufacturer and supplied to the contractor under Schedule 'A' shall contain cement of 50 Kg. net weight.

11.3 The admixtures such as plasticizers/super plasticizers for concrete grade M-20 and above shall be used as directed by Officer-in-charge depending upon specific requirements. No extra payment on this account will be admissible

TRADE SPECIFICATIONS FOR BUILDER'S WORK

1. EXCAVATIONS AND EARTHWORK

1.1 General: The excavation will generally refer to open excavation of foundations (including basement if necessary) wet or dry.

1.2 Examine the site: The contractor shall visit and ascertain the nature of the ground. to be excavated and the work to be done and shall accept all responsibility for the cost of the work involved.

1.3 Clearing the Site: The site on which the structure is to be built shown on the drawing and the area required for setting out and other operations, like roads, drains, sheds, etc., should be cleared and all obstructions, loose tones, materials

and rubbish of all kinds, stumps, brush wood and trees removed as directed, roots being entirely grubbed up. The materials obtained will be the property of the LIC and materials considered useful by the Officer-in-charge will be handed over to the LIC. Rejected materials will be removed by the Contractor to his own dump at his own cost.

1.4 Ground levels and site level plan: Before starting the excavations, the requisite block levels of the entire plot shall be taken by the contractor in consultation with the Officer-in-charge and a proper record of these levels kept, which shall be jointly signed by the Contractor and the Officer-in-charge. A block level plan showing all the ground levels of the pit shall be prepared and shall be jointly signed by the Contractor and the Officer-in-charge.

1.5 Setting out: After clearing the site and preparing the site level plan, the contractor will set out the centre lines of the building or other involved works & get the same approved from the Officer-in-charge. It shall be the responsibility of the contractor to install substantial reference marks, benchmarks etc. and maintain them as long as required by the Officer-in-charge. The Contractor will assume full responsibility for proper setting out, alignment, elevation and dimension of each and all parts of the work.

1.6 Excavation and Preparation of Foundation for Concreting: Excavation shall include removal of all materials of whatever nature at all depths and whether wet or dry necessary for the construction of foundation and sub. structure (including mass excavation for basement where applicable) exactly in accordance with lines, levels, grades and curves shown on the drawings or as directed by the Officer-in-charge. The bottoms of excavations shall be levelled both longitudinally and transversely or stepped as directed by the Officer-in-charge.

Should the Contractor excavate to a greater depth or width than shown on the drawings or as directed by the Officer-in-charge, he shall at his own expense fill the extra depth or width with cement concrete in proportion as directed by the Officer-in-charge but in no case with concrete of mix lesser than 1:4:8 cement concrete...

The Contractors shall report to the Officer-in-charge when the excavations are ready to receive concrete. No concrete shall be placed in foundations until the Contractor has obtained the Officer-in-charge's approval. In case, the excavation is done through different strata of soil and if the same is payable as per provision in the Schedule of quantities, the contractor shall get the dimensions of the strata payable decided from the Officer-in-charge. If no specific provision is made in the Schedule of Quantities it will be presumed that excavation shall be in all types of soil and the Contractors rate cover for the same.

After the excavation is passed by the Officer-in-charge (and before laying the concrete) the Contractor shall get the depth and dimensions of the excavations and levels (and nature of strata if applicable as per Schedule of Quantities, like hard rock, soft rock etc.) and measurements recorded from the Officer-in-charge on site.

1.7 Shoring: The sides of the excavations should be timbered and shored in such a way as is necessary to secure them from falling in, and the shoring shall be

maintained in position as long as necessary The Contractor shall be responsible for proper design of the shoring to hold the sides of the excavation in position and ensure safety from slips and prevent damage to work and property and injury to persons. The shoring shall be removed as directed after the items for which it is required are completed.

1.8 Protection: All foundation pits, well pits and similar excavations shall be strongly fenced and marked with red lights at nights in charge of watchmen to avoid accidents. Adequate protective measures shall be taken to see that the excavation does not affect or damage adjoining structures. All measures required for the safety of the excavations, the people working in and near the foundation trenches, property and the people in the vicinity shall be taken by the Contractor at his own cost, he is being entirely responsible for any injury and damage to property caused by his negligence or accident due to his constructional operations.

1.9 Stacking of Excavated Materials: All materials excavated will remain the property of the LIC and rate given in the schedule of quantities for excavation includes sorting out of useful materials and stacking them on site as directed. Materials suitable and useful for backfilling, plinth filling or levelling of the plot or other use shall be stacked in convenient place but not in such a way as to obstruct free movement of men, animals and vehicles or encroach on the area required for constructional purpose.

1.10 Backfilling: All shoring and form work shall be removed after necessity ceases and trash of any sort shall be cleaned out from excavation. All space between foundation masonry or concrete and sides of excavation shall be refilled to the original surface with approve excavated materials in layers, 15 cm to 30 cm in thickness, watered a rammed. The filling shall be done after concrete or masonry is fully and done in such a way as not to cause undue thrust on any part the structure. Where suitable excavated material is to be used for refill, it shall be brought from the place where it was temporarily stacked used in refilling.

No excavation or foundations shall be filled in or covered up until at measurements of excavations, masonry concrete and other works below ground level are jointly recorded.

Black cotton soil shall not be used for backfilling or in plinth filling.

1.11 Dewatering: Rate give in the schedule of quantities for excavation shall include bailing or pumping out water which may accumulate in the excavation during the progress of work either from seepage, springs, rain or any other cause diverting surface flow if any by bunds or other means. Pumping out water shall be done in such approved manner as to preclude the possibility of any damage to the foundation trenches, concrete or masonry' or any adjacent structure. When water is met in foundation trenches or in basement excavations, pumping out water shall be from an auxiliary pit of adequate size dug slightly outside the building excavations. The depth of the auxiliary pit shall be more the working foundation trench levels. The auxiliary pit shall be refilled with approved excavated materials after the dewatering is over.

The excavation shall be kept free from water (1) during inspection and measurement, (2) when concrete and / or masonry are in progress and till they

come above the natural water level, and (3) till the Officer-in-charge considers that the concrete/mortar is sufficiently set.

1.12 Surplus Excavated Materials: All excavated materials certified as surplus and not useful shall be removed by the Contractor from the site in an approved manner to his own dump at his own cost.

1.13 Rates given in schedule of quantities shall Include: Apart from other factors mentioned elsewhere in this contract; rates given in the schedule of quantities for the item of excavation shall also include for the following:

- (i) Clearing site
- (ii) Setting out works as required and setting up benchmarks and other reference marks.
- (iii) Providing shoring and strutting and subsequently removing the same.
- (iv) Bailing and pumping out water as required and directed.
- (v) Excavation at all depths (unless otherwise specified in the Schedule of Quantities) and removal of all materials of whatever nature wet or dry and necessary for the construction of foundational / basement etc. and preparing bed for laying concrete.
- (vi) Sorting out useful! Excavated materials and conveying beyond the structure and stacking them neatly on the site for backfilling or reuse as directed.
- (vii) Backfilling the trenches alongside masonry or concrete with approved excavated materials up to the natural ground level including watering and ramming.
- (viii) Necessary protection including labour, materials and equipment to ensure safety and protection against risk or accident.
- (ix) Removal of surplus excavated materials as directed to Contractor's own dump.
- (x) Drilling of small holes as directed to explore the nature of substratum if necessary.

1.14 Measurements for Excavation: Excavation for foundation of columns beams walls and the like shall be measured and paid net as per drawing dimensions of concrete (bed concrete where so specified) at the lowest level in regard to length and breadth and depth shall be computed from the concerned excavation levels and ground levels taken before excavation Any additional excavation required for working space. form work. planking dewatering and strutting etc. shall not be measured and paid for separately but rates quoted for excavation shall include for all these factors. No increase in bulk after excavation shall be made.

1.15 Earth Filling in Plinth: If there is approved surplus earth after backfilling the sides of excavation, the same will be used for plinth filling if required. Any additional approved earth if required for plinth filling the same shall be brought on to the site by the Contractor from outside. The borrow pits shall not be opened on the site. Filling in plinth shall be done in layers of 15 cm to 30 cm thick each layer being consolidated by ramming & watering. Black cotton soil shall not be used for plinth filling.

Filling in plinth shall be measured net as in position after consolidation height or

depth of filling being measured from original ground level to top of earth filling after consolidation.

2. CONCRETE & STEEL REINFORCEMENT

A. Cement Concrete:

2.1 General: P.C.C. shall mean Plain Cement Concrete.

R.C.C. shall mean Reinforced Cement Concrete.

2.2 Constant and strict supervision of all items of the construction is necessary during the progress of work, including proportioning, mixing and placing of concrete. Supervision is also extremely important in checking the reinforcement and its placing before being covered.

2.3 Contractor shall finalize the details in consultation with the Clerk of work as per which form work is proposed to be carried out and also the details of planning of concreting operations including adequacy of acceptable materials, testing of mixer and vibrator for ascertaining that they are in working condition, availability of test cube moulds, slump test apparatus etc.

2.4 SAMPLES AND TESTS: Every facility shall be provided to enable the Officer-in-charge to obtain samples and carry out tests on the materials and construction. If these tests show that any of the materials or construction do not comply with the requirements of this specification, the Contractor will be responsible for the costs of the tests and the replacement of the defective materials and/or construction.

2.5 REJECTED MATERIALS.: All materials which have been damaged contaminated or have deteriorated or do not comply in any way with the requirements of the specification shall be rejected and shall be removed immediately from the site at the Contractor's own expenses.

2.6 LOADING OF FLOOR SLABS: Materials shall not be stored or stacked on suspended floors and roofs without the Officer-in-charge's prior approval.

2.7 CO-ORDINATION: The Contractor shall be responsible for the co-ordination with sub-contractors or other contractors for incorporating any inserts or electrical conduit pipes, fixing blocks, chases, holes etc. in concrete members as required. The contractor shall ensure that these requirements have been approved by the Officer-in-charge before concreting operations are put in hand. All fixing blocks chases, Inserts, holders etc. to be left in the concrete shall be of sizes specified and be accurately set out and placed before pouring concrete. The contractor's rates quoted for concrete items shall include for all these factors. Holes or chases shall not be cut in concrete without prior approval of the Officer-in-charge.

2.8 INSERTS IN CONCRETE: Contractor should note that he shall provide necessary wooden lugs, sleeves, etc. for his own works to be made for which no extra payment will be made. He will have to provide if so directed. any' inserts, wooden lugs, sleeves for other contractor's work such as Electrical Contractor, Plumbing Contractor, A.C. Contractor, Contractor of lifts. etc. for which he will be entitled for payment but in case the other contractors provide such inserts, then he will have to take proper measures (at his expense) and take care not to disturb their work while laying concrete.

2.9 Contractor shall provide work-site-testing equipment for aggregate and concrete

such as test sieves, balances, slump cones, test cube moulds etc.

2.10 MATERIALS: ALL MATERIALS SHALL BE OF APPROVED QUALITY

2.11 CEMENT:

(a) Ordinary Portland Cement 33 'Grade shall conform to the I.S. Specification IS 269:1989 and ordinary Portland Cement 43 Grade shall conform to IS: 8112: 1989.

(b) The cement shall be stored in such a manner as to permit of easy access for proper inspection in a suitable weather-tight building to protect the cement from dampness and to minimize warehouse deterioration. The shed shall be built at the cost of the contractor. Care shall be taken to see that (i) there is no leakage from side walls and (ii) windows are not provided. The plinth level of the shed shall be raised and the surrounding ground shall drain the surface water away from the shed. The floor of the shed shall consist of wooden planks resting on base prepared of dry bricks laid on edge. The bags should not be piled against the wall. A space of 30 cm shall be left all around between exterior walls & piles. The bags shall be placed closed together in the pile to reduce circulation of air as much as possible. The bags should not be. piled more than 10. The bags shall be arranged in header and stretcher fashion so as to lessen the danger of toppling.

When removing the bags for use "first in, first out" rules shall be applied. For this purpose, consignment as it comes in for storage, shall be stacked separately and a placard bearing date of arrival shall be pinned to the pile.

(c) Contractor shall be fully responsible for the quality of cement brought at the work site. The contractor shall satisfy himself that the cement brought to the work site conforms to the requirements of relevant Indian Standard and shall procure manufacturer's certification to this effect in his own interests. In case the contractor has any doubt regarding the quality of cement brought on work site it is up to him to have it tested at his own expense and make sure that cement is of right quality.

(d) In case Officer-in-charge gets any doubt about quality of cements he can order the contractor to have cement tested or he can take samples in the presence of contractor from cement bags stored at work site and forward them to a government approved laboratory for testing. In respect of charges for testing in such a case. Contractor will be paid the charges, provided the cement conforms to the specified I.S. Standards.

(e) Cement concerning of which there is doubt, shall not be used pending testing and satisfactory results. All cement not conforming to specifications and rejected by Officer-in-charge and cement that is stored at site for a period longer than three months and deteriorated, damaged or set shall not be allowed to be used. All such cement shall be immediately removed from work site by the contractor. The cost of all such cement shall be borne by the Contractor.

2.12 Aggregates: Aggregates shall conform to IS : 383/1970 and shall be from approved sources.

2.13 Fine Aggregates:

(a) **The fine aggregate-** Sand shall be hard, strong, dense, durable, clean with uncoated

grains. The maximum size of the particles shall be 4.75mm (3/16 in.) and shall be graded down. The sand shall not contain any harmful material such as iron pyrites coal, mica, silt, clay, alkali, seashells, organic impurities. loam etc. or in case of reinforcement or detrimental to concrete. Aggregates which are chemically reactive with the alkalies of the cement, shall not be used. The maximum quantity of deleterious materials shall not exceed the limits specified in the relevant I.S. Specification. Silt and dust present in natural sand shall be limited to 3% by weight. In case it is more than 3%, it shall be washed at site, Presence of mica in sand shall not be more than 1% by weight.

- (b) **Grading:** The natural sand used for work shall have a grading conforming to one of the three grading zones given in following (table IA)

TABLE "1A" GRADING OF FINE AGGREGATES

(In accordance with IS: 2386/1963 Part I)

Sieve	Percentage passing for		
	Zone I	Zone II	Zone III
10 mm	100	100	100
4.75 mm	90-100	90-100	90-100
2.36 mm	60-95	75-100	85-100
1.18 mm	30-70	55-90	75-100
600 micron	15-34	35-69	60-79
300 micron	5-20	8-30	12 -40
150 micron	0-10	0-10	0- 10

When grading falls outside the limits of any particular zone of sieves. (other than 600 micron IS sieve), by a total amount not exceeding 5% - It shall be regarded as falling within the grading Zone.

2.14 Coarse Aggregates:

- (a) Coarse aggregates shall consist of hard, dense, durable, uncoated crushed rock, Gravel aggregate shall be allowed, to be used only if specially specified in the schedule of quantities. Otherwise it shall be taken that only crushed rock from an approved quarry shall be permitted as coarse aggregates.
- (b) The aggregates shall be free from soft friable, thin or long laminated pieces. Aggregates shall be free from injurious amounts of alkali, organic matter and other deleterious materials. Flaky or weathered stones shall not be used. The maximum percentage of deleterious materials shall not exceed those specified in the relevant I.S. Specifications.
- (c) In selecting the aggregate the contractor shall satisfy that the source is suitable for regular supply and a watch shall be maintained that the particle shape and grading remain reasonable uniform throughout the progress of work.
- (d) Contractor shall arrange to supply coarse aggregates in single sizes, confirming in the case of each nominal size, to the grading given in the following table (table-1 B) under

column 'A', the single sizes shall be combined in suitable proportions to get desired overall grading of aggregates. The Officer-in-charge at his discretion, may allow the use of "Graded Aggregates" of nominal size, to conform to the grading in the limits specified in the table 1 B under column "B"

(e) Size of Aggregates

- (i) (Nominal maximum size of aggregates in beams and columns should be restricted to 5 mm less than the minimum cover to the reinforcement whichever is less.
- (ii) Where reinforcement is widely spaced as in slabs. nominal maximum size of aggregate of 20 mm may be used.
- (iii) In no case the maximum size of aggregate to be greater than one quarter of the minimum thickness of the member so as to facilitate concrete to be placed without difficulty to summoned all reinforcement.
- (iv) Generally, on reinforced concrete work, nominal maximum size of 20 mm is considered suitable.

(f) Grading: It can be assumed as a rough guide that from 45 percent to 75 percent of the total aggregate (fine plus coarse) should pass through a sieve of aperture size equal to one half of the maximum size of coarse aggregate.

(g) Stock-piling of aggregate or storage of aggregates:

Aggregates shall be stored at site on a hard and dry patch of ground preferably levelled and rolled. Piles of sand and piles of different sizes coarse aggregate shall be stored in separate stock piles with height preferably not exceeding 1.25 to 1.5 metres. A bottom layer of aggregates of 10 cms. deep shall be left undisturbed while removing the material for use. If the aggregates are stored at site for a long time there is accumulation of dust. The contractor is required to sieve the aggregate before use, if advised by Officer-in-charge. Washing the aggregates by means of hose pipe is not permitted. silt and fine dust permitted in coarse aggregate is only up to 1 % by weight.

2.15 WATER: Water used for both mixing and curing shall be potable and free from injurious amounts of deleterious materials which are likely to effect the strength or durability of concrete. Water containing any sugar shall not to allowed for use. Also water which falls to satisfy the following requirements shall not be used:

- (a) To neutralise 200 ml. sample of water, it should not require more than 10 ml. of 0.1 normal HCL.
- (b) To neutralise of 200 ml. sample of water, it should not require more than 2 ml. of 0.1 normal NaOH.
- (c) Water should not contain solids in excess of the following.

Organic	200 mg / litre
Inorganic	3000 mg / litre.
Sulphate (as SO ₄)	500 mg / litre.
Chloride (as cl)	2000 mg / litre for P.C.C.
	1000 mg / litre for R.C.C.

Suspended matter 2000 mg/litre

The pH value of water shall be between 6 to 8.

2.16 MIXES OF CONCRETE: Concrete used shall be in volumetric mix such as 1:4:8, 1:3:6, 1:2:4, **1:1.5:3**, 1:1:2 etc.

2.17 BATCHING: The quantity of cement shall be determined by weight. Batching of cement and water shall be specified in the tender.

2.18 (a) In proportioning concrete the quantity of cement shall be determined by weight. One bag of cement containing 50 Kgs. of cement shall be assumed to contain 35 litres (1.20 Clt.). The quantities of fine and coarse aggregates and water shall be determined by volume. If fine aggregate is moist allowance shall be made for bulkgage in accordance with Appendix 'E'

(b) The water cement ratios shall not be more than those specified in Table II below. In case mechanical vibrators are used water content shall be suitably reduced, without reducing cement content, to avoid segregation. Water content specified in Table II may be increased under exceptional circumstances where workability of concrete produced poses difficulties of placement and compaction. Prior permission of Officer-in-charge shall be obtained for this purpose, when the water content is increased in the manner indicated above. The cement content also shall be increased in proportionately so that water cement ratio given in table II is maintained. Cost of extra cement shall be borne by the contractor.

