



LIC OF INDIA, ECZO, PATNA

PART- I

TENDER FOR BUILDERS WORK, WATER SUPPLY, SANITARY INSTALLATION, ELECTRICAL INSTALLATION, LIFTS AND ANCILLARY WORKS FOR PROPOSED CONSTRUCTION OF 28 NOS. OF OFFICERS' QUARTERS AND 1 NO. OF VIP GUEST HOUSE AT SURYA NAGAR, BHUBANESWAR.

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CONDITIONS OF CONTRACT**1. INTERPRETATIONS:**

- 1.1 In construing these Conditions, the Specifications, the Priced Schedule of Quantities, 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 THE LIFE INSURANCE CORPORATION OF INDIA and his (their) heirs, legal representatives, assignees and successors.
- 1.3 "Chief Engineer" shall mean the person occupying the post of head of the Zonal Engineering Department of the Corporation.
- 1.4 "Corporation's Engineers" shall mean such Deputy Chief Engineers, Superintending Engineers and/or Executive Engineers of the Corporation, who shall from time to time be appointed by the Chief Engineer 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 Corporation's Engineer 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/buildings 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, these Conditions, the General Instructions to Contractor, General Preambles to Schedule of Quantities, Special

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Conditions, the priced Schedule of Quantities, the Specifications, the Appendices, the Drawings and other related correspondence.

- 1.9 ऋAct of Insolvencyò 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 ऋNotice in Writingò 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 only 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 The following abbreviations shall be followed for the designations of various LIC Officers:

DESIGNATIONS**ABBREVIATIONS**

Executive Director (Engineering)	E.D.(E)
Zonal Manager	Z.M.
Chief Engineer	C.E.
Chief Architect	C.A.
Deputy Chief Architect	D.C.A.
Deputy Chief Engineer	Dy.C.E.
Superintending Engineer	S.E.
Senior Architect	S.A.
Executive Engineer	E.E.
Deputy Senior Architect	D.S.A.
Asstt. Secretary	A.S.

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- 1.14 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 Corporation's Engineer are intended unless otherwise specified.
- 1.15 The words "as described" shall mean the description in the Special Conditions, Specifications, General Instructions, Drawings etc. of this tender.
- 1.16 The words "allow" shall mean that the Contractor shall include in his rates for the particular matter referred to.
- 1.17 "Day Work" shall mean items of labour and/or materials which in the opinion of the Corporation's Engineer are not capable of being evaluated by the accepted method of measurement and analysis.

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 and to the satisfaction of the Corporation's Engineer. The Corporation's Engineer may issue further drawings and/or written instructions, details, directions and explanation in regard to:
- The variation or modification of the Design, quality of works or the addition or omission or substitution of any work;
 - Any discrepancy in the Drawings or between the Schedule of Quantities and/or Drawings and/or Specifications;
 - The removal from the site of any materials brought thereon by the Contractor and the substitution of any other material thereof;
 - The removal and/or re-execution of any work executed by the Contractor;
 - The dismissal from the work of any persons employed thereupon;
 - The opening up for inspection of any work covered thereupon;
 - The amending and making good of any defects under relevant Clause giving details of defects after completion.

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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 Chief Engineer 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 Chief Engineer 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) General preambles to schedule of quantities
- c) General instructions
- d) Conditions of contract

3.3 In case of discrepancies between the Schedule of Quantities, the specifications and/or drawings the following order of precedence shall be observed

- (a) Description in Schedule of Quantities
- (b) Specifications of relevant Trade
- (c) Drawings; detailed drawings shall be followed in preference to small scale drawings and figured dimension in preference to scale.
- (d) Indian Standard Specifications of `BISô

4. **DRAWINGS AND SCHEDULE OF QUANTITIES:**

4.1 Two complete sets of the Drawings and Specifications and Schedule of Quantities shall be furnished by the employer to the contractor. Two copies of the additional

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Drawings, if any, shall be furnished within such time as the Chief Engineer may consider reasonable which may be necessary for execution of any part of the work. Such copies shall be kept on the work site and the CE and his representatives shall at all reasonable times have access to the same and they shall be returned to the EE by the Contractor on completion of the contract.