TABLE 1-B COARSE AGGREGATES

COLUMN 'A'						COLUMN 'B'				
Is Sieve Designation	Percentage passing-for single sized aggregates of nominal size					Percentage passing for graded aggregates of nominal size				
	62mm	40mm	20mm	16mm	12.5mm	10mm	40mm	20mm	16mm	12.5mm
80mm	100	-	-	-	-	-	100	-	-	-
63mm	85-100	100	-	-	-	-	-	-	-	-
40mm	0-30	85-100	100	-	-	-	95-100	100	-	-
20mm	0-5	0-20	85-100	100	-	-	30-70	95-100	100	100
16mm	-	-	-	85-100	100	-	-	-	90-100	-

12.5mm	-	-	-	-	85-100	100	-	-	-	90-100
10mm	0-5	0-5	0-20	0-30	0-45	85-100	10-35	25-55	30-70	40-85
4.75mm	-	-	0-5	0-5	0-10	0-20	0-5	0-10	0-10	0-10
2.36mm	-	-	-	-	-	0-5	-	-	-	-

Table - II

Mix. of Concrete	Quantity of water per 50 Kg. of cement Max. litres.
1.3:6	34
1:2:4	32
1:1½:3	30
1:1:2	27

- (c) Allowance shall be made for surface water present in the aggregate while computing the content. Surface water shall be determined by one of the field methods described in IS:2386 (part 3)/1963, In the absence of exact date, with the approval of the Officer-in-charge the amount of surface water may be estimated from the values given in Table III below:

TABLE III SURFACE WATER CARRIED BY AVERAGE AGGREGATE.

Aggregate	Approximate quantity of surface <u>water in</u> <u>litre/Cu.M.</u>
Very wet sand	120
Moderately wet sand	80
Moist sand	40

Coarse the aggregate lesser water it will carry.

Most gavel or crushed rock 20 to 40.

- 2.19 Workability:** Workability of concrete should be controlled by direct measurement of water content making allowance for any surface Water in the fine and coarse aggregates. The slump test or compacting factor test shall be carried out at intervals as directed by the Officer-in-charge. The slump test is suitable for slump of 5 cm to

15 cm.

MIXING AND PLACING OF CONCRETE: MEASUREMENT OF MATERIALS

2.20. Cement: Cement shall be batched by weight even though aggregates are batched by volume. Where the weight of the cement is determined by accepting the maker's weight per bag. A number of bags as directed by Officer-in-charge shall be weighed separately to check the net weight.

2.21 Aggregates:

- (a) The quantities of fine and coarse aggregates shall be determined by volume. The proportions of aggregates (i.e. ratio of fine aggregate to coarse aggregate) shall be adjusted from upper limit to lower limit progressively as the grading of the fine aggregated becomes, finer and maximum size of coarse aggregate becomes larger.
- (i) For an average grading of fine aggregate i.e., zone II of IS:2386/1963 - Part I the ratios of fine aggregates to coarse aggregates shall be

Maximum size of coarse aggregate	Maximum size of coarse aggregate
10 mm	20 mm
1 : 1½	1 : 2

For fine aggregates within other grading zones of ratio shall be increased as the fine aggregate gets finer, that , passes from Zone 1 to Zone III.

- (ii) For the maximum size of coarse aggregate 20 mm the ratios of fine aggregate to coarse aggregate shall be (Zone as per IS:2386/ 1963 - Part I).

Zone I	Zone II	Zone III
1:1½	1:2	1:3

(b) The measuring boxes prepared for measuring the aggregate shall be of correct size. The measuring boxes are required to be certified by Officer-in-charge before they are used on site. Internal dimensions of the boxes shall be generally 35 cm x 25 cm x 40cm. heaping of aggregates over the boxes is prohibited. Aggregates shall be filled in only up to the brim of the boxes and struck off horizontally with a timber or steel bar. Allowance for bulkage for sand shall be made as determined by Officer-in-charge.

2.22 Water: Water shall be measured by volume in calibrated tanks/vessels having a conical shape narrow at top. Water shall not be measured using ordinary uncalibrated buckets, which are wider at top and narrower at the base. The measurement of water to control and maintain a constant water cement ratio is of utmost importance and adequate attention to this and by the contractor to the satisfaction of Officer-in-charge, shall be given.

2.23 Mixing of Concrete:

- (a) **Machine Mixing:** Concrete shall be mixed in a mechanical mixer, having an optimum speed which yields good concrete that is neither inadequately mixed nor showing tendency of segregation. This avoids frequent washing. A small amount

of water shall be fed first followed by all solid materials. Remainder of water shall be added after the solids. Mixing shall be continued until there is uniform distribution of materials and the mass is uniform in colour and consistency. The mixing time shall be counted after all the materials are in drum and shall be in accordance with IS:1791/1968 but in no case mixing shall be done for less than two minutes.

- (b) **Hand Mixing:** Hand mixing shall not be permitted except for unimportant structural members and purely at the discretion of the Officer-in-charge. Hand mixing will not be permitted for concrete going into columns. When hand mixing is permitted, it shall be ensured that the mixing is continued until the mass is uniform in colour and consistency. The contractor shall use 10% extra cement for hand mixing for which no extra payment will be made. Hand mixing when permitted shall be done on platform.
- 2.24 **Transporting:** Concrete shall be handled from the place of mixing to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of the ingredients. It shall be deposited as nearly as practicable in its final position to avoid re handling or flowing. Wet concrete discharged from each batch of mixer shall be neatly collected and transported. Remnants from earlier batches shall be rejected and removed.
- 2.25 **Placing:** The concrete shall be placed in position and compacted before that initial setting time and shall not be disturbed subsequently. Concreting shall be carried out continuously up to construction Joints, the position and arrangement of which shall be predetermined. When the work has to be resumed on the surface which has hardened, it shall be thoroughly backed, swept clean, wetted and covered with a layer of mortar composed of cement and sand in the same ratio as the cement and sand in the concrete mixture. This mortar shall be freshly mixed and placed immediately before placing of the concrete. Concrete shall be placed in shuttering by shovels or other approved implements and shall not be dropped from a height, say greater than 1 M or handled in a manner which will not cause segregation. Concrete which has already set shall not be allowed to be incorporated in the work even after adding cement and remixing.
- 2.26 **DEBRIS ETC. TO BE REMOVED:** All debris shall be removed from the shuttering before any concrete is placed. Care shall be taken to see that the shuttering is water-tight and has been properly treated with approved composition to prevent absorption of water.
- Shuttering for concrete shall be rigidly constructed of approved material and shall be true to the shape and dimensions described on the working drawing. Faces in contact with concrete shall be free from adhering grout, projecting nails, splits and other defects. Joints shall be sufficiently tight to prevent the leakage of cement grout and to avoid the formation of fins and other blemishes. Shuttering shall be secured so as to be strong enough to retain the correct shape during consolidation of concrete. Shuttering shall be true to line and braced and strutted to prevent deformation under the weight and pressure of the wet concrete, constructional loads, wind and other forces. The shuttering on the sides of the beams and soffits of slabs can be removed without disturbing the beam bottoms. Repropping of beams shall not be permitted. Immediately prior to placing of the concrete, the shuttering shall be well wetted.
- 2.27 **Protection and Placing in Layers:** Concrete shall be placed in single. operation to the full thickness of slabs, beams and similar members and shall be placed in

horizontal layers not exceeding 1 m deep in walls, columns and similar members. Concrete after placing shall be protected by use of covering to the approval of the Officer-in-charge during first stages of hardening against high winds, hot sun and/or rain or surface water. No shock or vibrations shall be allowed to be imparted to the forms supporting fresh concrete.

- 2.28 Compaction:** Concrete shall be thoroughly compacted during operation of, placing and carefully worked around the reinforcement embedded fixtures and into corners of form work. The use of mechanical vibrators is strongly recommended. Sufficient number of vibrators including standby of adequate capacities shall be used for compaction of concrete. Vibrators shall be carried out by trained men and in the presence of a qualified supervisor trained in the use of vibrators and vibrated concrete. In certain portions where vibration is not effective, careful rodding and tamping shall be carried out and sufficient men employed to ensure that thorough consolidation takes place. Where manual compaction becomes necessary the workability of the mix should be controlled to suit such made of compaction subject of course, to compliance of strength requirements specified.
- 2.29 Continuous Concreting:** Concreting shall be carried out continuously up to predetermined positions of construction joints. The position and arrangement for construction joints shall be approved by the Officer-in-charge. Rest pauses for meals etc. shall be subject to the Officer-in-charge's approval.
- 2.30 Packing Bound Reinforcement:** In the case of reinforced concrete work, the concrete shall be carefully consolidated round the reinforcement and care shall be taken to ensure that reinforcement is not displaced during the placing and compaction of concrete. If reinforcement moves out of its place it must be brought back to position immediately.
- 2.31 Vibration of Concrete:**
- (a) Number and size of vibrations:** Vibrators shall be of sturdy construction, adequately powered and capable of transmitting to the concern not less than 3500 impulses per minute when operating under load. The vibration shall be sufficiently tense to cause the concrete to flow or settle readily into place and visibly affect the concrete over a radius of at least 450 mm (18) when used in concrete having slump of 25 mm. A sufficient number of vibrators (at least one vibrator for a rate of concreting of 1.5 Cu. M or 50 Cu.Ft. per hour) shall be employed so that vibrating through the entire volume of each layer of concrete and complete compaction are secured.
- (b) Manipulation of vibrators:** Internal vibrators shall be kept constantly moving in the concrete and shall be applied at points uniformly placed not farther apart than the radius over which the vibrator is visibly effective. The vibrator shall not be held in one location long enough to draw out a pool of grout from surrounding concrete. The vibration shall be such that the concrete becomes uniformly plastic and there shall be at least 200 seconds of vibration per square metre (20 seconds of vibration per Sq.Ft. of surface of each layer of concrete, computed on the basis of visibly effected radius and taking overlap into consideration. Vibrations shall be stopped when an bubbles have practically ceased coming to the surface.
- 2.32 CURING:** All concrete work shall be kept constantly wet for a minimum period of seven days after concreting. Horizontal surfaces shall be kept covered with water

ponded by means of bunds and vertical surfaces like those of columns, fins, etc. by burlaps kept constantly wet by water sprays. Mere sprinkling of water on vertical surfaces without sacks or burlaps will not be allowed.

- 2.33 TRAINED SUPERVISOR:** It is essential that the contractor's supervisor who is in charge of the construction and all concrete work, whether reinforced or not, shall be skilled in this class of work and shall superintend personally the whole construction and pay special attention to:
- (a) The quality, testing, Proportioning and mixing of the materials and particularly control of water cement ratio.
 - (b) Laying of materials in place and thorough consolidation of the concrete to ensure solidity and freedom from voids.
 - (c) Sizes and positions of reinforcements.
- a. **STRENGTH REQUIREMENTS OF CONCRETE:** Where ordinary portland cement is used, the compressive strength requirements for various mixes of concrete shall be as given in Table IV. It shall be the contractor's responsibility to obtain specified strengths for the various mixes of concrete.

TABLE IV - STRENGTH REQUIREMENTS OF CONCRETE

(All values in Kg/Sq. Cm.)

All tests conducted in accordance with IS: 516-1959		
Concrete Mix	Minimum compressive strength on 15 cm. cubes at 7 days (Works Test only)	Minimum compressive strength of 15 cm. cubes at 28 days (works test Only)
1:3:6	70	100
1:2:4	100	150
1:1½:3	135	200
1:1:2	170	250

Note: **WORKS TEST: A test-** conducted in an approved laboratory on the specimens made on the works out of the concrete being used on the works.

2.35 Criteria Regarding Strength: Although the works test cubes are specified to be conducted at the age of 7 and 28 days, in all cases 28 days compressive strength specified in Table IV shall alone be the criteria for acceptance or rejection of concrete.

2.36 CLASSIFICATION OF CONCRETE OF LOWER OR HIGHER STRENGTH THAN SPECIFIED: If concrete made in accordance with the proportions given for a particular mix does not yield the specified average strength of three cubes at 28 days' (refer table V for acceptance criteria) such concrete shall be dealt as stated in the criteria for acceptance of concrete.

2.37 Test Cubes:

- (a) Concrete used for preparing works test cubes shall represent quality of concrete incorporated in the work. The concrete for preparation of one set of six cubes shall be taken from one batch of mixed concrete discharged from mixer. The cubes shall be moulded in accordance with Indian Standard Code of Practices.
- (b) The cubes shall be cured as per IS Code of Practices. The entire operation of ,casting, arranging and dispatch of cubes to laboratory will be carried out by the Contractor under the joint supervision of the Officer-in-charge and Contractor's Engineer. Out of six cubes, three cubes shall be tested at an age of seven days and the other three at the age of 28 days in a laboratory approved by the Officer-in-charge.
- (c) The cubes shall be initialed jointly by Contractor's representative and the Officer-in-charge with a piece of wire or nail, so that an indentation of the initials is left on the cubes.
- (d) The contractor shall arrange to transport the cubes to the laboratory and arrange to have the test results forwarded (in duplicate) directly from the laboratory' to the Officer-in-charge. The contractor shall bear all expenses in connection with the preparation of test cubes like cost of moulds, cost of concrete, labour and transportation charges to the approved laboratory etc. The charges for testing shall be paid initially by the contractor to the laboratory.
- (e) A register shall be maintained at site by the Officer-in-charge with the following details entered and initialed by the contractor and the Officer-in-charge:
 - (i) Date and time of casting.
 - (ii) The mix of concrete
 - (iii) Reference to specific structural member receiving the batch of concrete from which the cubes were cast
 - (iv) Mark on cubes.
 - (v) Water cement ratio by weight and slump.
 - (vi) Crushing strengths as obtained at the end of seven days for three cube out of a set of six and at the end of 28 days for the other three cubes.
 - (vii) Laboratory in which tested and reference to test certificate.
 - (viii) Any other information directed by the Director, NIA.

- (f) A record of the quantity of concrete incorporated in the work that is represented by the quality of concrete of the set of cubes along with the description of the structural members where such concrete has been deposited shall be maintained. For floor beams and slabs, such record shall be supported by a drawing on which the areas of concreting carried out and representing the set of cubes taken out shall be properly demarcated with cube references entered in the drawing at the relevant portions. This record shall be initialed by the contractor and maintained by the Officer-in-charge.

TABLE V: ACCEPTANCE CRITERIA, TESTS ETC. FOR CONCRETE (Ref.: Para 2.37 and 2.38)

AGGREGATE				CONCRETE							
Separation			Tests	Batching			Test				
Fine	Coarse	Grading	Moisture Determina- tion	Cement	Aggre- gates	Worka- bility	Strength (Works Test Only)				
							Minimum number of Specimens (15 cm cubes)		Minimum Frequency		Criteria for Accept- ance
							7 days Compressive Strength Test	28 days Compressiv e Strength Test	In Terms of Quantity	In Terms of Period	

One Size	-Single Sized Aggregate in two sizes (20mm 10 mm) for max. 20mm size aggregates or in three sizes (40mm, 20mm 10mm) for max. 40mm sized aggregates or if approved by Officer graded aggregates conforming to Table under	After Standard has been established when variation is suspected	When Variation in moisture is suspected e.g. rain	By Weight	By Volume	As frequency as directed by the Officer-in-charge	3	3	for each 50 M ³ of concrete or part thereof at more frequent intervals if directed by E.E.	As decided By E.E.	Refer Para 2.38
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g) Samples size and acceptance criteria: All tests shall be carry out in accordance with IS :516-1962. The number at least specifications required, the frequency of sampling and the criteria for acceptance of a concrete of a specified mix shall be in accordance with the Table V Ordinary concrete.

2.38 Standard of Acceptance: The average compressive strength of the three specimens tested at seven days shall satisfy the specified strengths given in Table IV, for the appropriate mix. As a guidance the difference between the maximum and the minimum strength of the three specimens shall not exceed 15% of the average strength. In case seven days tests result is not satisfactory all further work structurally interlinked with the concrete represented by the samples shall be stopped unless otherwise decided by the Director, NIA,

II. Twenty-eight days test: Acceptance criteria of twenty-eight days shall be as follows:

(a) If the average compressive strength of three cubes is more than the compressive strength indicated in Table IV, the concrete shall be accepted at full rates.

- (b) If the average compressive strength of three cubes is less than the specified but not less than 85% of the specified strength, the concrete may be accepted at reduced rates at the discretion of the Director, NIA.
- (c) If the average compressive strength of three cubes is less than 85% of the specified strength, Director, NIA shall reject and get dismantled the defective portion of the work represented by the samples along with the structurally connected work as considered necessary at the risk and cost of the contractor.

In case of (b) and (c) above, Director, NIA, if he so decides may order the additional tests like core test, ultrasonic test, rebound hammer test, load test of structure or part of structure etc. All the charges in connection with these additional tests shall be borne by the contractor. If on the basis of those additional tests the Officer-in-charge is satisfied about the structural adequacy of the concrete. he may accept the work at reduced rates.

2.39 Concrete Ordered to be Dismantled: Where the Officer-in-charge does not accept the poor or defective concrete and orders the same to be dismantled, the contractor shall dismantle such concrete at his expense and reconstruct the same to the Director's satisfaction. Concrete thus dismantled will not be measured and paid for. The additional work if any, required to be carried out for re-concreting, shall be to the contractor's account.

2.40 Concrete Retained with Rectification: Where the Director, NIA in order to save time and where he considers adequate, orders that defective concrete be strengthened as directed by him the contractor shall carry out all rectification measured to Director's approval at his expense. The concrete thus strengthened and accepted shall however, be paid at reduced rate, (for mixes of concrete be refer Table IV under para 2.34).

2.41 Quality of Defective Concrete Represented by cubes: In all cases of defective concrete as revealed by works test cubes strength failing below the specified strength, the quantity of concrete thus affected and represented by the cubes shall be decided by the Director, NIA whose decision shall be final and binding on the contractor.

2.42 Honey Combing:

(a) Where honeycombed surfaces are noticed in the concrete, the contractor shall not patch up the same until examined by the Officer-in-charge and decision given regarding the acceptance with rectification or rejection of the same. If contractor patches up such defects without the knowledge of the Officer-in-charge, the Officer-in-charge will be at liberty to order demolition of the concerned concrete members to the extent he considers necessary. In such case, the contractor at his expense, shall reconstruct demolished work. Demolished work shall not be measured and paid for.

(b) If in the opinion of the Officer-in-charge the honeycombing is harmful to the structure and where so directed by the Director, NIA, the full structural members affected by honeycombing as decided by Director, NIA shall be dismantled and reconstructed to Officer-in-charge's approval at contractor's expense. The demolished concrete will not be measured and paid for.

- (c) Such honeycombed areas which are not severe in the opinion of Officer-in-charge and to be retained with rectification shall be dealt with as under:

Patches are first treated with the coat of thin grout composed of 1 Part of cement and 1 part of sand and then filled with mortar similar to that used in the concrete. The mortar is placed in layers not more than 10 mm thick and each layer is given a scratch finish to secure bond with the succeeding layer.

- 2.43 OTHER DEFECTS:** Any other defects in concrete shall be made good as directed by the Officer-in-charge at contractor's expense.

- 2.44 DEVALUATION OF RATES FOR CONCRETE NOT CONFORMING TO SPECIFIED STRENGTH:** In case of average compressive strength being less than the specified strength but up to 85% of the specified strength, the rate payable shall be in the same proportion as average compressive strength bears to the specified compressive strength.

In case average compressive strength of concrete is less than 85% of the specified strength (but the same is accepted to be retained in the structure, the rate payable shall be 85% of the quoted rate minus 1-1/2 times the further percentage reduction below 85% strength.

(Note: While working out the devaluation only the concrete component of the rate excluding shuttering shall be taken into account for calculation).

2.45 CONSTRUCTION JOINTS

- (a) **Location:** The contractor shall submit sketches showing the location where he proposes to provide construction joints and get them approved from the Officer-in-charge prior to concreting.
- (b) **Stop boards:** All vertical construction-joints shall be formed with proper wooden stop-board at the joint. Where directed, the joints shall be rebated or joggled and be of approved shape.
- (c) **Stop Boards:** Wherever water bars/stops are specified, the same shall be provided as per drawing or as directed. It is necessary to ensure that water bars form continuous diaphragms. When P.V.C. water bars/stops are provided the joints shall be properly heated and fused as per manufacturers specifications.

2.46 CONSTRUCTION JOINTS IN BASEMENT

- (a) **Location and formation:** Contractor shall prepare a drawing showing the proposed construction joints and have it approved by the Officer-in-charge. After such approval, it is necessary to place stop boards, well in advance, at predetermined positions and carry out the concreting right up to the stop boards.
- (b) Particular care is required to form and treat construction joints in basement in order to ensure water tightness for which contractor shall be responsible.
- (c) Joints in the base slab: Joints in base slabs and beams of a basement shall be so located that the joint is parallel to the principal reinforcement. Where it is unavoidable and is at right angle to the principal reinforcement, the joint shall be in the middle of the span of the slab or beams.

- (d) **Formation vertical joints:** Vertical construction joints in base slab and wall of basement shall be formed by using vertical stop-boards in predetermined positions. P. V. C. water bars shall be provided for vertical joints in walls.
- (e) **Formation horizontal joints:** Horizontal joints in wall shall be rebated and care shall be taken to establish a proper and good bond between the hardened concrete and freshly laid concrete produce a watertight joint which shall be contractor's responsibility. P.V.C. water bars shall be provided for horizontal joints in walls.
- (f) **Wall slab junction:** Each layer must be compacted before placing the next layer. Concrete in the splays at the junction of the wall and the slab shall be placed without joints at the time of concreting the slab.

2.47 Treatment of Construction joints in basement:

- (a) When work is resumed on the surface which has hardened such surface shall be roughened. It shall be thoroughly cleaned and wetted and covered with a 12 mm layer of Mortar and sand' in the concrete mix. This 12 mm layer of mortar shall be freshly mixed and placed immediately before the placing of the concrete.
- (b) When the surface has not fully hardened, the laitance shall be removed by scrubbing the wet surface with wire bristle brushes, care being taken to avoid dislodgement of aggregate particles. The surface shall be thoroughly wetted and all free water removed. The surface shall then be thoroughly wetted and free water removed. The surface shall be coated with thick neat cement grout.
- (c) Care shall be taken to obtain good bond between the hardened and freshly placed concrete. Careful ramming and moulding of concrete around the water bar is very important.

2.48. Construction joints in Superstructure

- (a) **Columns:** A joint shall be formed horizontally at the top of a foundation and 75 mm below the lowest soffit of the beams meeting at the head of the column or 12 mm below the tip of anchor bar projected from the floor beam into the column where one or more beams meet, concrete shall be placed without a joint i.e., concrete in the joint shall be poured along with floor concrete.
- (b) **Beams:** Concrete in the beam shall be placed, throughout without a joint but if the provision of a joint is unavoidable, the joint shall be vertical and at the middle of the span.
- (c) **Slabs:** A joint in the slab shall be vertical. and parallel to the principal reinforcement. Where it is unavoidable and at right angles to the principal reinforcement the joint shall be vertical and at the middle of the span.
- (d) **Treatment of construction joints:** Same as for construction joints in basement i.e. 2.47 above.

2.49 Expansion Joints:

- (a) Expansion joints shall be provided as shown in the drawings.
- (b) Expansion joints are meant to provide discontinuity in the structure. Care shall be taken to ensure this discontinuity by having clear joints throughout the length and height of the expansion joints. There shall be no connection between two sides of

an expansion joint except like fillers, G.I. Strips etc.

- (c) Filler material for expansion joints shall be Shalltex joint filler as manufactured by M/s Shalimar or other equal and approved make and of appropriate thickness. The filler material shall extend to the entire depth of a joint except for a distance of 25 mm from the exposed faces.
- (d) Contractor shall ensure that expansion joints are made watertight and that no leakages occur through these joints for which he shall be responsible.

2.50 WATER TIGHT CONCRETE: Concrete IN all basement works such as basement base slab and beams wall etc. water tanks and the like where concrete of 1:1.5:3 mix or richer mix is specified, will be considered as watertight concrete whether so specially mentioned or not in the Schedule of quantities. In respect of such concrete, it shall be the contractor's responsibility to ensure that the resulting construction is watertight. If it is not, the contractor shall carry out at his own cost, all necessary remedial measures which the Officer-in-charge directs.

2.51 FORM WORK:

MATERIALS AND DESIGN:

- (a) The formwork shall be of timber or plywood or steel. If any particular material or materials be specified in the Schedule of Quantities for formwork such particularly specified material or materials shall be used in work. The form work shall be so constructed as to remain sufficiently rigid during placing of the concrete and shall be sufficiently tight to prevent loss of liquid from the concrete. The forms shall have sufficient strength and rigidly to hold concrete and withstand the pressure of remaining and vibration without excessive deflection of the prescribed lines and more so when the concrete is vibrated. The surface of all forms in contact with concrete shall be clean, rigid, watertight and smooth. Suitable devices shall be used to hold corners, adjacent ends and edges of panels of other forms together in accurate alignment.
- (b) The form work shall conform to the shape, lines and dimensions to suit the R.C.C. members as shown on drawings and to be so constructed. Form work shall be adequately designed to support the full weight of workers, fresh placed concrete without yielding settlement or deflection and to ensure good and truly aligned concrete finished in accordance with the construction drawings to camber in all directions of 6 mm for every 5 m span in all slab and beam centering shall be given to allow for a unavoidable sagging due to compression or other causes.
- (c) The form work shall be so designed that the sides of the beams shall be first struck leaving the soffit of beams and the supporting props in position. Props shall be designed to allow accurate adjustment and to permit their being struck without jarring the concrete.
- (d) Temporary openings shall be provided at the base of column forms and at other points where necessary to facilitate cleaning and observation immediately before concrete is deposited.

(e) Vertical Shuttering:

The vertical shuttering shall be carried down to such solid surface as is sufficiently

strong to afford adequate support and shall remain in position until the newly constructed work is able to support itself. Props shall be securely braced against latest deflection. Where timber props are used like bullies, they shall be of a minimum diameter of 10 cm and shall be straight and adequately strong. The spacing of such struts shall be designed to carry loads imposed on it without undue deflection of the members supported; by the props. The spacing of props shall be approved by the Officer-in-charge and any alterations suggested by him shall be carried out at contractor's expense. Bracing shall be provided as directed without extra cost. The rates given in the schedule of quantities shall include for providing props and struts for any height shown in the working drawings issued to Contractor from time to time.

- 2.52 WATER TIGHTNESS:** It is the contractor's responsibility to ensure that the forms are checked for water tightness just before concreting operation starts and to make good any deficiencies.
- 2.53 CLEANING AND TREATMENT OF FORMS:** All rubbish, particularly, chippings, savings and saw-dust, shall be removed from the interior of the forms before the concrete is placed and the form work in contact with the concrete shall be cleaned and thoroughly wetted or treated with an approved composition. Care shall be taken that such approved composition is kept out of contact with the reinforcement.
- 2.54 STRIPPING:** Forms shall be left in place until their removal is authorized by the Officer-in-charge and shall then be removed with care so as to avoid injury to concrete. In no circumstances shall forms be firm until the concrete reaches strength of at least twice the stress to which concrete may be subjected at the time of striking. The strength referred to shall be that of concrete using the same cement and aggregate with the same proportions, and cured under conditions of temperature and moisture similar to those existing on the work. Where possible, the form work shall be left, longer, as it would assist the curing.
- 2.55 STRIPPING TIME:** In normal circumstances (generally where temperature is above 20°C) and where ordinary cement is used, forms shall be struck after expiry of the following, periods given in table VI.

TABLE - VI

Location	Striking time in days for	
	Ordinary Portland Cement	Pozzolana Cement

(a)	Vertical sides of walls, slabs, beams and columns	2	4
(b)	Bottoms of slabs up to 4.5M span.	7	14
(c)	Bottoms of slabs above 4.5 M span, bottoms of beams up to 6M span and arch rib bottom up to 6M Span.	14	21
(d)	Bottoms of beams over 6M span and arch rib bottoms above 6M span.	21	30

Note: 1 In case the shuttering for the part of the structure is supported or suspended from the shuttering of the concrete member already cast then the shuttering of the concrete member (already cast) supporting the new shuttering shall not be removed until the concrete of the supported/suspended member is matured.

Note 2: Special care shall be taken while striking of the shuttering for canopies (ii) Chajjas (iii) Cantilever slabs and beams and (iv) retaining walls, so as to ensure stability of these structural elements. Relevant notes given in the structural drawings in this connection shall be strictly followed.

2.56 FORM WORK IN LIFTS FOR CONTINUOUS SURFACE: Where forms for continuous surface are placed in successive units (as for example in columns or walls), the forms shall fit tightly over the completed surfaces so as to prevent leakage or mortar from the concrete and to maintain accurate alignment of the surface.

2.57 PROCEDURE FOR REMOVING THE FORM WORK: All form work shall be removed without such shock or vibration as would' damage the reinforced concrete. Before the soffit and struts are removed, the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened. Proper precautions shall be taken to allow for the decrease in the rate of hardening that occurs with all cements in the cold weather. For cantilevers props shall be removed from the tip towards support. Special notes given in relevant structural drawing shall be strictly adhered to in order to avoid mishaps.

2.58 TOLERANCES: The following shall be the maximum permissible tolerances:

- (a). On general setting out dimensions up to 4M in length, a tolerance up to 3 mm will be allowed.
- (b) On lengths of more than 4M tolerance of not more than 5 mm will be allowed.
- (c) On the cross-sectional dimension of columns, beams, slabs, facias, chajjas, mullions, grills, fins, leaves and such other members tolerance of more than 2 mm will not be allowed.
- (d) The top surface of concrete floor slab shall be within 6 mm of the level and line

shown on the drawings.

- (e) Column and walls and other vertical members shall not be more than 3 mm out of plumb in their story height and not more than 6 mm out of plumb in their full height.
- (f) If the work is not carried out within the tolerance set out above in (a) to (e), the cost of all rectification measures or dismantling and reconstructing as decided by the Director, NIA shall be borne by the contractor. In case if work is dismantled the same shall not be measured and paid for:

2.59 THE RATES GIVEN IN THE SCHEDULE OF QUANTITIES FOR CONCRETE TO INCLUDE: The rates given in the schedule of quantities for providing and laying cement concrete in various grades or proportions in the Schedule of Quantities shall, apart from any other factors specified elsewhere in the tender documents, include for the following,

- (a) For all factors and method of work described in these specifications:
- (b) For all materials, labour, tools and plants, scaffolding etc., mixing, conveying and placing concrete in position, ramming, vibration, trowelling, curing providing necessary scaffolding and removing the same after the work is complete.
- (c) Unless otherwise specified in the Schedule of Quantities the cost of concrete items, shall not include for providing and fixing form work as described inclusive of erecting, propping to required heights, bracing, providing stays, struts, bolts, nuts and everything necessary to keep the forms rigid, smoothing the surface to receive concrete as per detailed drawings, striking and stripping form work after the concrete is cured, tacking the concrete surface required to receive plaster etc.
- (d) The reinforcement in case of reinforced concrete work will be paid for separately unless otherwise stated in the particular items, but rate shall include for pouring concrete and packing round reinforcement.
- (e) The measurement of concrete will be as per detailed drawings shapes and size based on net structural sizes as per drawings i.e., exclusive of plaster.
- (f) Rates given in the schedule of quantities for concrete items shall cover for any shape of structural members like columns, beams facias, fins, louvres, etc. and of cantilever beams, slabs etc., as per detailed final drawings including providing slopes to slabs, beams, chajjas, canopies etc. wherever required.
- (g) Formation and treatment of construction and expansion joints (where water bars like P.V.C. water bars, strips or joint fillers like "Shalitex" or other equal and approved make are specified, such materials shall be paid separately):
- (h) Fixing all inserts like pipes, plugs, forming holes, etc. as described.
- (i) For volumetric batching.
- (j) For taking out dowel bars, fan hooks etc. through shuttering.
- (k) In cases where at the junctions of beams, columns, slabs the composition of concrete mix or specified strength be different for columns, beams and slabs, then in such cases only the richer concrete among those specified for in all those members shall be used at the junctions and rate quoted for columns, beams and slabs or any members entering such junctions shall allow for the same. Rate shall also cover for spillover of richer concrete in beams to natural

angle of repose of wet concrete required from practical considerations, while concreting the junctions.

- (l) For forming chamfers, bands and drip moulds in columns, beams, labs, chajjas, facias, sills coping etc. and where shown in the drawings or as directed.
- (m) For work at all levels.

APPENDIX "E"

(To be read with Clause no.2.18(a))

Field method of determining the necessary adjustment for the bulking of fine aggregate.

Moisture cause loosely filled sand to occupy a larger volume than it would occupy it dry. It is therefore necessary to increase the volume of sand by the percentage bulking. The correction shall be made on the following lines:

In a 250 Cu. Cm. measuring cylinder pour the sample of fine aggregate (sand) to be used at site, consolidate if by shaking, until it reaches 200 Cu. Cm. mark. Then fill the cylinder with water and stir the sand well. The water must be sufficient to completely submerge the sand. The sand surface will be seen below its original level. Suppose the surface is at the mark 'X' Cu. Cm. The percentage of bulking of sand due to moisture shall be calculated from the formula: -

$$\text{Percentage bulking 'K' } = \frac{200 - X}{X} \times 100$$

Therefore,

$$\text{True Volume } = \frac{100 \times \text{Measured Volume}}{\text{'K' } + 100}$$

B. STEEL REINFORCEMENT:

2.60 MILD STEEL BAR:

Mild Steel reinforcement bars shall conform to I.S. 228-1962 "Standard Quality" or I.S. 432-1962 "Grade 1". Other qualities of steel shall not be acceptable. High Strength Cold Twisted Deformed Bars: Wherever deformed high strength reinforcement bars are specified the Contractor shall use ribbed! deformed bars conforming to IS: 1786/1985.

- 2.61 **Cleaning of Reinforcement:** Before steel reinforcement is placed in position, the surface of the reinforcement shall be cleaned of rust, dust, grease and other objectionable substances.
- 2.62 **Cutting of Reinforcement:** Before the reinforcement bars are cut the Contractor shall study the lengths of bars required as per Drawings and shall carry out cutting only to suit the sizes required as per drawings.
- 2.63 **Placing and Securing:** Reinforcement bars shall be accurately placed and secured in position and firmly supported or wedged by precast concrete blocks of suitable thickness, at sufficient close intervals, so that they will not sag between the supports

or get displaced during the placing of concrete or any other operation of the work. It is most important to maintain reinforcement in its correct position without displacement and to maintain the correct specified cover. Contractor shall be responsible for all costs for rectification required in case the bars are displaced out of their correct position.

- 2.64 **Binding Wire:** The reinforcement shall be securely bound wherever bars cross or wherever required with annealed steel binding wire of size not less than 0.90 mm and conforming to I.S. 280-1962.
- 2.65 **Welding:** Welding of bars shall not be carried out unless specially authorised in writing by the Director, NIA.
- 2.66 **Bends etc.:** Bends, Crank etc. on steel reinforcement shall be carefully formed, care being taken to keep bends' out of winding. Otherwise, all rods shall be truly straight. If any bend shows signs or brittleness or cracking, the rod shall be removed immediately from the site. Minimum radius of 9 times diameter of the bar shall be used unless otherwise specified in the drawings. However, in respect of standard hooks, the radius of bend shall be 2 times of diameter of bar. Heating of reinforcement of bars to facilitate bending will not be permitted. The bars shall always be bent cold. In case of mild steel reinforcement bars of large sizes, where cold bending is not possible, they may be bent by heating with written permission of the Officer-in-charge. Bars when bent hot shall not be heated beyond cherry red colour and after bending, shall be allowed to cool slowly without quenching. The bars damaged or weakened in any way in bending shall not be used on the work. High strength deformed bars shall in no case be heated to facilitate bending or cranking.
- 2.67 **Inspection of Reinforcement:** No concreting shall be commenced until the Officer-in-charge has inspected, the reinforcement in position and until his approval has been obtained. A notice of at least 24 hours shall be given to the Officer-in-charge by the Contractor for inspection of reinforcement. If in the opinion of the Officer-in-charge any material is not in accordance with the specification or the reinforcement is incorrectly spaced, bent or otherwise defective, the Contractor shall immediately remove such materials from the site and replace with new and rectify any other defects in accordance with the instruction of the Officer-in-charge and to his entire satisfaction.
- 2.68 **Net Measurements:** Reinforcement shall be placed as shown on the structural drawings and payment will be made on the net measurements from the drawings. Only such laps, dowls, chairs and pins in reinforcement as approved by the Officer-in-charge or shown on drawings shall be paid for the Contractor shall allow in his quoted rate for all wastage which will not be paid for.
- 2.69 **Cover for Reinforcement:** Cover shall be measured from the outer surface of main reinforcement. Cover shall be as follows::
- (a) At each end of a reinforcement bar, 25 mm or twice the diameter of such rod or bar, whichever is greater.
 - (b) For a longitudinal reinforcing bar in a beam, 25 mm or the diameter of such rod or bar, whichever is greater.
 - (c) For tensile, compressive, shear or other reinforcement in a slab, 13 mm or the diameter of such reinforcement, whichever is greater.
 - (d) For reinforcement in any other member such as a Lintel, Chajja. Canopy or pardi, 13 mm or the diameters or such reinforcement whichever is greater.