This Contract and the signed Drawings, Specifications and Schedule of Quantities shall remain in the custody of the Employer.

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 & 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 CE 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 and things disturbed during the execution of the work to the satisfaction of the Corporation's Engineer.

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,

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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 CE 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 Bye-Laws in question.

- 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 Bye-Laws 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 he has informed the Chief Engineer 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 neighbouring occupants in particular.
- 6.6 Should the Contractor desire to work on Sundays, Holidays and during night hours, permission in writing from the Corporation's Engineer must be obtained in time. It shall

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be the responsibility of the Contractor to obtain permission from Civil Authorities, if necessary.

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 corrections 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, if called upon, to the satisfaction of the Corporation's Engineer. The Contractor must not commence work until the outlines of the building and Centre line layout have been pegged out and approved by the Corporation's Engineer.

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 some pit or place provided by him.

9. **MATERIALS AND SAMPLES:**

- 9.1 All the materials stores and equipment required for the full performance of the Contract must be provided through normal trade channels and must include octroi, excise and import duties, sales tax payable to all authorities and other charges. 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/outside sources as early as necessary to the satisfaction of the Corporation's Engineer and to ensure that such materials are on site well ahead of requirement for use in the work.
- 9.2 Before ordering such materials, the Contractor shall get samples of the materials approved well in time. 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

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product will also be tested if desired by the CE 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. If called upon by the Executive Engineer 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 Corporation's Engineer 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 Corporation's Engineers or any persons authorised by any one of them 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 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 Corporation's Engineer.

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 Corporation's Engineer for doing so.

11. **CONTRACTOR'S SUPERVISION & 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 CE to act in his stead.

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11.2 Where the contractor is not a qualified Engineer or even if he is so qualified, he cannot in the opinion of C.E., 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 Corporation's Engineers. Any directions, instructions or notices given by the Corporation's Engineer to such supervisor(s) shall be deemed to be given to the contractors.

a. **FOR WORKS COSTING UPTO Rs. 100 LAKHS :**

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

b. **FOR WORKS COSTING MORE THAN Rs. 100 LAKHS & UPTO Rs. 200 LAKHS :**

A qualified resident Engineer having a Recognised Degree in Civil Engineering or equivalent qualification and minimum of 2 years experience on building construction site/s or a recognised Diploma in Civil Engineering with minimum 5 years experience on such construction jobs.

c. **FOR WORKS COSTING MORE THAN Rs.200 LAKHS :**

- i) A qualified resident Engineer having a Recognised Degree in Civil Engineering and minimum of 3 years experience of such major construction site/s or a recognised diploma in Civil Engineering with 8 years experience.
- ii) In addition the contractor shall employ suitable number of supervisors with recognised degree / diploma in the relevant branches or recognised qualification & experience in the relevant trades for proper execution of the work as approved by the Chief Engineer.

- d. The CE may vary any of the above qualification / experience at his discretion if so warranted by conditions prevailing and applicable to any particular work such as Air-conditioning, HT, Interiors etc.

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- e. 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 Corporation's Engineer, immediately dismiss from the work any person employed thereon, who may, in the opinion of the Corporation's Engineer, 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 Corporation's Engineer.

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 CE 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 AND PRICING:

- 15.1 The Contractor should note that unless otherwise stated, the tender is strictly on Item Rate basis and his attention is drawn to the fact that rates for each and every item should be correct, workable and self supporting. The quantities in the Schedule of Quantities approximately indicate the total extent of work and no variation i.e.

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additions, omissions or subtractions shall vitiate the Contract. No liability shall attach to the Employer for any error therein or variation there from.