- (e) For main reinforcement in isolated footings (side and bottom) clear cover shall 40 mm
- (f) For column has clear cover shall be 40 mm unless otherwise specified in drawing.
- (g) For bars in slabs of strip footings and mat foundations, the clear cover shall be 30 mm, Beam bars shall be placed over slab bars in respect of beam and slab type foundations.

2. 70 **Stock Piling of Steel:** Steel required shall be stockpiled well in advance of need in the work. Contractors shall stockpile 1/3 requirement within 15days of commencement, 2/3 requirement at 1/4 contract time and full requirement at 1/2 contract time.

2.71 Rates given in schedule of quantity for Reinforcement shall in Addition to any Factors Mentioned Elsewhere Shall Also Include For:

- (a) All cutting to lengths, labour in bending and cranking, forming hooked ends, handling hoisting and everything necessary to fix reinforcement in work as per drawings.
- (b) Cost of binding wire required as described.
- (c) Cost of precast concrete cover blocks to maintain Cover and holding reinforcement in position.
- (d) For fabricating and fixing reinforcement in any structural members irrespective of its location, dimensions and level.
- (e) Removal of rust and every other undesirable substance, using wire brush etc., as described.
- (f) Stock piling of reinforcement as described.
- (g)
- (h) Work at all levels.

3. BRICK WORK

3.1 Bricks:

- a. Nominal size of brick shall be 250 x 125 x 75 mm from approved source. Bricks shall be well burnt first quality, having regular shape with sharp corners, edges and should stand all tests as required by I.S.I. specification. One brick wall shall be considered as 250mmthick, half brick thick shall be 125mm thick and brick on edge shall be 75mm thick.
- b. The brick should have minimum crushing strength of 35 Kg per sq. cm.
- c. The rates quoted shall include for all work like those in walls, jambs, pillars, mullions, steps, kerbs or thresholds, corbels, nibs and raking out joints, cutting , scaffolding and curing.
- d. The rates quoted shall also include for recesses, cut outs etc., in brick work for Electrical / plumbing works if required.
- e. Sand for masonry mortars shall be as per I.S. 2116-1965 as applicable to unreinforced brick work.
- f. For exposed brick work, selected and approved facing, bricks shall be used having uniform colour, size and shape edges. Faces of bricks shall be protected from staining by cement mortar splashing.

- (a) The bricks shall be table moulded chimney burnt best quality. of regular and uniform size, shape and colour, uniformly well burnt throughout but not over burnt. They shall have plane rectangular faces with parallel sides and sharp, straight and right-angled edges. They shall be free from cracks or other flaws. They shall have a frog of 10 mm depth on one of their flat faces. The bricks shall be Chimney burnt of class designation 100, sub class (a) conform to latest relevant T.S. specification.
- (b) They shall give a clean metallic ringing sound when struck.
- (c) They shall show a fine grained, uniform, homogeneous and dense texture on fracture and be free from lumps of lime, animations, cracks, air holes, soluble salts causing efflorescence or other defects which may in any way impair their strength, durability, appearance or usefulness for, the purpose intended. They shall not any part under burnt. They shall not break when thrown on the ground on their flat face in a saturated condition from a height of 60cm.
- (d) The size of brick shall be 23x11.5x7.5 cm. Only bricks of one standard size shall be used on one work unless specially permitted by the Officer-in-charge. The following tolerances are permitted in the standard conventional size adopted on a particular work.
 - Length - Plus or minus 3mm (about 1/8")
 - Breadth - Plus or minus 1.5mm (about 1/16")
 - Depth - Plus or minus 1.5mm (about 1/16")
- (e) After immersion in water, absorption by weight shall not exceed 20 per cent of the dry weight of the brick when tested according to I.S.S. No. 1077-1957.
- (f) Unless otherwise specified the load to crush the brick when tested according to I.S.S. No. 1077-1957 shall not be less than 75 Kg/sq. cm.

3.2 Mortar: Unless otherwise specified, mortar for brick work shall be composed of 1 part of cement to 5 parts of coarse approved sand for walls of one brick thick (i.e., 23 cms) and over and one part of cement to 4 parts of coarse approved sand for half brick thick walls. Other specifications for mortar in brick work shall be as per I.S.S. No. 2116-1965

The particulars size grading of sand in mortars for unreinforced masonry work shall be within the lists specified below: -

I.S. Sieve designation	Percentage by weight Passing I.S. Sieve
4.75mm	100
2.36 mm	90-100
1.18 mm	70-100
600 micron	40-100
300 micron	5-70
150 micron	0-15

3.3 Construction Details:

- (a) **Soaking:** All bricks shall be immersed in water for two hours, before being put into work so that they will be saturated and will not absorb water from the mortar.
- (b) **Bats:** No bats or cut bricks shall be used in the work unless absolutely necessary, around Irregular opening or for adjusting the dimensions of different course and for closers, in which case. full bricks shall be laid at corner, the bats being placed in the middle of the courses.
- (c) **Laying:** The bricks shall be laid in mortar to line level and shapes shown on the plans, slightly pressed and thoroughly bedded in mortar and all joints shall be properly flushed and packed with mortar so that they will be completely filled with mortar and no hollows left anywhere, Bricks shall be handled carefully so as not to damage their edges. They should not be thrown from any height to the ground but should be put down gently. All courses shall be laid truly horizontal and all vertical joints made truly vertical. Vertical joints are one course and the next below shall not come over one another and shall not normally be nearer than quarter of a brick length. For battered faces bedding shall be at right angles to the face. Fixtures, plugs, frames etc. If any, shall be built in at places shown in the plans while laying the courses only not later by removal of bricks already laid.

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

The verticality of the wall and horizontality of the courses shall be checked very often with plumb-bob and spirit level respectively.

- d) **Joints:** Joints shall not exceed 10mm (about 3/6") in thickness and this thickness shall be uniform throughout, the joints shall be raked out not less than 10mm (about 3/8") deep? when the mortar is green where pointing is to be done. When the brick surfaces are to be plastered, the joints shall be raked to a depth of 5mm when the mortar is green, so as to provide good key to plaster.
- e) **Uniform Raising:** Brick work shall be carried up regular in all 'cases where the nature of work will admit, not leaving any part 60 cm. lower than another. But where building at different level is necessary the breaks shall be stopped so as to give later a uniform level and effectual bond, Horizontal courses should be to line and level and even and face plumb or to batter as shown on the plan. The rate of laying masonry may be up to a height of 80 cm per day if cement mortar is used and 45 cm. (about 18") if lime mortar is used.

3.4 Scaffolding: will be double or single as is warranted for the particular work.

Put log holes shall be made good by bricks to match the face work when put legs are removed after ensuring that the holes behind are solidly filled in with 1:4:8 cement concrete.

3.5 Curing: All brick work shall be kept well-watered for 14 days after laying where puzzalona cement is used for mortar, the curing shall be extended by one week at the contractor's expenses.

3.6. Exposed work: Where exposed brick work is specified, the usual specifications for the "Brick Work" as mentioned above will be applicable for "Exposed Brick Work" but in addition specially selected bricks shall be used for facing, ensuring regular and

clean faces of uniform colour. No bricks which are broken, chipped indicating wrinkled on which have irregular edges or corners shall be used. Depending on the quality of bricks and if instructed by the Officer-in-charge, the exposed face of every brick shall be rubbed before laying without extra charges. Wooden fillets 10 mm thick and 10 mm wide shall be placed at the edge of joints so that no mortar comes on the surface of the bricks and a regular thickness of joints is maintained. The surface shall be rubbed down with brushes or bricks if necessary, and thoroughly washed. No mortar shall be allowed to stick to the surface which shall be left clean to the Officer-in-charge's satisfaction with all joints even and true to straight line, double scaffolding shall be used in exposed brick work.

3.7. Reinforcement in half brick thick walls: Half brick and brick-on-edge walls shall be provided with reinforcement consisting of 2 nos. of 6 mm dia. M.S. round bars of 500 mm long (each) as dowels, embedded in mortar 15 mm thick at every fourth course and securely anchored at their ends, where the partition bonds with the cross walls. The cost of reinforcement in half brick wall and brick on edge wall shall be paid separately unless otherwise stated in the Schedule of Quantities.

3.8 Rates given in the schedule of quantities shall include: Apart from other factors mentioned elsewhere in this contract, the rate given in the schedule of quantities for items of brick work shall include for the following:

(a) All labour, materials, use of tools, equipment and other items incidental to the satisfactory completion of brick masonry at all heights and levels.

(b) Erecting and removing of all scaffolding, ladders and plant required for the execution of the work to the height and depth and shapes as shown on the plan or as ordered by the Officer-in-charge.

(c) Constructing brick work to lines, levels, batters, pillars, curves and to any position or shape, any to height or levels including raking of joints and housing frames, fixtures etc.

(d) Curing the Brick Work.

3.9 Measurements:

(a) Half brick work and brick on edge walls shall be measured in Sqm unless otherwise mentioned.

(b) One brick thick wall and thicker walls shall be measured in Cu.M. Brick wall up to and including 3 bricks in thickness should be measured in multiples of half bricks in walls and the thickness of brick wall exceeding 3 bricks will be measured actually and limited to the width specified.

(c) No deductions or additions shall be made on any account for:

(i) Ends of dissimilar materials (i.e., joints, beams, lintels, posts, girders, rafters, purlins, trusses, corbels, steps etc.) up to 500 cm in section and

(ii) Openings up to 0.1 sqm in section

Note: In calculating the area of openings, any separate lintels or sills be included along with the size of the openings but the end portions of the lintels shall be excluded and extra width or rebated reveals, if any shall be excluded.

- (iii) Wall plates and bed plates, and bearing of stabs, CHAJJAS and the like which the thickness does not exceed 15 cm and the bearing does not extend over the full thickness of the wall.

4. BRICK ON EDGE SOLING:

- 4.1 Bricks:** The brick unless otherwise specified shall be locally available over burnt bricks and shall be approved, sound, hard, tough, durable, dense, clean, free from soft spots, cracks, decay and other defects. Brick bats shall not be used.
- 4.2 Preparation of Sub-Grade:** All the fillings shall be watered and compacted to get maximum consolidation. All necessary trimming or filling for the laying of the soling in and required grade shall be done. The sub-grade shall be marked by stakes and strings for the required depth for laying of the soling.
- 4.3 Laying of Soling:** The bricks shall be laid on edge (unless otherwise specified) touching each other. Bricks shall be laid in parallel rows breaking bond or in Herringbons bond pattern as directed All bricks shall be laid closely in position and firmly embedded, true to line and gradient as required, the joints shall be filled by sand as directed.
- 4.4 Consolidation:** The soling shall be watered and rammed with wooden rammers of approved weight. The brick soling shall not be rammed with heavy Iron tammers as the bricks are likely to be crushed. Ramming shall continue till closely knit & compacted and surface conforming to the required levels is obtained. Earth on no account shall be used for making good or blinding purposes and if approved by Officer-in-charge, sand shall be used for blinding purposes. Water shall be lightly sprinkled if required and directed.
- 4.5 Rates given in the schedule of quantities shall Include:** Apart from other factors mentioned elsewhere in following:
- (i) Preparing the sub-grade.
 - (ii) Providing and laying the bricks on edge as described above.
 - (iii) Consolidating watering, ramming and blinding with approved sand as directed.
 - (iv) All labour materials and use of equipments and tools required for carrying out the works satisfactorily.
- 4.6 Mode of Measurement:** The measurement for brick on edge soling shall be in square meter as provided.

5. CEMENT CONCRETE FLOORING AND CEMENT SKIRTING OR DADO

Plain Cement Concrete Flooring in Single Layer

- 5.1 Cement Concrete:** Unless otherwise specified, the proportion of cement concrete shall be 1 :2.5:3.5 (Cement: fine aggregate: coarse stone aggregate of size 12mm and below by volume. Cement however, shall not be measured in volume but by weight. One bag of cement of 50kgs. shall be assumed to contain 35 litres of cement i.e. 1.20 cft). The coarse aggregate shall be from approved source, carefully selected, sufficiently. tough and hard stone pieces broken in a manner that will provide particles of approx. Cubical shapes affording good interlocking. Elongated or thin flake like fragments should be avoided. The maximum size of the coarse

aggregate shall be 12 mm The fine aggregate shall be sand from approved source and consist of properly graded particles. The coarse and fine aggregates shall be conforming to relevant I.S. 383-1963 and shall be washed clean if necessary.

Unless otherwise mentioned in the item concrete in flooring shall be 40mm thick. The least amount of mixing water that will produce a workable mix and will allow finishing without excessive troweling shall be used. Generally water cement ratio of 0.5 should sufficient.

5.2 Preparation of Sub-grade: Before placing the concrete flooring the sub-grade shall be got approved by the Officer-in-charge. The top surface of the sub-grade shall be thoroughly cleared of the dirt, loose particles, cake mortar droppings and laitance if any, by scrubbing with coir or steel wire brush or by hacking if necessary. The top surface of subgrade shall be elightly rough and shall have the required slope. The subgrade shall be moistened before laying the concrete flooring without forming any pools of water.

5.3 Laying: The concrete flooring shall be laid in alternate bays not exceeding 2x2 M. each. The edge of each panel into which the floor is divided should to supported by flat iron or wood duly oiled to prevent sticking. Their depth shall be same as that proposed for the concrete flooring as mentioned in the item. The flat iron should be removed before filling in the adjoining panels. At least 48. hours shall elapse before the concreting in the adjoining bays is commenced. Glass strips or approved separators shall be provided if specified in the item.

The concrete shall be laid immediately after mixing. While being placed, the concrete shall be vigorously sliced and spaded with suitable tools to prevent formation of voids or honeycomb pockets. The concrete shall be brought to the specified levels 'by means of a heavy straight edge resting on the side forms and drawn ahead with a sawing motion in combination with a series of lifts and drops alternating with small lateral shifts. While concreting the adjacent hays, care shall be taken at ensure that edge of previously laid bays are not broken by careless or. hard tamping. Immediately after laying the concrete, the surface shall be inspected for high or low spots and any needed correction shall be done by adding or removing the concrete. After striking of the surface to the required grade it shall be compacted with wooden float. The blows shall be fairly heavy in the beginning but as consolidation takes place, light rapid strokes shall be given to complete the ramming. The floating shall be followed by steel troweling after the surface has hardened sufficiently to present excess of fine material from working to the surface. The finish shall be brought to a smooth and even surface, free from defects and blemishes and tested with straight edges and mason's spirit level to detect any inequalities in the surface which, if any, shall be made good immediately. No dry cement or mixture of dry cement and said shall he sprinkled on the surface of concrete to absorb moisture or to stiffen the mix. The junctions of floor and walls shall be rounded off if so directed without extra payment.

No extra mortar shall be laid over the concrete to make the floor in level. If broom finish is specifically. mentioned in the item, the surface shall be obtained rough with parallel broom marks before the concrete sets.

After the concrete in the bays has set, the joints of the panels shall be filled with cement paste as directed. The joints shall be straight both ways i.e., along the length and width.

The vertical edge of the bays shall be neatly marked on the surface with a pointed trowel after filling the joints.

- 5.4 Curing:** The surface shall be protected from direct sun when it is green. As soon as the surface has hardened sufficiently to prevent damage to it, it shall be kept continuously moist for at least 14 days by means of wet gunny bags 50 mm thick layer of damp sand spread over the surface or pooling water on the surface.
- 5.5 Rates given in the schedule of quantities shall Include:** Apart from other factors mentioned elsewhere in the contract, the rates given in the schedule of quantity shall include for the following: -
- (i) Cleaning and preparing the sub-grade.
 - (ii) Providing and laying concrete of the specified mix, and finishing the surface as described above.
 - (iii) Providing and fixing glass strips of approved separators to form panels when specified.
 - (iv) Curing.
 - (v) All labour, materials, tools and equipment for carrying out the item as specified above.
- 5.6 Mode of Measurement:** The measurements shall be in square metres of cast-in-situ of cement concrete flooring as provided.
- 5.7 Cement dado and Skirting**
- (a) Preparation of Surface:** The walls to which skirting, or dado is to be done shall have all the joints raked out to a depth of 10 mm If not already done. RCC surface shall be properly backed to get good key to mortar. All dust and oily matter, if any, shall be brushed and cleaned and the surface shall be kept wet for 6 hours before the dado or skirting work commences. The dado or skirting work shall not be commenced unless the preparatory work is passed by the Officer-in-charge.
 - (b) Cement Mortar:** Unless otherwise mentioned the proportion of mortar shall be 1:3 (1 cement: 3 sand), Sand in mortar shall be as per IS:1542-1960 as applicable to internal wall plastering and washed clean if necessary. The thickness of dado or skirting shall be 20mm thick unless otherwise specified.
 - (c) Application:** The mortar shall be firmly applied with somewhat more than tile required thickness and well pressed, rubbed and levelled with a flat wooden rule to give required thickness. Long straight edges shall be freely used to ensure perfectly plain and even surface. No dry cement or mixture of dry cement and sand shall be sprinkled directly on the surface to absorb moisture or to stiffen the mix. The mortar shall adhere to the surface intimately when set and there should be no hollow sound when struck. All corners, angles and junctions shall be truly vertical and horizontal as the case may be, carefully and neatly finished. Care shall be taken to see that the top edge of the skirting straight in line and square and jointed with plaster above as required.

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

When no finish is specified the plastered surface shall be rubbed well to an even plane

with a wooden float for external surface and finished smooth with a steel trowel for internal surface. If coloured dado or skirting is required approved coloured cement or cement mixed with the required shade of approved pigment shall be used.

(d) Curing: The dado or skirting shall be kept wet for 14 days.

5.8 Rates given in the schedule of quantities shall Include: Apart from other factors mentioned elsewhere in this contract, the rate given in the schedule of quantities for the item of dado or skirting shall include for the following:

- (i) Preparing the surface
- (ii) Providing and applying segment mortar of specified mix, finishing the surface and finishing the edges with plaster as stated above.
- (iii) Providing coloured cement and colouring pigment when coloured cement dado/skirting is specified.
- (iv) Curing.
- (v) All labour, materials, tools and equipment for carrying out the items as specified above.

5.9 Mode of Measurement:

(a)Dado shall be measured in square metres as provided.

(b)The height of skirting shall be specified in the item and shall be measured in R.M. (Skirting up to 30cm in height shall be measured in running metres).

6. INTERNAL CEMENT PLASTER

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

6.2 Proportion of Mortar: Unless otherwise mentioned, the proportion of internal cement plaster for walls and ceiling shall be 1:4 (1 cement: 4 sand). Sand shall be from approved source free from foreign matter and shall be as per IS:1542-1960 as applicable to internal wall and ceiling plastering. No more cement mortar shall be prepared than that can be used within an hour.

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

surfaces and 20 mm over stone walls. Plaster for ceiling shall not be more than 12mm.

6.4 Neeru finish: If the plaster surface is to be given neeru finish, the surface shall be combed slightly with wire brushes or nails before it is completely set to form key for neeru. The under coat shall be only damped but not soaked before the application of neeru. The lime of preparing neeru shall be fat lime and shall be of approved quality and source. Lime shall be slaked and mixed with sufficient water to form a thick paste. It shall be reduced to a fine paste by grinding. It shall then be passed through a fine sieve (3mm mesh) to remove all un-slaked particles and foreign matter and allowed to mellow under water for at least 10 days in large slaking tanks. The surplus water on the top shall be allowed to run off. The slaked lime paste thus formed shall be used for preparing neeru. The neeru shall be prepared by mixing together 4 parts of this lime paste and 1 part approved fine sieved sand by volume, Jute fibers finely chopped shall be, added to the above mortar at the rate of 1 kg. of jute to every Cubic Metre of lime sand mixture. The mixture shall then be properly ground to a fine paste between two stones or a mill. The neeru thus prepared shall be kept moist until used and not more than what can be consumed in 15 days shall be prepared at a time.

Neeru shall be applied to the prepared and partially set but somewhat plastic surface with steel trowel to a thickness slightly exceeding 1.5 mm (about 1/6") and rubbed down to 1.5 mm (1/16") thickness and polished to a perfectly smooth and even finish, working from top to bottom. While troweling is going on soap powder contained in thin muslin bags shall be dusted over the surface and worked in.

Moistening shall be commenced as soon as the plaster has hardened sufficiently and is not susceptible to injury. Soaking of wall shall be avoided and only as much water as can be readily absorbed shall be used. The surface shall be kept sprinkled with water for 14 days.

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

6.6 When no finish is specified the plastered surface shall be rubbed well to an even plane with a wooden float for external surface and finished smooth with, a stool

trowel for internal surface.

6.7 Rates given in schedule of quantities shall Include: Apart from other factors mentioned elsewhere in this Contract, rates given in schedule of quantities for the item of plaster shall include for the following:

- (i) Erecting, dismantling and removing the scaffolding.
- (ii) Preparing the surface to receive the plaster.
- (iii) Providing cement plaster for the specified average thickness.
- (iv) All labour, material, use of tools and equipment to complete the plastering as per specification.
- (v) Curing for 14 days.
- (vi) And moulding work if shown on the drawings or as specified unless separately provided in the tender.
- (vii) Plaster work in hands, arises, rounded angles, fair edges, narrow returns quirks, 'V' joints, splays, drip mouldings, making good to metal frames, junctions with skirting or dados, narrow widths and small quantities, making good around pipes, conduits, timbers, sills, brackets, railings etc., and making good after all the sub-contractors or nominated sub-contractors have done their work.
- (viii) Neeru or cement finish when specified in the item.

6.8 Mode of Measurement: Plaster shall be measured in square metre.

- (a) **Walls:** (i) The measurement of wall plastering shall be taken between the walls or partitions (the dimensions before plastering shall be taken) for the length and from the top of floor/skirting/dado (as the case may be) to the ceiling for the height.
- (ii) **Deductions:** A, For jambs, soffits, sills, etc. for openings not exceeding 0.5 M² each in area: ends of joists, beams, posts, girders, steps, etc. not exceeding 0.5 m² each in area and openings not exceeding 3m² each, deductions and additions shall be made in the following manner:
 - (a) No deduction shall be made for ends of joists, beams posts; etc., and openings not exceeding 0.5 m² each, and no addition shall be made for reveals, jambs, soffits, sills etc., of these openings nor for inside the plaster around ends of joists, breams, posts, etc.
 - (b) Deductions for openings exceeding 0.5M² but not exceeding 31M² each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings:
 - (i) When both faces of wall are plastered with the same plaster deduction, shall be made for one face only.
 - (ii) When two faces of wall are plastered with different plaster or if one face is plastered and the other pointed, deduction shall made from the side of frames for doors, windows, etc. on which the width of reveals is less than that on the other side, but no deduction shall be made on the other side.
- B.** In case of openings of area 3 M² each, deductions shall be made for the openings but jambs, soffits and sills shall be measured.

- (b) **Ceilings** : (i) Ceilings shall be measured between the walls or partitions and the dimensions before plastering shall be taken.
- (ii) Ceiling with projected beam shall be measured over beams and the plastered sides of beams shall be measured and added to plastering on ceilings.

7. EXTERNAL CEMENT PLASTER WITH SAND FACED/COMBED/ROUGH CAST FINISHES

Sand Faced Finishes :

7.1 Preparation of Surface : The walls to be plastered to have all joints raked out to a depth of 10mm if not already done. RCC surface shall be properly hacked to get good key to the plaster. Any unevenness shall be levelled before the plastering is applied. All dust and oily matter, if any, shall be brushed and cleaned with a stiff bristle or wire brush, and the surface to be plastered shall be kept wet for 6 hours before plastering is commenced. If the surface becomes dry in spots such areas shall be moistened again to restore uniform suction.

7.2 Proportion of Mortar: Unless otherwise mentioned the proportion of external cement plaster for brick or concrete surfaces shall be 1:4 (1 cement : 4 sand), sand shall be from approved source free from foreign matter, washed clear if necessary and shall be as per IS: 1542-1960. No more cement mortar shall be prepared than that can be used within half an hour. The mortar may be hand mixed or machine mixed. In hand mixed mortar, cement and sand in the specified proportion shall be thoroughly mixed dry on a clean impervious platform by turning over at least 3 times or more till a homogeneous mixture of uniform colour is obtained. Fresh and clean water shall be added gradually through a rose and thoroughly mixed so that mix becomes homogeneous and each particle of sand shall be completely covered with a film of cement. Mixing platform shall be so arranged that no detrious extraneous material shall get mixed with mortar nor the mixing water of the mortar shall flow out.

7.3 Application of Plaster: The plastering shall be done in two coats namely under coat and finishing coat.

Under Coat: The under coat shall be of cement mortar 1:4. Water proofing compound of approved make shall be added according to manufacturer's specifications to make the mortar waterproof. Patches of plaster 15cm x 15cm shall be put on about 3m apart as gauges to ensure even plastering in one place. The thickness of the under coat in any part shall not be less than 8mm and more than 12 mm. The mortar shall be firmly applied with somewhat more than the required thickness and well pressed into the joints on the surface and rubbed area levelled with a flat wooden rule to give required thickness. Long straight edges shall be freely used to ensure of perfectly plane and even surface. All corners must be finished to their true angles or rounded as directed. Plastering shall be done from top downward. Keys shall be formed on the surface by thoroughly combining it with wavy horizontal lines about 12mm apart and 2mm deep when the mortar is still plastic. Under coat shall be cured for not less than 2 days before finishing coat is applied.

Finishing Coat: Cement mortar for finishing coat shall have washed approved sand with slightly larger proportion of coarse materials. The proportion of cement to sand

shall be 1:4. The finishing coat shall be of such thickness to make the total average finish to thickness equal to the required plaster thickness as described. The finishing coat shall not be less than 4mm or more than 8mm thick. The finished surface shall be true and even and shall present uniform- texture throughout and all joining mark shall be eliminated. After application the surface should be finished with a wooden float laying with cork and tapped gently to retain coarse surface texture. A steel trowel shall not be used and overworking. shall be avoided. water shall not be applied to the surface of the finishing coat whilst working up. but patches showing signs of premature drying may be patted with a damp float. When the finishing coat had hardened, the surface shall be kept moist continuously for 14 days in any continuous face of wall. finishing coat should be carried out continuously and day to day breaks made to coincide with architectural breaks in order to avoid unsightly junction.

All mouldings shall be worked true to template and drawn neat dean and level. All exposed angles and junctions with door frames etc. shall be carefully finished as directed.

7.4 Curing: All plaster work shall be kept damp continuously for a period of 14 days. To prevent excessive evaporation on the sunny or windward side of the buildings in hot dry whether' matting or gunny bags may be hung over on the outside of the plaster in the beginning and kept moist.

7.5 Rates given in schedule of quantities shall include: Apart from other factors mentioned elsewhere in this contract, rates given in the schedule of quantities for the item of plaster shall include for the following: -

- (i) Erecting, dismantling and removing the scaffolding.
- (ii) Preparing the surface to receive the plaster,
- (ii) Providing cement plaster of the specified average thickness in two coats, including, water proofing compound.
- (iv) All labour, materials, use of tools and equipment to complete the plastering as per specification.
- (v) Curing for 14 days.
- (vi) Any moulding work if shown on the drawings or as specified unless separately provided in the tender.
- (vii) Plaster work in the bands, arises, rounded angles, fair edges, narrow returns, quirks, 'V' joints, plays drip mouldings: making good to metal frames junctions with skirting or dados, narrow width, and small quantities, making good round pipes, conduits, timber, sills, brackets, railings, etc. and making good. after all the sub-contractors or nominated sub-contractors have done their work.

7.6 Measurement: All plastering work shall be measured in square metres. Dimensions shall be measured and quality worked out correct up to two places of decimals in metre and square metre respectively. If the average thickness of plaster provided by the contractor is more than what is specified on any account no extra payment will be made.

No deduction shall be made for ends of joists, beams, posts etc. and openings not exceeding a.5M2 each. and no addition shall be made for reveals, jambs, soffits, sills. etc; of these openings nor for finishing the plaster around ends of joists, beams, posts etc.

Deductions for opening a.5M2 but not exceeding 3M2 each shall be made as follows and no addition shall be made for reveals jambs, soffits, sills, etc., of the following:

- (i) When two faces of wall are plastered with the same plaster. deduction shall be made for one face only.
- (ii) When two faces of wall are plastered with different plaster or if one face is plastered and the other pointed deduction shall be made from the plaster or points on the side of the frames for doors, windows, etc. on which reveals is less than that on the other side, but no deduction shall be made on the other side.

In case of openings of area above 3M² each, deductions shall be made for the openings but jambs soffits and sills shall be measured.

7.7 Combed Finish: All the specifications given above for sand faced finish shall apply to this as well except that in the case of combed finish, the finishing coat will be treated to have combed texture of approved pattern.

7.8 Rough Cast Finish:

(a) All the specifications given above for sand faced finish shall apply to this as well except for the application of plaster which is described below:

(b) **Application of Plaster:** The plastering shall be done in two coats namely undercoat and finishing coat. The under coat shall be done same as in case of sand faced finish. The finishing coat shall contain a fairly coarse aggregate and shall be thrown on as a wet mix and shall be left in rough condition. The mortar of the finishing coat shall consist of coarse aggregate of crushed stone or fine gravel of size generally 6 to 12mm as approved by Officer-in-charge and specially graded mixture, mixed with approved sand cement. The proportion of cement to sand and aggregate/gravel shall be generally 1:1.1/2:3. The mortar shall be flung upon the under coat with large trowels to form an even protection coat. The finishing coat must be applied while the under coat is still soft and plastic. The thickness of the finishing coat shall be about 12mm unless otherwise specified.

9. WHITE WASHING, COLOUR WASHING AND DISTEMPERING

9.1 White Washing:

(a) **Material:** Whitewash shall be prepared from fresh burnt fat lime. The lime shall be dissolved in a tub with sufficient quantity of water (about 4/5 litres), kg. of lime) and the whole thoroughly mixed and stirred until it attains the consistency of thin cream. The wash shall be taken out in small quantities and strained through as clean coarse cloth. Clean gum dissolved in hot water shall then be added in suitable proportion of two grams of gum arrabic to a litre of lime to prevent the whitewash coming off easily when rubbed. Rice size may also be used instead of gum.

(b) **Scaffolding:** This shall be double or single according to requirement and as directed, if ladders are used pieces of old gunny bags or cloth rags shall be tied on their lops to avoid damage or scratches to the plastered surfaces, etc. Proper stage scaffolding shall be erected when whitewashing the Ceiling,

(c) **Preparation for Surface:** The surface shall be prepared by removing all mortar droppings and foreign matter and thoroughly cleaned with hair or fibre brush or other means as may be ordered by the Officer-in-charge to produce an approved clean and

an even. surface. All loose pieces and scales shall be scraped off and holes, cracks etc. filled with mortar to match with the surrounding finish.

In case where the surfaces have been previously whitewashed or colour washed, the old white or colour wash shall be entirely removed and surfaces broomed down before the new whitewash is applied In case the old whitewash cannot be removed by brooming, the surface shall be cleaned by scraping.

- (d) Application of whitewash:** On the surface so prepared, the whitewash shall be laid on with a brush. The first strike of the brush shall be from top-down wards, another from 'bottom upward over the first stroke and similarly one stroke from the right and another from the left over the first brush before it dries. This will form one coat, Each coat must be allowed to dry and shall be subject to Inspection and approval before the next coat is applied. When dry, the surface shall show no signs of cracking. It shall present a smooth and uniform finish free from brush marks and it should not come off easily when rubbed with a finger. Minimum 3 coats of white wash shall be applied.

No portions in the surface shall be left out initially to be patched up later on.

For old work, patches and repairs shall be whitewashed first. Thereafter, the whole surface shall be whitewashed with the required number of coats.

Doors, windows, floors and other articles of furniture etc. shall be protected from being splashed upon. Splashing, droppings, if any. shall be removed and the surfaces cleaned.

- (e) Rates given in the schedule of quantities to Include:** Apart from other factors mentioned elsewhere in this contract, the rates given in the schedule of quantities for whitewash shall include for the following:
- (i) All labour, materials, equipment required for white washing.
 - (ii) Scaffolding including erection and removal,
 - (iii) Providing and preparing the white wash.
 - (iv) Preparing the surface for whitewash including the scaffolding.
 - (v) Applying the whitewash in three coats minimum, if a proper even surface is not obtained to the satisfaction of the Officer-in-charge in 3 coats, Contractor shall carry out additional coats of whitewash to approval at contractor's expense.
- (f) Mode of Measurement:** The measurement shall be in Sq. Metre. The mode of measurement shall be applicable to that for plaster.

9.2 Colour Wash

Material: This shall be prepared by adding approved colouring matter to the whitewash (prepared as for white washing) according to tint required.

In all respects the same conditions and specifications as applicable to whitewash shall also be applicable to colour wash.

9.3 Distemping: Powdered/Dry Distemper

- (a) Material:** The powdered/dry distemper shall be of approved colour and shade manufactured by M/s. Blundel Eomite or other equivalent and approved.

- (b) **Scaffolding** : This shall be double or single as required and directed.
- (c) **Preparing the Surface** : The surface to be distempered shall be cleaned and all cracks, holes and surface defects shall be repaired with gypsum and allowed to set hard. All Irregularities shall be sand papered smooth and wiped clean. The surface so prepared must completely dry and free from dust before distempering is commenced, In the case of walls newly plastered, care shall be taken to see that it is completely dry before any treatment is attempted.
- For the old surface which had earlier been distempered, the surface shall be' cleaned of grease dust etc. The flecking of previous coatings, if any, shall be taken off. All cracks, holes and surface defects shall be repaired with gypsum and allowed to set 'hard and then sand papered smooth and wiped clean. But in case the surfaces are coloured or whitewashed the wash must be removed thoroughly first.
- (d) **Priming Coat**: The priming coat shall be applied over the completely dry surface in the manner recommended by the makes in the case of patent distempers. When no priming coat is specified by the manufacturer a finely powdered chalk mixed with a thin solution of glue shall be applied to prepare a good, hard background, the coating when dry being sand papered as clean and smooth as possible.
- (e) **Application of Distemper**: The instruction of the makers shall be followed regarding the preparation of the surface and application of priming and finishing coats. Distemper shall not be mixed in a larger quantity than is actually required for day's work. Hot water should be used to prepare the mixture, Distempers shall be applied in dry weather with a hard still brush in long parallel strokes. The treated surface shall be allowed to dry and harden. Second or succeeding coats shall not be applied until the preceding coat has been passed by the Officer-in-charge. Two more coats of distemper shall be given in exactly the same manner as the first one but that only after the earlier coat laid has thoroughly dried.
- (f) **Rates given in the schedule of quantities shall include**: The rate shall include all labour, materials, equipment and tools for carrying out the following operations:
- (i) Providing the primer and distemper and mixing the distemper.
 - (ii) Scaffolding.
 - (iii) Preparing the surface to receive the priming and finishing coats.
 - (iv) Applying the priming coat.
 - (v) Applying the distemper in 3 coats minimum. If a proper even surface is not obtained to the satisfaction of the Officer-in-charge in 3 Coats. Contractor shall carry out additional coats of distemper to approval, at Contractor's expense.
- (g) **Mode of Measurement**: Similar to that for white washing.
- 9.4 **Oil Bound Distempers**: The specification and conditions for this shall be the same as that applicable for dry distemper above except that oil bound distemper of approved make, shade and colour shall be used after applying priming coat of petrifying liquid or other primer as may be recommended by that, manufacturers of distemper or as directed.

10. PAINTING,

10.1 Painting:

10.2 Material: Ready mixed oil paints and primers, In general, shall be approved quality, colour and of approved manufacture. These materials shall be in sealed tins and shall be opened in the presence of the Officer-in-charge on site.

10.3 Preparation of Surface:

(a) **Iron and Steel Work:** Surface to be painted shall be thoroughly cleaned. sand papered and/or rubbed with Emery cloth, if necessary, to remove grease, mortar or any other foreign material, In case of rusted surface, it shall be first cleaned with wire brushes till the corroded rust is removed. The prepared surface shall be shiny and free from brush marks. patches, blister and other irregularities. The surface thus finished shall be got approved for painting.

(b) **Woodwork:** All surface to be painted shall be thoroughly cleared, sand papered and removed of all foreign materials. In case of surface having knot and nail holes, the same shall be filled with knotting and stopping materials. The knotting. material shall consist of pure shellac dissolved in methylated spirit. Stopping materials shall consist of putty. The surfaces thus treated shall be allowed to dry and then sand papered smooth.

10.4 Application: After preparing the surface a primer coat shall be applied. The primer coat shall be ready mixed of approved make and manufacture. After the. primer coat is applied and perfectly dried, all holes, cracks, etc. if still remaining shall be filled in with putty and the surfaces sand papered smooth. Then a second coat, of paint of approved shade and manufacture shall be evenly applied and allowed to dry. The third coat shall be carefully applied to achieve smooth and even surface after the previous coat has dried up. Minimum 3 coats of paint shall be applied inclusive of a primer coat If a proper and even surface is not obtained to the satisfaction of the Officer-in-charge in 3 coats, Contractor shall carry out additional coats of painting to approval, at Contractor's expense. Care shall be taken that dust or other foreign material do not settle or otherwise disfigure the various coats.