- 15.2 The contractor may when authorized and shall when directed, in writing by the CE or the Corporation's Engineers, whom the CE may for that purpose appoint, add to, omit from, make alterations in, substitutions for, or vary the works shown upon the Drawings or described in Specifications or included in the priced Schedule of Quantities but the Contractor shall make no additions, omissions, alterations, substitutions or variations without such authorization or direction. A verbal authority or direction by the CE, if confirmed by the contractor in writing within 7 (seven) days, be deemed to have been given in writing.
- 15.3 The rates of such altered, additional or substituted works shall be determined in accordance with the following.
- a. The net rates or prices in the original tender shall determine the valuation of the extra work where such extra work is of similar character and executed under similar conditions as the work priced therein.
 - b. The net price of the items in the original tender shall determine the value of the items omitted. However, if omissions vary the conditions under which any remaining items of the work are carried out or if the amount of any omission relative to the amount of the whole of the Contract works or to any part thereof shall be such that in the opinion of the Chief Engineer, the net rate or price contained in the Priced Schedule of Quantities or Tender or for any item of work involves loss or expenses beyond that reasonably contemplated by the Contractor and is by reason of such omission rendered unreasonable or inapplicable, the Chief Engineer shall fix another rate or price as in the circumstance he shall think reasonable and proper.
 - c. If the rate for any altered, additional, or substituted item of work is not specified in the schedule of quantities, the rate for that item shall be derived from the rate for the nearest similar item specified therein.

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- d. If the rate for altered, additional or substituted item of work cannot be determined in the manner specified above, then such items of work shall be priced on the basis of coefficients 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.
- e. Where such co-efficient are not available in C.P.W.D. rate analysis, the actual Labour/Materials involved and recorded by the Executive Engineer in executing the items shall be considered.
- f. 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 EE the names of workmen employed) and materials incorporated be delivered for verification to the EE or his representative at or before the end of the week following that in which the work has been executed. The EE is not bound to recognize the cost of materials furnished in vouchers; the CE at his discretion, will fix the price of such materials based upon market value.
- g. While fixing rates of extra items 15% (Fifteen percent only) shall be allowed on the cost of material and labour to cover all supervision, overheads, statutory Taxes and Levies and profits. This shall not however apply if 100% advance is given by the employer for purchase of any material (such as cement, steel etc.). In such cases 3.75% of the cost of materials only shall be allowed as handling charges and 15% shall be allowed only on the labour cost.
- h. Where the quantities of any item in the schedule exceeds by 100% in foundation and in plinth, and 50% in super-structure (above plinth), these extra quantities over 100% & 50% respectively will be treated as extra items of work and priced accordingly as above. [Items such as roads, pavements etc. shall be

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considered as below plinth]. The decision of CE for terming items below or above plinth is final & binding on the contractor.

- i. For all extra items of work, the contractor should submit to the concerned Corporation's Engineer 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 Corporation's Engineer, then the CE shall proceed to fix the rate for the item(s) and the same shall be final and binding on the contractor.
- j. 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. **SUB-CONTRACTORS:**

- 16.1 All specialist Merchants, Tradesmen and others, executing any work or supplying, fixing any goods for which provisional sums are included in the Schedule of Quantities and/or Specifications, who may be nominated or selected by the CE, who shall be the final authority are hereby declared to be Sub-Contractors and are herein referred to as nominated Sub-Contractors.
- 16.2 No nominated Sub-contractor shall be employed on or in connection with the work against whom the Contractors shall make reasonable objection or (save where the CE and the Contractor shall otherwise agree) who will not enter into a Contract providing:-
 - a. That the nominated Sub-Contractor shall indemnify the Contractor against the same obligation in respect of the Sub-Contractor as the Contractor is under, in respect of this Contract;

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- b. That the nominated Sub-Contractor shall indemnify the Contractor against claims in respect of any negligence by the Sub-Contractor or his servants or agents or any misuse by him or them of any scaffolding or other plant or the property of the Contractor or under any Workmen's Compensation Act in force.