14.5 Rates given in schedule of quantities shall Include: Apart from other factors mentioned elsewhere in this contract, the rate for the item of painting shall include for the following:

- (i) All labour, materials and equipment necessary to carry out the work.
- (ii) Supplying the approved paint for priming and finishing coats.
- (iii) Preparing the surface including knotting and stopping for receiving the primer and finishing coats.
- (iv) Scaffolding including its erection and dismantling.
- (v) Application of the one primer coat and two coats of finishing minimum. If a proper and even surface is not obtained to the satisfaction of the Officer-in-charge in 3 coats, Contractor shall carry out additional coats of painting to approval at Contractors expense.
- (vi) Protection to painted surface till dried and handed over.

Mode of Measurement: normally painting to woodwork and steel shall be included in

the concerned items of work and shall not be measured separately. If painting is to be measured separately tile same will be as per I.S. 12001964.

11. CEMENT PAINTING

- 11.1 Material:** External waterproof cement paint shall be of approved colour, manufacture Snowcem/Snowweem Plus' Durocem or other equivalent and approved make.
- 11.2 Preparation of Surface:** Before painting is commenced on surface, all dirt, oil grease, efflorescence and organic material shall be completely removed. The surfaces shall be wetted by sprinkling of water with the fine spray. The surface shall be sprayed several times with a few minutes intervals between each spraying to allow the moisture to soak into the surface.
- 11.3 Application:** Cement paint solution shall be applied to the surface with hairbrushes in a number of coats to get uniform finish. After the first coat of paint hardened, it shall be cured with water at least for 24 hours, before the application of the second coat. At least 24 hours should elapse between the two coats. Similarly, 3rd coat shall be given to get uniform colour.
- 11.4 Curing :** Cement paint work shall be kept damp at least for 7 days.
- 11.5 Rates given in the schedule of quantities shall include:** Apart from other factors mentioned elsewhere in this contract the rate given in the schedule of quantities of providing cement paint shall include be the following:
- (a) All labour, material and equipment to provide cement paint
 - (b) Scaffolding, including erecting and removing.
 - (c) Preparing the surface as stated above.
 - (d) Applying 3 coats of approved Snowcem or equal and approved paint. If a proper and even surface is not obtained to the satisfaction of the Officer-in-charge in the 3 coats applied, the Contractor shall provide additional costs of painting to approval, at Contractor's expense.
 - (e) Curing as stated above.
- 11.6 Mode of measurement:** Measurement shall be in Square Metre and as applicable to whitewash. Nothing extra shall be allowed for painting on rough surface, for example, external sand-faced plaster rough cast plaster etc.

12. CEMENT CONCRETE FLOORING IN TWO LAYERS

- 12.1 Plain Cement Concrete Flooring in two Layers:** Unless otherwise mentioned in the item, concrete in flooring shall be 40 mm thick overall and shall be laid in two layers water added shall be minimum necessary to give sufficient plasticity for laying.

The concrete in under layer, unless otherwise specified, shall be in the proportion of 1:2:4 (Cement Fine aggregate: Coarse stone aggregate size of 12.5 and below) by volume and the proportion of the cement concrete for the top wearing layer shall be 1:2 (Cement: combined stone aggregate 4.75 mm and below) by volume. Cement, however, shall not be measured in volume but by weight. One bag of concrete of 50 kg, shall be assumed to contain 35 litres of cement i.e. 1.20 Cft: The coarse aggregate

shall be from approved source, carefully selected, sufficiently tough and hard stone pieces broken in a manner that will provided particles of approx. cubical shape affording good interlocking. Elongated or thin flake like fragments should be avoided. The fine aggregate shall be send from approved source and consist of property graded particles. The coarse and fine aggregates shall be conforming to relevant IS:383-1963 and shall be washed clean if necessary. The concrete shall be as stiff as possible and the amount of water added shall be minimum necessary to give sufficient plasticity for laying and compacting. For improving the workability of the mix, through mixing for a longer period rather than addition of more water shall be restored to Generally a water cement ratio of 0.5 (by weight) should suffix. Mix shall be used within half an hour of the addition of water for its preparation.

17.2 Preparation of Sub-Grade: Before placing the concrete flooring, the sub grade shall be got approved from the Officer-in-charge. The top surface of the sub-grade shall be thoroughly cleaned of dirt, loose particles, cake mortar droppings and laitance if any by scrubbing with coir or steel wire brush or by hacking if necessary. The top surface of sub-grade shall be slightly rough and shall have the required slope. The sub-grade shall be moistened before laying the concrete flooring without forming any pools of water.

Before commencement of laying under layer of concrete on the prepared sub-grade, “screed” i.e., narrow strips of wood, bands of plaster or pieces of tiles laid on the sub-grade to act as guides for bringing the whole work to a true an even surface and imparting necessary slope to the under-layer with average thickness of 25 mm or specified in the item shall be provided.

The screeds shall be removed after laying the concrete for under layer of all the floor area for which they have been applied as guides and filled up with concrete mix of under layer. No extra payment shall be made for these “screeds”.

12.3 Laying: The concrete flooring shall be laid in alternate bays not exceeding 2 x 2 m each. The edge of each panel into which floor is divided should be supported by the flat-iron or wood duly oiled to prevent sticking. Their depth shall be same as the proposed for the concrete flooring as mentioned in the item. The flat iron should be removed before filling in the adjoining panels. At least 48 hours elapse before the concreting in the adjoining bays is commenced. A.C./glass/aluminium strips or other approved separators (depth to be same as the proposed for concrete flooring) shall be provided if specified in the item and shall be retained permanently in the concrete flooring. Care shall be taken to see that at no point the separators shall protrude above the finished floor level.

Just before placing the concrete mix for under-layer, neat cement slurry shall be thoroughly brushed into the prepared sub-grade.

The concrete for under-layer shall be laid immediately after mixing. While being placed, the concrete shall be vigorously sliced and spaded with suitable tools to prevent formation of voids of honeycomb packers. The concrete shall be brought ahead with a sawing motion in combination with a series of lift and drops alternating with small lateral shifts. While concerting the adjacent bays, care shall be taken to ensure that the edges of previously laid bays are not broken by careless or hard tamping. Immediately after laying the concrete, the. surface shall be inspected for high or low sports and any need

correction shall be done by adding or removing the concrete. After striking of the surface to the required grade, it shall be compacted with wooden flont. The blows shall be fairly heavy in the beginning but as consolidation takes place, light rapid strokes shall be given to the complete the ramming.

The surface of the concrete is under-layer as laid above, shall not be finished smooth with a trowel but left rough after tamping it and levelling it with screed board.

The top wearing layer of mix 1:2 cement concrete of consistency stiffer than that of under-layer concrete shall when be immediately laid over the rough but green surface of under-layer and thoroughly trampled, struck off-level, and the surface floated with wooden boat. The surface shall then be tested with a straight edge and masons spirit level to detect any undulation in the surface which if any, should be made good immediately. The surface shall the be finished smooth as stated below.

- 12.4 Finishing the Surface:** After the concrete has been fully compacted it shall be finished by troweling. Finishing operations shall start shortly after the compaction of concrete and shall be spread over the period of one to six hours depending upon the temperature at atmospheric conditions. The surface shall be troweled at intervals so as to produce a uniform and hard surface. The satisfactory resistance of floor to wear depends largely upon the care with which troweling is carried out. The object of troweling is to produce as hard and close knit a surface as possible. The time interval allowed between successive troweling is very important. Immediately after laying top wearing layer, only just sufficient troweling shall be done to give a level surface. Excessive troweling in the earlier stages shall be avoided as this tends to work a layer rich in cement to the surface. Sometime after the first troweling, the duration depending upon the temperature, atmospheric conditions and the rate of set of cement used, the surface shall be re-troweled to close any pores in the surface, and to bring to surface and scrap off any excess water in concrete or liatance (it shall not be troweled back into the topping). The final troweling shall be done well before the concrete has become too hard but at such a time that considerable pressure is required to make any impression on the surface. The finished surface shall be smooth and even. Troweling on a rich mix of dry cement and fine aggregate on to the surface shall not be permitted. The junctions of floor and walls shall be rounded off if so directed without extra payment.

Trowel marks, wherever visible shall be immediately removed by lightly brushing with 100 mm wide painter's brush which is made just moist, so as to have the surface of uniform appearance. Over brushing shall be avoided.

After the concrete in the days has set, the joints (if permanent separators are not provided) of the panels shall be filled with cement pastes as directed. The joints shall be straight both ways i.e., along the length and width. The vertical edge of the bays shall be neatly marked on the surface with a pointed trowel after filling the joints. No extra mortar shall be laid over the concrete to make the floor in level.

If broom finish is specially mentioned in the item, the surface shall be obtained rough with parallel broom marks before the concrete the concrete sets.

- 12.5** If coloured cement concrete flooring is specified in the item, the top wearing layer shall

consist of concrete mix coloured with the addition of coloured cement and approved mineral pigments shall be such as to produce required shade but in no case will it exceed one third part of cement. A few samples of coloured concrete flooring of required colour and shade (Light Shade Medium Shade or Dark Shade as specified in the item) shall be got approved from the Officer-in-charge before commencement to flooring work.

12.6 Curing: Immediately after the flooring surface is finished, it shall be protected from rapid drying by erecting barriers against wind or draught and strong sunlight. As soon as the surface has hardened sufficiently to prevent damage to it, it shall be kept continuously moist for at least the days by means of wet gunny bags; 50 mm thick layer of damp sand spread over the surface or pooling water as the surface. During this period of flooring shall not be exposed to any traffic.

12.7 Harderinding and Polishing: Whenever specified in the item grinding shall be carried out as under, to make the surface smoother than trowel finish.

(a) First Grinding with Carborundum Stone of Coarse Grade: Grinding shall be commenced when the concrete, surfaces is 3-4 days old and sufficiently hardened and cured. The first grinding should be done with carborundum stone of coarse grade and fine and sprinkled over the surface using water freely.

After the first grinding, the surface shall be thoroughly washed to remove all grinding mud and covered with a grout of cement (including colouring pigment in case of coloured concrete flooring) in order to fill the pores and pin holes that appear after grinding.

(b) Second Grinding with Carborundum stone of Medium Grade: After the first grinding is over the surface shall be cured for 4 days and then the second grinding should be started with carborundum stone of medium grade, The flooring shall be washed and pores or holes, if any shall be filled in the same manner as described in (a) above.

(c) Final Grinding with Carborundum Stone of Fine Grade: After ten days from the completion of the second grinding, the final grinding shall be carried out with carborundum stone of fine grade.

(d) Cleaning and Polishing: After the completion of the grinding as above the floor shall be thoroughly washed with warm water and soft soap and when it is completely dry, Oxalic acid powder shall be dusted over the surface sufficiently which must be sprinkled with water and rubbed hard with a piece of felt till the surface has acquired require gloss.

A hot mixture of turpentine and Bees Wax (4: 1 by weight) shall then be applied to the surface and thoroughly rubbed with clean cotton waste. The rubbing must be continued until the flooring ceases to be slickly.

12.8 Rates given in schedule of quantities shall include: Apart from other factors mentioned elsewhere in the contact, the rates given in the schedule of quantities shall include for the following: -

(i) Cleaning and preparing the sub-grade.

- (ii) Providing and laying concrete of the specified mixes and finishing the surface as described above.
- (iii) Providing and fixing A.C./glass/aluminium strips or other approved separators to form panels when specified.
- (iv) Curing.
- (v) Providing coloured cement and approved mineral colouring pigment when coloured concrete flooring is specified.
- (vi) Grinding and hand polishing when specified.
- (vii) All labour, materials, tools and equipment for carrying out the item as specified above.

12.9 Mode of Measurement: The measurement shall be in square metres of cast-in-situ of cement concrete flooring as provided.

13. ALL THE WINDOWS WILL BE OF ANODISED ALLUMINIUM WINDOWS

14. ALL THE DOORS WILL BE OF FLUSH DOOR OF TERMITE PROOF BWP GRADE

II. WATER SUPPLY, INTERNAL SANITARY INSTALLATIONS AND DRAINAGE WORK

GENERAL SPECIFICATIONS

1. GENERAL

- 1.1** All water supply, internal sanitary installations and drainage work shall be carried out by skilled and licensed plumbers in a manner complying in all respects with the requirements of the relevant bye-laws of the municipal or of local bodies in whose jurisdiction the work is to be executed.
- 1.2** All fittings are to be accurately placed in the positions as directed by Officer-in-charge, to be securely plugged to walls with hard wood or any other approved plugs or breeze blocks built into Bricks/Stone, R.C.C. work or set in cement as required and are to be left in a clean, sound and perfect conditions.
- 1.3** All sizes and lengths to be verified at site.
- 1.4.** The whole of the work is to be tested at contractor's expenses at such items and in such a manner as Officer-in-charge shall direct and to the entire satisfaction. The contractor shall also make arrangement for the disinfection of all mains and tanks intended for potable water to the satisfaction of the Officer-in-charge and rates given in the schedule of quantities shall include for same. The mains and tanks should be thoroughly flushed with clean water after disinfection.
- 1.5** All damage done to floors, walls etc, during the process of fixing of water supply, internal sanitary installations and drainage work shall be restored to original condition, to the satisfaction of the Officer-in-charge at the Contractor's expenses.
- 1.6** All the materials shall be in accordance with the specifications and shall be approved by the Officer-in-charge before bulk suppliers are brought to site. The contractor shall furnish well in time before work commences, at his own cost, any samples of materials of workmanship that may be called for by the Officer-in-charge for his approval or rejection and any further samples in case of rejection until such samples are approved. Such samples when approved shall be the minimum standard for the work to which they apply.

Where materials are specified to comply with an Indian Standard specification, the contractor shall, if required, furnish the manufacture's certificate that the materials satisfy the requirements of Indian Standard Specifications. For plumbing works, typical samples prototypes shall be erected in position for approval before undertaking work. Rates given in the schedule of quantities shall cover for each preliminary work. Materials rejected shall be removed forthwith by the contractor off the premises.

1.7 Sewer and drains shall be laid in proper alignment and gradient in accordance with the rules and regulations of statutory bodies whose approval are necessary. On completion.

2 WATER SUPPLY

Cast iron pressure pipes and specials:

2.1 Pipes and Specials: All pipes and specials shall be of cast or spun iron, straight with spigot and socket ends with flanged ends as specified and shall conform to the latest edition of the Indian Standard Specifications for class 'A' pipes. Class A pipes may be used when the test water pressure exceeds 120 meter of head. The pipes and specials shall be suitable for joining with lead unless otherwise specified. As far as possible only standard specials shall be used.

2.1.1 All pipes shall be coated inside and outside while hot with an approved anticorrosive paint having a tar or other suitable base.

2.2 Excavation of trenches for C.I. Pipes and specials.

2.2.1.1 Excavation : The trenches for the pipes shall be excavated to lines and levels as directed. The bed of the trenches shall have to be truly and evenly dressed throughout from one change of grade to the next.

2.2.1.2 The gradient is to be set out by means of boring rods and should the required depth be exceeded at any point, the trench shall be refilled as directed by the Officer-in-charge at the Contractor's Expense.

2.2.1.3 The bed of the trench, if in soft or made-up earth, shall be well-watered and rammed before laying the pipes and depressions thus formed shall be filled with sand or other soft materials as the Officer-in-charge may direct.

2.2.1.4 If rock is met with, it shall be removed to 15 cm below the level of the pipe valves and fittings and the trench shall be refilled with sand or other suitable materials.

2.2.1.5 The excavated materials shall not be placed within 1 metre or half the depth of the trench, whichever is greater from the edge of the trench.

2.2.1.6 The trench shall be kept free from water. Shoring and timbering shall be provided wherever required.

2.2.1.7 The Width of trench at bottom between faces of sheeting shall be such as to provide not less than 20 cms. clearance on other side of pipe, Trenches shall be of such extra width when required as will permit the convenient placing of timber supports, strutting and planning and handling of specials.

2.2.2 Internal Road Crossing: All road crossing within the site, if any, will be excavated half at a time the second half being commenced, after the pipes have been laid in the first half and the trench refilled. The trench at existing road crossings shall be filled with mud concrete for the full depth except for the top 15 cm layer, which will be filled with cement concrete 1:2:4. The rates quoted shall also cover the cost of breaking road surfaces of all types wherever met with, including their foundation.

2.2.3 Protection of Existing Services: All pipes, water mains, cables etc. met within the course of excavation shall be carefully protected and supported by the contractors at their own cost to the satisfaction of the Officer-in-charge. Such mains will be hung from timbers placed across the trench. Care shall be taken not to disturb the electrical and

communication cables, removal of which, if necessary shall be arranged by the Officer-in-charge.

- 2.2.4 Lighting and Watch: The 'open trenches' shall be provided with fencing and watchmen to guard against accidents. Red flags during day and Red lights during night shall be provided at the ends and at intervals along the sides of the trenches.
- 2.2.4.1 Sign boards with necessary wording such as "SLOW", "ROAD CLOSED" etc. shall be provided at least 30 metres ahead of road crossings where the work is in progress. The precaution will be continued till the surface is restored. The contractor shall be held responsible for compensation as a result of accident or injury to any person or property due to improper fencing or inadequate lighting arrangements.
- 2.2.4.2 Temporary bridges of planks shall be provided over the trenches for keeping open the access to private or public property.
- 2.3 Lay of Pipes & Specials:
- 2.3.1 Stacking: The pipes and specials shall be lined up on one side of alignment of the trench socket facing up hill or in the direction of flow of water.
- 2.3.2 Laying: Before being laid the pipes shall be examined to see that there are no cracks or defects. Subjects to the approval of the Officer-in-charge, the damaged portion of the cracked pipe may be cut at a point not less than 15 cm beyond the visible extremity of the crack with diamond pointed chisel. Before lowering the pipe in the trench, the pipes shall be thoroughly cleaned of all dust and dirt. Special care shall be taken to clean the inside of the sockets and the outside of the spigots. Holes to receive the sockets shall be excavated in the trench bed so as to firmly bed the full length of the pipe.
- 2.3.2.1 The pipes shall be lowered into the trench by means of suitable pulley blocks shear-legs, chain ropes etc. In no case the pipes shall be rolled and dropped into the trench. After lowering the pipes the spigot of one pipe shall be carefully centered into the socket of the next pipe and driven to the full distance that it can go and the pipe line laid to levels required, being kept in position by earth filling well watered and rammed at two or more places in its length.
- 2.3.2.2 Specials shall also be laid in their proper position as stated above.
- 2.3.2.3 The pipes laid on level ground, will be laid with socket facing the direction of flow of water in all other cases, the sockets will be laid facing uphill.
- 2.3.2.4 Any deviation either in plain or elevation of less than $11\frac{1}{4}^{\circ}$ shall usually be effected by laying the straight pipes round a flat curve, of such radius that minimum thickness of lead at the face of the socket shall not be reduced below 12 mm or the opening between spigot, and socket increased beyond 12 mm at any joint. A deviation of about $2\frac{1}{2}^{\circ}$ can be effected at each joint in this way.
- 2.3.2.5 At the end of each day's work, the last pipe to be laid shall have its open end securely closed with a wooden plug to prevent access to dirt and animals.
- 2.4 **Thrust Blocks and Anchorages:** Portland cement concrete thrust blocks of suitable design shall be provided at all bends of the pipes so as to withstand dynamic and static forces likely to be developed due to water running through the pipes. The thrust blocks shall be made after the joints have been caulked with lead and these shall be paid for separately, unless otherwise specified.
- 2.5 **Lead caulked joints:**

2.5.1 Lead for joints: It shall be bluish grey in colour, very soft and malleable of uniform quality, readily melted, free from foreign material and shall conform to I.S. 782.

2.5.2 Spun yarn for joints: This shall be of best quality preferably white. It shall be free from oil, tar, greasy substances and shall be soaked in hot coal tar or bitumen and dried before use.

2.5.3 Jointing: The yarning material shall be placed around the spigot of the pipe and shall be of proper dimensions to centre the spigot in the socket. When spigot is shoved home, the yarning material shall be driven tightly against the inside base or hub of the socket with suitable yarning tools. When a single strand of yarning material is used, it shall have an overlap at the top of not more than 5 cm. When more than a single strand is required for a joint, each strand shall be cut to sufficient length so that the ends will meet on opposite sides of the pipe and not on the top or at the bottom. Successive strands of yarning material shall be driven home separately. The leading of the pipes etc., shall be done by means of ropes covered with clay or by using special leading rings. The lead shall be rendered thoroughly fluid and each joint shall be filled in one pouring.

2.5.4 Quantity of lead and yarn: Approximate weight of lead and yarn required for joint for various sizes of C.I. Pipes and specials shall be as per I.S. 3114 as under: -

Dia of pipe	Lead/Joint	Spun Yarn/Joint
80 mm	1.8 Kg.	0.10 Kg.
100 mm	2.2 Kg.	0.18 Kg.
125 mm	2.6 Kg.	0.20 Kg.
150 mm	3.4 Kg.	0.20 Kg.
200 mm	5.0 Kg.	0.30 Kg.
250 mm	6.1 Kg.	0.35 Kg.
300 mm	7.2 Kg.	0.48 Kg.
350 mm	8.4 Kg.	0.60 Kg.
400 mm	9.5 Kg.	0.75 Kg.

NOTE: The quantities of lead and spun yam given in this table are provisional and a variation of 20 per cent is permissible.

2.5.5 Caulking : After the joints have been run they must be thoroughly caulked until they are perfectly watertight. Caulking of joints will be done after a convenient length of pipe has been laid and leaded. The leading ring shall first be removed and any lead, outside the socket shall be removed with a flat chisel and then the joint caulked round three times with caulking tools of increasing thickness and a hammer of 2 to 3 kg. weight. Lead joints shall not be covered till the pipeline has been tested under pressure but

the rest of the pipeline may be covered up to prevent expansion and contraction due to variation in temperature.

- 2.5.6 Lead Wool Joint:** When it is impractical or dangerous to use molten lead for joints, they may be made with lead wool inserted in strings not less than 6 mm thick and thoroughly caulked.
- 2.6 Flanged Joint:** C.I. Pipes may also be joined by means of flanges cast on where specified. The jointing material between flanges of pipes shall be compressed fiber board or rubber of thickness between 1.5 mm to 3 mm. The fiber board shall be impregnated with chemically neutral mineral oil and shall have a smooth and hard surface. Its weight per sq. metre shall be not less than 112 gm/mm thickness.
- 2.6.1** Each bolt shall be tightened a little at a time taking care to tighten diametrically opposite bolts alternatively. The practice of fully tightening the bolts one after another is highly undesirable.
- 2.7 Testing:** Before testing the trench shall be partially backfilled except at the joints. Completed pipeline shall be subjected to the following two tests.
- (a) Pressure test at a pressure of at least double the maximum working pressure pipe and joints shall be absolutely watertight under the test
 - (b) Leakage test (to be conducted after the satisfactory completion of the pressure test) for a duration of two hours.
- 2.7.1** Where any Section of a main is provided with concrete thrust block or anchorage, the pressure test shall not be made until at least five days have elapsed after the concrete was cast.
- 2.7.2 Pressure Test Procedure:** Each valve section of the pipe shall be slowly filled with water and all air shall be expelled from the pipe through hydrant and blow off. If these are not available at high places, necessary tapping may be made at points of highest elevation before the test is made and plugs inserted after the tests have been completed.
- 2.7.2.1** The specified pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Officer-in-charge. The duration of the test shall not be less than 5 minutes.
- 2.7.2.2** All exposed fittings, valves, hydrants and joints should be carefully examined during the test. When the joints are made with lead, all such joints showing visible leaks shall be re-caulked until tight. Any cracked or defective pipes, fittings, valves or hydrants discovered in consequence of this pressure test shall be removed and replaced by sound material and the test shall be repeated at Contractor's own expense until satisfactory results are obtained.
- 2.7.3 Leakage Test Procedure:** Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valve section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

2.7.3.1 Should any test of pipe laid disclose leakage greater than that permitted by IS Code of Practice 3114, defective joints shall be repaired at Contractor's own expense until the leakage is within the specified allowance.

2.8 Refilling: Refilling in trenches for pipes shall be commenced as soon as the joints have been tested and passed. The refilling on top and round the pipes, shall be done with great care and in such a manner so as to obtain the greatest amount of compactness and solidity possible. For this purpose the earth filling shall be done in regular layers of 15 cm (watered and rammed at each layer). All surplus earth shall be disposed off as directed by the Officer-in-charge.

3. G.I. Pipes and Fittings:

3.1 Pipes and Fittings: The pipes shall be of galvanised steel, welded and seamless, screwed and socketed and shall conform to the latest Indian Standard Specifications for "Medium" pipes, unless otherwise specified.

3.1.1 The details of screwed and socketed M.S. pipes regarding nominal bore thickness and weight shall be as per IS 1239 (part-I) as under:

Nominal bore	Weight of pipe in kg/m.		
	Light	Medium	Heavy
15 mm	0.96	1.23	1.46
20mm	1.42	1.59	1.91
25 mm	2.03	2.46	2.99
32 mm	2.61	3.17	3.87
40mm	3.29	3.65	4.47
50mm	4.18	5.17	6.24
65mm	5.92	6.63	8.02
80mm	6.98	8.65	10.30
100 mm	10.20	12.40	14.70

The above weights are for black pipes and theoretical weights of G.I. pipes are about 6 % higher.

3.1.2 The pipes shall be tested to withstand a pressure of 50 kg/sq.cm. without showing defects of any kind. These shall be supplied screwed with taper threads and the sockets with parallel threads.

3.2 Laying in trenches for External Work: G.I. Pipes and fittings shall be laid in trenches. The width of the trench shall be the minimum width required for the working. The pipes laid underground shall not be less than 60 cm. from the ground level. They shall be surrounded on all sides by approved quality material. The work of excavation and

refilling shall be done as specified earlier for Cast Iron Pressure Pipes. All pipes and fittings laid below ground shall be painted with anti-corrosive bitumastic paint and wrapped with hessian and again coated with anti-corrosive bitumastic paint of approved quality. The cost of the above shall be included in Contractor's rates.

- 3.2.1 Pipes embedded in masonry/concrete shall be treated similarly as described above.
- 3.3 **Fixing of Pipes for Internal Work:** G.I. Pipes and fittings on the walls shall be fixed by means of standard pattern holder-bat clamps, keeping the pipe 12 mm clear of the plastered surface of wall everywhere, or concealed (inside chase) as directed. Where pipes are to be concealed in walls and floors by cutting chases, the pipes and fittings shall be coated with bitumen wrapped with hessian & again painted with one coat of anti-corrosive bitumen of approved quality and rates quoted shall include for same. Cutting long length of horizontal chases on the walls for concealing pipes shall be avoided.
 - 3.3.1 All exposed G.I. pipes and fittings shall be painted with two coats of oil paint of approved quality, manufacture, colour and shade, over a coat of red-oxide or other approved primer after cleaning thoroughly the surface of the pipes and fittings and allowed to dry. The cost of such painting shall be included in the rates quoted by the contractor.
 - 3.3.2 All pipes and fittings shall be fixed truly vertical and horizontal or as directed by the Officer-in-charge. Care shall be taken to ensure that concealed G.I. Pipes (used for external or internal works) are not laid in lime mortar or lime concrete surroundings.
 - 3.3.3 **Jointing:** Where pipes have to be cut or re-threaded, ends shall be carefully filed out so that no obstruction to bore is offered.
 - 3.4 In jointing the pipes, the inside of the socket and the screwed end of the pipe shall be rubbed over with white lead and few turns of hemp yam wrapped round the screwed end of the pipe which shall then be screwed home in the socket with a pipe wrench. Care must be taken that all pipe and fittings are kept at all times free from dust and dirt during fixing.
 - 3.5 **All G.I. pipes and fittings may be tested to a pressure of 7 kg. per sq.cm. to ensure that pipes have proper threads and that proper materials (such as white lead and hemp) have been used in jointing. All leaky joints must be made leak proof by tightening or redoing at Contractor's expense.**
- 4. Plastic Pressure Pipes
 - 4.1 Types of Plastic Pipes: **Plastic Pipes and fittings conforming to Indian Standard Specifications are of three types as under:**
 - (a) **Low Density Polyethylene (LDPE) Conforming to IS:3076**
 - (b) **High Density Polyethylene (HDPE)' Conforming to IS:4984**
 - (c) **Un-plasticised Polyvinyl Chloride (UPVC) Conforming to IS:4985**
 - 4.1.1 The pipes used in water works shall be of the specified type and shall conform to Indian Standard Specifications with pressure ratings indicated below, unless otherwise specified.

Outside dia of Pipe	Pressure rating
Up to 32mm	10.0 Kgf/cm ²
40 mm to 50 mm	6.0 Kgf/cm ²
Above 50 mm	4.0 Kgf/cm ²

4.1.2 Plastic pipes shall not be used for hot water installations.

4.2 Polyethylene Pipes' (Low Density & High Density): Long lengths of unbranched underground water supply lines, flexible water supply connectors in place of lead connectors in houses and laboratories and as waste pipes for wash basins and sinks are some of the applications of these pipes. The recommended temperature range for these pipes is from - 18°C to 38°C. The pipes shall neither be used in soils liable for contamination by coal gas nor may be installed exposed to sunlight.

4.2.1 Jointing: Pipes to be jointed shall be cut to required length with knife or hand-saw, if required a mandrel may be inserted into the bore of the pipe for ease of operation. Excessive pressure shall be avoided at the time of cutting so that the circular shape of the open end is not distorted.

4.2.1.1 The pipe end to be jointed shall be heated in boiling water by dipping 10 cm of the end of the pipe for 2 to 4 minutes to make it soft and pliable. (A large diameter pipe which has heavier wall thickness will naturally take a little more time to soften). The pipe end should not touch the bottom surface of the container which is in direct contact with the flame.

4.2.1.2 The spigot (or insert type) fitting shall be inserted through the softened end by slow and steady direct push. Twisting motion shall be avoided. Where the fitting cannot be pushed in fully in the first instance, the pipe along with the partly inserted fitting shall be reheated in boiling water for another minute or two and the fitting pushed in straight. The fitting is not to be pulled out. After inserting the fitting the pipe should be allowed to cool by itself (and not by dipping in cold water). All joints shall be made leak proof.

4.2.1.3 If indicated, hose clips shall be fixed and tightened over the portion of the fittings, as reinforcement

4.2.1.4 If polythene pipe is to be jointed with G.I. pipe, an adaptor will be used.

4.2.1.5 For bends, Polythene Pipes may be bent cold to a radius of not less than eight times the outside diameter of the pipe. Bends of small radius down to three times the outside diameter may be made by hot bending.

4.2.1.6 For internal use in cold bending a wall clip should be fitted at the point where the bend is to start. The pipe should be flexed by hand and a second clip fixed at the end of the bend to prevent the pipe springing back. When the pipe is buried, no clips are necessary.

4.2.1.7 In hot bending the pipe should be heated by immersion in boiling water or by the careful application of a blow lamp flame. The flame should be used with care, taking about three minutes to heat the pipe. The flame should be applied only between the

limits of the bend. When sufficiently soft, the pipe should be bent to the desired radius using a bending spring inside the bore.

4.2.1.8 The work, where so directed, shall be carried out in accordance with the manufacturer's instructions and as illustrated in their catalogues.

4.2.2 Fixing: For internal work continuous support shall be given in the following manner:

Horizontal runs	12 times outer dia of pipe of 25 mm and under 8 times outer dia of pipe of over 25mm
Vertical runs	24 times outer dia of pipe.

4.2.2.1 For external work, the Polythene pipes shall be unrolled and laid in trenches. The width of the trench shall be the minimum width required for working. The pipe shall be laid underground at 30 to 60 cm. depth. The pipes shall be laid with a slight horizontal undulation ("Snaking") so that it can follow any movement of soil.

4.3 Un-plasticised Polyvinyl Chloride Pipes and Fittings (UPVC): The pipes may be used as substitute for G.I. pipes in water supply where specified. The recommended temperature range for these pipes is from -1°C to 49°C. These pipes shall not be used for transporting bleaching powder solutions for disinfection of water.

4.3.1 Jointing: Unless otherwise specified, the pipes and fittings shall be jointed by solvent welded joints as per manufacturer's specifications by the non-heat application method. This technique is used with spigot and socket type joints. The sockets shall be in the form of injected moulded fittings. The solvent cement shall consist of a solution of vinyl-Polymer or copolymer dissolved in a suitable volatile mixture of organic solvents and shall be of the slow drying variety. The pipe ends must be bevelled with a bevelling tool at an angle of 30° on the outer periphery. The total length of the socket of the fittings shall be marked on pipe ends and checked how far the pipe ends could be inserted into the fitting. Usually the free insertion (without force) should go up to 1/3 to 2/3 of length. The cement solvent shall be applied on the pipe ends to the full length of the socket and on the inside surface of the socket after cleaning the surfaces. The pipe ends should be pushed tight into the socket fitting and held for about 30 seconds. The surplus cement solvent should be wiped out. The pipe finally inserted shall in no case be less than 2/3 of the marked length of the pipe end.

4.3.2 Service Connections: UPVC saddles shall be used for the offtake of the service connections from larger bore pipes. Ferrules shall not be screwed directly into the UPVC pipes.

4.3.3 Fixing: The UPVC pipes can be bent cold or hot in the similar manner as stated earlier for polyethylene pipes, with the difference that only very gradual curves (radius of curvature not less than 3 times the nominal diameter of pipes of size up to 50 mm) can be negotiated. The spacing for supports in above ground indoor installations shall vary from 600mm to 1200mm for pipes of nominal bore 12mm to 50mm respectively.

4.4 Testing of Plastic Pipes: All pipe work, fittings and appliances shall be inspected

and tested hydraulically after the completion of installation of contractor's own cost. All control valves shall be positioned 'open' for the duration of the test and open ends temporarily closed with watertight fittings, the testing pressure normally shall not be one and half times, nor greater than twice the maximum working pressure at the weakest point of the system. The test pressure shall be maintained for at least one hour. Pressure shall be applied by either manually operated hand pump or a power-driven pump. Air vents should be kept open at all high points so that air may be expelled from the system during filling. When the system has been fully all air displays from the line, air bends shall be closed & the line initially inspected for seepage charged with water and at the joints and the firmness of support under load. Pressure then may be applied until the required level is obtained. The system shall be slowly and carefully filled with water during pressurisation, to avoid surge pressure of water hammer.

- 4.4.1** With the test pump stopped, the required pressure should be maintained without significant loss for a period of one hour. Any defects revealed by such tests should be made good at Contractor's cost and the tests repeated until a satisfactory result is obtained.
- 4.4.2** Underground lines shall be tested before 'backfilling. Where pipelines contain couplings which permit the pipe to slip, consideration must be given to the restraint of the line before pressure is applied. Partial backfilling leaving the joints exposed for inspection may be adopted.

5. Water Meters, Sluice Valves and other Appurtenances

5.1 Water Meters (Domestic type): Water Metres up to 50 mm nominal size shall conform to IS Specifications for Water Metres (Domestic types) IS:779 of Type A unless otherwise specified. The meter body shall be of bronze gunmetal or brass and marked to read in litres complete with registration box, cap and lid. The water meters shall be provided with strainers. Strainers shall be of a material which is not susceptible to electrolytic corrosion. They shall be rigid, easy to remove and clean and shall be fitted on the inlet side of water meter. It shall be possible to remove and clean the strainer, in such a way as not to permit disturbing the registration box or tampering with it. Meters provided with internal strainer involving opening of the registration box for cleaning, shall be fitted with an additional strainer on the inlet side and rates quoted by contractor shall include such additional strainers cost of testing and scaling by local Municipal authorities complete.

5.1.1 Connections: The meter casing shall be fitted in the pipeline by two conical or cylindrical nipples or tail pipes with connecting nuts which shall be provided with each meter. The nipples of water meters shall be made of the same materials as specified for body.

5.1.2 Markings: Each Meter shall be marked with the following information:

- (a) Nominal size:
- (b) Direction of flow:
- (c) ISI Certification Mark.

(d) Manufacturer's name and trademark:

- 5.2 Water meters (Bulk type):** These shall conform to IS:2373 and shall be of size 50 mm and above. They shall be of (impeller) vane wheel type or helical type. The body of the meter shall be made from cast iron. The meter casting shall be fitted into the pipeline by means of a double flange, the internal diameter of which shall be equal to nominal size of meter. The meter shall be provided with registration box and cap of brass or cast iron. Provision shall be made to lock the lid to registration box. Meters shall be supplied and fitted with an External Strainer (Dirt Box) of suitable material not susceptible to electrolytic corrosion and rates quoted by contractor shall include for the same. Meters shall be provided with markings as described in Clause 5.1.2 above.
- 5.3 Ferrules:** Brass Ferrules shall conform to IS 2692. Necessary saddle pieces of approved type shall be used for off take of the service connections and rates quoted shall include for the same.
- 5.4 Sluice Valves:** Sluice Valves shall conform to IS: 780 and shall be of Class I Type unless otherwise specified with double flange and hand wheel for operation. The body, dome, cover, stuffing box, thrust plate, wedge, gland and cap may be of cast iron but the spindle shall be of brass or Aluminium, bronze. Valves shall be fixed to spigot and socket cast iron and steel pipes by means of suitable flanged spigots or flanged socketed tail piece as directed and rates quoted by contractor shall include for the same. Before the valves are actually fixed, they shall be cleaned and greased and it should be seen that all parts are in perfect working condition.
- 5.4.1 Surface boxes for sluice valves:** These shall conform to IS: 3950 with a cast iron frame and a mild steel hinge pin. The upper surface of cover shall have non-slip surface. The surface boxes shall be coated with a composition having bitumen or tar base. The minimum weight of surface box shall be 33 kg. The internal size of surface box shall be 230 mm x 150 mm x 150 mm.
- 5.5 Air Valves:** These are placed at every summit, in the line to permit the escape of air when the main is filled and afterwards, if any air is carried into the main. Fixing of Air Valves may be done by means of fixing saddle piece on pipes and drilling the same where necessary. Rates quoted shall include for the same.
- 5.6 Brick Masonry Chambers for Housing Meters, Valves and Appurtenances:** These shall be constructed as per size as indicated. These shall be measured and paid for separately. The bricks used shall be of first quality best locally available and from approved source and shall be laid in cement mortar 1:3. The walls shall be plastered both inside and outside with 15 mm thick cement plaster 1:3. The foundation concrete shall be of PCC 1:4:8 and 75 mm thick. The top slab shall be of 100mm thick RCC 1:2:4 unless otherwise specified.