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

- 17.1 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 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.
- 17.2 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.
- 17.3 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.

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- 17.4 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.
- 17.5 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.
- 17.6 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.
- 17.7 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.
- 17.8 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.

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- 17.9 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 as the CE deems appropriate.
- 17.10 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.
- 17.11 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.

18. DELAY AND EXTENSION OF TIME:

- 18.1 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 neighbouring owners, or public authorities,
 - (d) by the work, or delays, of other Contractors or Tradesmen engaged by the Employer,
 - (e) by reason of any additional work or instruction ordered by the employer,
 - (f) by reason of Civil Commotion, local commotion of workmen or strike or lock-out affecting any of the building trades,
 - (g) in consequence of the Contractor not having received in due time necessary instructions from the CE for which he shall have specifically applied in writing,
 - (h) from other causes which the CE may certify as beyond the Control of the Contractor,
 - (i) by reason of non-payment of interim certificate at specified time, then upon the happening of any such event causing delay the contractor shall immediately, give notice thereof in writing to the Corporation.

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Engineer, but shall nevertheless use constantly his best endeavours to make good this delay.

- 18.2 Request for extension of time shall be made by the contractor at the earliest but not later than 14 (fourteen) days of the event causing the delay.
- 18.3 In case of strike or lockout the Contractor shall give written notice thereof to the CE as soon as possible but he shall nevertheless constantly use his endeavours to prevent delay and shall do all that may reasonably be required to the satisfaction of the CE to proceed with the work.
- 18.4 The CE 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 Corporation's Engineer within 3 (Three) months of the date of receipt of such request. 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 CE.
- 18.5 The decision of the CE as communicated by the Corporation's Engineer to the contractor on the extension of time shall be final & binding.
- 18.6 No claim in respect of compensation or otherwise, howsoever arising, as a result of extension granted under the above conditions shall be admissible.

19. DAMAGE FOR NON-COMPLETION:

- 19.1 If the Contractor fails to complete the work by the date of completion stated in the Appendix to Condition of Contract or within time properly extended under Clause (18) hereof and the CE certifies in writing that in his opinion the same ought, reasonably so, to have been completed, the Contractor shall pay or allow the Employer the sum named in the Appendix as "Liquidated Damages" for the period during which the said works shall so remain incomplete and the Employer may deduct such damages from any money due to the Contractor. In case liquidated damages in accordance with the above provision accrue to maximum limit as mentioned in the Appendix to the

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Conditions of the Contract, the Chief Engineer shall be at liberty to rescind the Contract and to get it completed entirely at the risk and cost of the Contractor through any other agency he decides to appoint. All extra expenses incurred shall be recoverable from the money due to Contractor or lying to his credit with the Employer against the present or any other Contract.

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

20.1 If the Contractor after receipt of written notice from the CE, requiring compliance with such further Drawings and/or his instructions, fails within 7 (seven) days to comply with the same the CE 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.

21. PAYMENT OF BILLS :

a. MEASUREMENT OF WORKS

21.1 The EE may, from time to time, intimate the contractor that he requires the work to be measured and the contractor shall forthwith attend or send a qualified representative to assist the EE or his representative in taking such measurements and calculations and to furnish all particulars or to give all assistance required by either of them. All items having a financial value shall be entered in the Measurement Book . All measurements and levels shall be taken jointly by the Contractor or his authorised representative and Site Engineer or his authorised representative from time to time during the progress of the work and such measurements shall be signed and dated by both the parties in token of their acceptance. If any of the measurements recorded are objected by any one of the party, a note shall be made to that effect with reason, signed by both parties and referred to Corporation's Engineer whose decision in the matter shall be final and binding. Measurements can also be recorded through electronic medium where specifically approved by Chief Engineer.