LIST OF PRINCIPAL MAKES / AGENCIES / BRANDS OF VARIOUS MATERIALS

1. Materials used in the work should be from the following list of principal makes/ brands. All brands appearing under each specific head shall be treated as being on “at par”. In case of non-availability of these makes/brands, The Director, NIA shall allow materials licensed by BIS bearing "ISI" monogram at par with principal makes.
2. For all other manufactured materials for which principal makes are not mentioned the materials allowed to be used in the work shall have BIS certification and samples for which are to be got approved prior to use of the same in the work.
3. For some materials BIS certification may not be available. In such cases the samples shall have to be got approved before using in the work.

Material	Approved Make/ Brand
Elastomeric Paint	Berger / Asian
Texture Paint	SKK / Equivalent
White Cement	Birla Cement
	J.K. White
	Travancore Cements Ltd
Reinforcement Steel (TMT-Fe 500)	SAIL
	Tata Steel
	RINL



Structural Steel / M.S. Tube	TATA
	Jindal Steel & Power Ltd
	JSW Steel Ltd
	Rastriya Ispat Nigam Ltd
	SAIL
Plasticizer, Super Plasticizer, Admixtures, Other construction chemicals	Asian Laboratories
	CICO
	Ultracon
	Fosroc
	Sika
	Kunal Conchem
	Pidilite
	BASF
	ECMAS
Waterproofing Compound (Crystalline)	Fosroc
	Sika
	Pidilite
	Choksey
	Roff
Waterproofing Self Adhesive (HDPE) Membrane	Asian Paints Ltd
	Ardex Endura
	Fosroc
	Pidilite
Decking Steel Sheet	TATA Steel
	Lloyds
	JSW
Shuttering Ply	Archid
	Kitply
	Century
	Merino
AAC Block	Aerocon
	Finecrete
	Builttech
	Magicrete
	Instablock



	JK
Flush door / Laminated Flush doors	Century
	Duro
	Green
	Archid
	Merino
	Anchor
	Swastik
	Kutty
Plywood	Merino
	Archid
	Greenlam
	Duro
	Anchor
	Swastik
	Century
Lamination	Green Lam
	Merino
	Sunmica/Formica
	Century
	Durian
	Sundek
	Anchor
Decolam	
Silicon based water repellent / Weather Sealant	Dow Corning
	STP
	Pidilite
	Wacker
Poly-Sulphide Sealant	Fosroc
	Laticrete
	Pidilite
	Wacker
	Sika
	Dow Corning
Wall Putty	Birla Wall Care
	Snowcem
	JK White
	Berger
	Asian Paints



Oil Bound Washable Distemper	Asian Paints
	Nerolac
	Akzonobel Dulux
	Berger
	Jenson & Nicholson
Acrylic Distemper	Berger
	Asian
	Dulux
Premium Acrylic Emulsion paints Steel / Wood Primer	Dulux
	Berger
	Nerolac
	Asian Paints
	Jenson & Nicholson
	Akzonobel (Dulux)
	Berger
	Nerolac
	Jenson & Nicholson
	Asian Paints
Synthetic Enamel Paint	Akzonobel (Dulux)
	Berger
	Asian (Apcolite)
	Kansai Nerolac
	Jenson & Nicholson
Epoxy Paint	Kansai Nerolac
	Asian
	Akzonobel(Dulux)
	FOSROC
Stainless Steel	Salem Steel
	Jindal Alloys
	SAIL
Stainless Steel Hardware	Godrej
	KICH
	OZONE
Ceramic Tiles / Glazed Tiles	Kajaria



	Asian (AGL)
	Somany
	H&R Johnson
	EURO
	NITCO
	Vermora
Cement Concrete Tiles (designer Tiles)	Unistone
	Ultra
Tile / Stone Adhesive / Tile / Epoxy Grout	Eurocon
	Pidilite
	Fosroc
	Ferrous Crete
	BASF
	MYK Laticrete
Nuts / Bolts & Screws	GKW
	Atul
	Boun
Material	Approved Make/ Brand
Door/Window Fittings	Godrej
	Hardwyn
	Everite
	Dorset
SS Tower bolt	Lockwood
	(AssAbloy)
	Everite
	Godrej
	Dorset
SS Butt hinges with ball bearing grade SS 304	Lockwood
	(AssAbloy)
	Godrej
	Hettich
G.I. / M.S. Pipe	Tata
	Jindal (Hissar)
	Surya Prakash
G.I. Fittings	Unik



	R-Brand
	KS
	Surya
	Zoloto
SS Pipes	Jindal
	Tata
	Viega
HDPE Pipes	Reliance
	Vertex
	Vectus
	Jain Irrigation
	West Well
	Oriplast
	Supreme
DI Pipes	Electrosteel
	Jindal
	Tata Ductura
Material	Approved Make/ Brand
DI Fittings	Kartar
	Electrosteel
	Kalinga
CI Fittings	Neel
	Kartar
	Electrosteel
Float Valve	IVC
	KSB
	Leader
	Zoloto
UPVC Pipe and Fittings	Astral
	Prince
	Vectus
	Supreme
	AKG
	PKS Export
	Finolex



	Surya Roshni
PVC Pipe & Fittings	AKG
	Surya (Prakash)
	Supreme
	Vectus
	Finolex
CPVC Pipes & Fittings	AKG
	Finolex
	SFMC
	Astral
	Surya Prakash
	Supreme
	Vectus
Centrifugally Cast (Spun) Iron Pipes & fittings	NECO
	SKF
	Electrosteel
Material	Approved Make/ Brand
Centrifugally Cast (Spun) Iron (Class LA) pipes	NECO
	Electro Steel
	TATA
Centrifugally Cast (Spun) Ductile Iron Pipes & Fittings	Electro Steel
	Jindal (Hissar)
	Kalinga
C.I. Manhole covers, Frames & GI Gratings	NECO
	SKF
	RIF
	Jain Spun Pipe Co.
	BIC
SFRC Manhole covers & gratings	KK
	OCR
	Pargati
Gun Metal Valves, Globes	Kartar



	Sant
	Castle
	Zoloto
Non Return Valve (Check valve) 1/2" to 1 1/4"	Zoloto
	Kartar
	Sant
	Leader
Brass Ferrules	Dhawan Sanitary Udyog
	Kalsi
	Annapurna
Polythylene water storage tank	Sintex
	Vectus
	Polycon
	SPL
Stoneware Pipes	Perfect
	Hind
	RK
Material	Approved Make/ Brand
RCC Pipes (NP-2)	Lakshmi
	Pragati Concrete
	Sood & Sood
	Jain & Co.
Ball Valves / wafer type valves	Zoloto
	Leader
	AIP
Air Release Valves	Sant
	Leader
	Zoloto
Pipecoat	IWL Ltd
	Pypkote
	STP
CI Double Flanged Sluice Valve	Kirloskar
	Kejriwal
	IVC
	Sondhi



Adhesives	Duratuff
	Pidilite
	McCoy Soudal

APPROVED MAKE OF MATERIALS LIST FOR ELECTRICAL WORKS - INTERNAL
ELECTRICALS & CABLES

PVC RIGID CONDUITS & ACCESSORIES ISI (FRLS)	PRECISION/ BEC/ AKG / POLYPACK/ SG
PVC CASING CAPING (FRLS)	PRECISION/ BEC/ AKG / DIAMOND
MS CONDUITS	AKG / BEC / NIC / SUPREME
LT / HT CABLES (FRLS)	POLYCAB / FINOLEX / AVOCAB/ GLOSTER / CCI / RR KABEL/ DELTON
WIRES (FRLS)	FINOLEX / RR KABEL/ HAVELLS / V. GUARD
MAIN DISTRIBUTION BOARDS	ABB/ LEGRAND /L&T/ SCHNEIDER / SIEMENS
MINIATURE CIRCUIT BREAKER	ABB/LEGRAND/L&T/ SCHNEIDER / SIEMENS
ELMCB / RCCB	ABB/LEGRAND/L&T/ SCHNEIDER / SIEMENS
INDUSTRIAL SOCKET & TOP POLYCARBONATE	CROMPTON/ LEGRAND / L & T
MODULAR SWITCHES & SOCKETS ACCESSORIES & REGULATORS	ANCHOR/ SSK/ LEADER/ CRABTREE/ MK/ LEGRAND / ABB

ADHESIVE TAPE	BHOR (STEEL GRIP) OR APPROVED EQUIVALENT
HOLDERS / CEILING ROSES	ANCHOR/ SSK/ LEADER/ CRABTREE/ MK
TELEPHONE (RJ 11) / T.V. SOCKETS (CO-AXIAL)	M. K. INDIA MAKE (WRAPAROUND) / LEGRAND / ABB / D-LINK/ MOLEX/ HONEYWELL
CABLE LUGS	DOWELL / LOTUS / JAINSON / COMET
CABLE GLAND SINGLE / DOUBLE COMPRESSION	HMI / COMET / CENTRAL HARDWARE IND / DOWELLS/ SIEMENS
LUMINARIES	PHILIPS / CROMPTON/ WIPRO
LIGHTING FIXTURES (FLAME PROOF)	PHILIPS / CROMPTON/ WIPRO
SWITCH FUSE UNIT/SWITCH GEAR	L&T / SCHNEIDER / SIEMENS / ABB MAKE/ ENGLISH ELECTRIC
HRC FUSES/ FUSE CARRIER & LINKS	L&T / SCHNEIDER / SIEMENS / ABB MAKE./ ENGLISH ELECTRIC
CHANGE OVER SWITCH	L&T/ SIEMENS / HPL
CONTACTORS / POWER CONTACTORS FOR CAPACITOR DUTY	L&T / SCHNEIDER / SIEMENS (EPCOS)/ ABB/ TELEMECANIQUE
APFC RELAY	EPCOS / NEPTUNE/ L&T / SCHNEIDER/ CONZERV
CAPACITOR BANK	EPCOS / NEPTUNE/ L&T / SCHNEIDER/ CROMPTON
MCCB / ACB	L&T / SCHNEIDER / SIEMENS / LEGRAND / ABB
AMMETER / VOLTMETER	AE / HPL /MECO/L & T / AMP/ ENERCON / CONZERV/NEPTUNE/ SCHNEIDER/ RISHABH
SELECTOR SWITCHES	L & T/ SALZER / KAYCEE / SIEMENS/ C&S/CONZERV/ RISHABH
INDICATOR LAMPS (LED TYPE)	SIEMENS / TEKNIC / PRECIFINE/ PHILIPS / ESSEN / L&T/ C&S/ ELMEX/ BHARTI /CONZERV/ RISHABH
CONNECTOR STRIPS	ELMEX / WAGO / CONNECT WELL/ PHOENEX
LOAD MANAGER ENERGY MANAGEMENT SYSTEM	ENERCON / L&T / HPL / CONZERV / ELMEASURE
KWH METER	ENERCON / L&T / SECURE/ HPL / CONZERV / ELMEASURE

RELAYS (PROTECTION)	ALSTOM / AREVA / SIEMENS/ L&T
PUSH BUTTON STATION	L&T/ C&S/ ALAN/ EAPL/ TEKNIC
BUS BAR ALUMINIUM	JINDAL/ INDALCO/ CENTURY
MONOBLOCK SUBMERSIBLE PUMP	KIRLOSKAR/ CROMPTON/ CRI / ABB/ SIEMENS/ KSB/ GRUNDFOS/ WILO /XYLUM
MOTOR STARTER	SIEMENS/ L&T/ CROMPTON/ ABB/ SCHNEIDER

PAYMENT SCHEDULE:

Contractor shall be paid towards bill according to the major cost centre and corresponding sop as given under:

SCHEDULE OF MAJOR COST CENTRE

1.0 All running/ intermediate and final bill payments shall be made to the agency in accordance with the apportionment of Accepted Contract Amount according to the Major Cost Centre as per following schedule:

2.0 The percentage figure filled in column (5) by the Employer for the accepted contract amount for completion of the works corresponding to the Major cost centre and payment shall be released for different cost centres as per percentage break up in respective SOP (Schedule of Payment).

3.0 The percentage of major cost centre apportioned to the accepted contract amount given in the schedule and weightage of major cost centre shall be reviewed based on the detailed cost estimates submitted by the contractor and duly verified by Officer-In -charge and will be suitably modified with mutual agreement. However, the decision of Officer-in-charge shall be final and binding to the contractor in this regard.

Major Cost Centre	Description of Major Cost Centre	Qty	Unit	Amount i.e. % of accepted contract sum	% due	Reference to Schedule of payment for cost centre
1	2	3	4	5	6	7

A	Investigation, Planning, Designing and obtaining its approval as per scope of work, preparation of Technical Specification & Drawing etc, and submission and approval all complete.		Lump sum	5%		Refer Annexure-SOP:01
B	Supply of Sewage Treatment Plant according to design & drawings along with other accessories & materials etc.		Lump sum	45%		Refer Annexure-SOP:02
C	Construction of infrastructure to install the plant etc. along with other necessary works and infrastructure, finishing etc. complete in all respect on Design, build and handover basis as per scope of work, Technical Specification, & Drawing complete.		Lump sum	35%		Refer Annexure-SOP:03
D	Testing & Commissioning of Plant including all finishes and services like Electrical Installations, etc complete in all respect on Design, build and handover basis as per scope of work, Technical Specification, & Drawing complete.		Lump sum	15%		Refer Annexure-SOP:04
				100%		

Annexure- SOP-01

Apportionment of Major Cost Centre "A" for Payment according to Cost Centre

i) Percentage Apportionment to Major Cost Centre "A" = 5 % of Accepted Contract Amount.

ii) The basis of payment on "Pro rata basis" shall be worked out on the percentage of work done out of total scope of work under each activity/item.

Investigation, Planning, Designing and obtaining its approval as per scope of work, Technical Specification & Drawing etc, including submission of priced schedule of quantities supported by detailed estimate complete. All design shall be vetted by Government Engineering college specified elsewhere in tender. Obtaining approvals from all statutory/local authorities, Pollution Control Board etc. required for Construction of 200 KLD underground Sewage Treatment Plant in MBBR Technology.

Cost Centre	Item of Work	Weightage of Major cost centre "A"
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A-1	On preparation, submission and approval of design of 200 KLD underground Sewage Treatment Plant in MBBR Technology and design & drawing of infrastructure etc. vetting through IIT of Govt. Engineering Collage.	40.00 %
A-2	On preparation and submission of all working drawings of Sewage Treatment Plant and infrastructures including Schedule of Works to be carried in steps and priced schedule of quantities supported by detailed estimate covering entire gamut of work and maintenance Manuals and revisions, if any.	25.00 %
A-3	On obtaining all required NOCs including Environmental Clearance for obtaining work including tree cutting permission if any and Commencement from local authority etc..On obtaining Service connections and submission of all required NOC from local/statutory authorities.	20.00 %
A-4	Test certificates and all as-Built Drawings and copies of drawings in CDs/Pen drive etc. all complete.	15.00 %
	TOTAL	100%

Annexure- SOP-02

Apportionment of Major Cost Centre "B" for Payment according to Cost Centre

i) Percentage Apportionment to Major Cost Centre "B" = 45 % of Accepted Contract Amount.

ii) The basis of payment on "Pro rata basis" shall be worked out on the percentage of work done out of total scope of work under each activity/item.

Supply of Sewage Treatment Plant according to design & drawings along with other accessories & materials etc.

Cost Centre	Item of Work	Weightage of Major cost centre "B"
B-1	On supply of equipments/ parts of designed 200 KLD underground Sewage Treatment Plant in MBBR Technology.	50.00 %

B-2	On supply of all accessories and infrastructure equipments like pumps, pipes, .valves etc. including all civil & electrical materials, other required materials etc.	35 .00 %
B-3	On supply of all equipments tools & plants for smooth execution of the work to carry out excavation, construction installation etc.	15.00 %
	TOTAL	100%

Annexure- SOP-03

Apportionment of Major Cost Centre "C" for Payment according to Cost Centre

i) Percentage Apportionment to Major Cost Centre "C" = 35 % of Accepted Contract Amount.

ii) The basis of payment on "Pro rata basis" shall be worked out on the percentage of work done out of total scope of work under each activity/item.

Construction of infrastructure to install the plant etc including pump/ control room and along with other necessary works & infrastructure, finishing etc. complete in all respect on Design, build and handover basis as per scope of work, Technical Specification, & Drawing complete.

Cost Centre	Item of Work	Weightage of Major cost centre "C"
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C-1	On excavation and construction of all infrastructure to install the designed 200 KLD underground Sewage Treatment Plant in MBBR Technology with other necessary works & infrastructure, finishing etc. complete.	40.00 %
C-3	On installation of the designed 200 KLD underground Sewage Treatment Plant in MBBR Technology, including infrastructure etc. and construction of necessary related works of infrastructure, electrical works, installation of pumps, finishing etc. all complete	50.00 %
C-3	Cleaning, Finishing the external area without any leftover works etc. all complete as a whole.	10%
	TOTAL	100%

Annexure- SOP-04

Apportionment of Major Cost Centre "D" for Payment according to Cost Centre

i) Percentage Apportionment to Major Cost Centre "D" = 25% of Accepted Contract Amount

ii) The basis of payment on "Pro rata basis" shall be worked out on the percentage of work done out of total scope of work under each activity/item.

Testing & Commissioning of Plant including all finishes and services like Electrical Installations, etc complete in all respect on Design, build and handover basis as per scope of work, Technical Specification, & Drawing complete.

Cost Centre	Item of Work	Weightage of Major cost centre "D"
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D-1	On Testing & Commissioning of 200KLD underground Sewage Treatment Plant and pump room /control room including all necessary accessories, fittings and connecting to local /municipal line etc. if required	55.00 %
D-2	On submission of test certificates, NOC from statutory /local authority, as-made/ built drawings & marking/ signage of equipments etc. and copy of as-made/built drawings in pen drive etc.	25.00 %
D-3	Training for maintenance and details of Sewage treatment plants & equipments as a whole etc. Handing over the Sewage treatment plants & equipments along with all infrastructures electrical & civil work in completely functional condition.	20.00 %
	TOTAL	100%