21.2 Should the contractor not attend or neglect or omit to send such representative, then the measurements taken by the EE or representative shall be taken to be correct measurements of the work. Wherever not specified in the Schedule of Quantities or elsewhere the mode of measurements shall be in accordance with the latest brochure

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issued by the Indian Standards Institutions (now renamed as Bureau of Indian Standards) on Method of measurement of Building works

- 21.3 The Contractor or his representative may, at the time of measurement, take such notes and measurements as he may require.
- 21.4 All authorized extra work. Omissions and all variations made without the Chief Engineer's knowledge, if subsequently sanctioned by him in writing, shall be included in such measurement.
- 21.5 If the contractor or his authorised representative does not record the measurements periodically for the completed works, then the site Engineer shall take measurements after giving notice in writing of at least 3 (three) days. Measurements recorded in the absence of Contractor shall be intimated with a copy of such measurements to the contractor. If the contractor fails to countersign or record objections within a week from the date of measurement, then such measurement recorded in absence by the Site Engineer shall be deemed to be accepted by and binding on the Contractor.
- 21.6 The Contractor shall, without any extra charge provide all assistance with every appliance, labour and other things necessary for taking measurements (either by him or by site Engineer) and recording levels including test checking of such measurements by any person authorised by the Employer.
- 21.7 All work shall be measured net as fixed in its place. All measurements of cutting shall be held to include for the consequent wastage on the materials used.
- 21.8 Except where any general or detail description of the works expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications notwithstanding any provision in the relevant Standard Method of measurement or any general or local custom. In the case of items for which procedure is not covered in the specification, measurement shall be taken in accordance with the relevant Standard Method of measurement issued by BIS and if for any item no such standard is available then a mutually agreed method shall be followed.
- 21.9 Measurements of all hidden/concealed items of work including extra items if any, such as, work in foundations including excavations, plinth filling, masonry, concrete etc. steel in all R.C.C. work, pipe to be encased etc. shall be jointly recorded by the contractor and Site Engineer or his authorised representative before they are covered up.

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Immediately after the work is ready for measurements, Contractor will give specific notice to the Site Engineer for recording the measurements. If the Site Engineer or his authorised representative fails to record the measurements, the Contractor will refer the matter to the Corporation's Engineer for instructions, but in no case shall cover up work without the latter's permission.

22. PAYMENTS:

22.1 The contractor shall be paid by the Employer, from time to time, by instalment under Interim Certificate to be issued by the EE to the Contractor on account of the work executed, when in the opinion of the EE, work to the approximate value named in the Appendix to the conditions of Contract as "Value of work for Interim certificate" (or less at the reasonable discretion of the Executive Engineer) has been executed in accordance with this contract, subject however to a retention of the percentage of such value mentioned in Appendix to the Conditions of Contract hereto as "Retention percentage on account of Security Deposit". The Interim Certificate shall be based upon interim Bills of Running Account Bills to be prepared by the Contractor and supported by the detailed measurements. The EE may include 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, after satisfying price of materials on basis of vouchers/bills submitted by the contractor.

In case any material have been supplied by the Employer to the contractor in connection with the work, necessary recovery for the same shall be effected from the bills of the contractor by the CE at the issue rates of such materials as stipulated while calling for tenders and in other cases at a stock rate or market rates of such materials, whichever is higher. The contractor will, however, not be entitled to modify his rates for items of work requiring use of such materials and when the work has been virtually completed and the CE shall have certified in writing that it has been so completed on the basis of detailed measurements and after obtaining written endorsement by the CE that the CE Deputy Chief Engineer has made a final Scrutiny and that there are no disputed items, rates of quantities, the contractor shall be paid by the Employer in accordance with certificate to be issued by the CE the sum of money named in the

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Appendix as Instalment after Virtual Completion and the contractor shall be entitled to the payment of the final bill in accordance with the final certificate to be issued in writing by the Deputy Chief Engineer with the approval of the CE with expiration of the period referred to as Defects Liability Period in the Appendix to Conditions of Contract hereto from the date of Virtual Completion or as soon after the expiration of such period as to work shall have been finally completed and all defects made good according to the true intent and meaning hereof, whichever shall last happen.

Provided always that the issue by the EE of any certificate during the progress of the works or at after their completion shall not relieve the contractor from his liability under Clause (2) in cases of fraud, dishonesty or fraudulent concealment relating to the work of materials or to nay 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 Deputy Chief Engineer or Executive Engineer shall of itself be conclusive evidence that any work or materials to which it related are in accordance with the contract.

The Deputy Chief Engineer may be any certificate make any correction in previous certificate which shall have been issued by the Executive Engineer.

Payment upon the EE'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.

The CE shall have power to withhold any certificate if the work or any part thereof are not being carried out to his satisfaction.

22.2 Provided always that the issue by the Corporation's Engineer 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 Corporation's Engineer shall of itself be conclusive evidence that any work or materials to which it related are in accordance with the Contract.

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- 22.3 Payment upon the Corporation's Engineer'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;
- 22.4 The CE shall have power to withhold any Certificate if the work or any parts thereof are not being carried out to his satisfaction. However, if the final certificate is not issued within the period as mentioned under Clause No.22.5, 26 due to Audit para by CTE etc., the amount involved for such items of deficient work as decided by Chief Engineer would be withheld. The same would be allowed as agreed upon by the CTE & the Chief Engineer and the final certificate would accordingly be issued and final bill passed. For such withheld amount, a simple interest @ 6% per annum shall be paid to the contractor along with the said payment. Such interest will be calculated from the last date (as mentioned in Appendix to Conditions of Contract) for honoring final certificate till the date of payment.
- 22.5 The measurements and valuation in respect of the Contract shall be completed within the "period of Final Measurement" stated in the Appendix or if not so stated then within six months of the completion of the contract works as defined in Clause (26) 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.
- 22.6 The final certificate shall be based on the submission of final measurements or overall measurements of the work (to be taken if so directed by Corporation's Engineer) with all relevant details similar to 22.1 above. The CE 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 CE after the conditions are met with as per 22.4, 22.5, 22.6 and 26 and contractor's submission of **No Claim certificate cum receipt** as per the Proforma given in Appendix to Conditions of Contract.

23. SECURED ADVANCE AGAINST MATERIALS

- 23.1 The Contractor shall be entitled to be paid advance along with interim bill against materials which are not perishable and which are in the opinion of Corporation's

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Engineer, required for the works and have been brought on site for incorporation in the work but have not been so incorporated and are safeguarded against loss due to any cause whatsoever, (refer clause no-17). The amount of such advance against materials shall be arrived at on the following basis:

- a) 80% of the market value of materials required for the work and brought on site.

OR

80% of the cost of such materials (brought on site) as derived from the relevant accepted tender rate for the particular item involving such materials, whichever is lower.

- b) Such advance payment made against materials shall be recovered from or adjusted from the interim bills as and when the materials are utilized in the work. Examples of certain perishable materials on which no advance shall be paid are Sand, Paint, Bitumen, Hard Boards/Soft Boards and other paper products, Petroleum Products, Coal Tar, Insulating Boards etc.

23.2 In case of dispute, the decision of the Chief Engineer on whether advance payment can be made against specific materials shall be final and binding.

24. UNFIXED MATERIALS AND EQUIPMENTS:

24.1 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 except by permission of the Corporation's Engineer in writing. The Employer shall have a lien on these materials and plants.

25. REMOVAL OF IMPROPER WORK:

25.1 The Corporation's Engineer 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

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default on the part of the Contractor to carry out such an order, the CE 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 EE shall be borne by the Contractor and may be deducted from any amounts due or that may become due to the Contractor.

26. VIRTUAL COMPLETION:

26.1 The work shall be completed in accordance with the Contract and to the entire satisfaction of Chief Engineer. 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 CE to this effect. The Chief Engineer after satisfying himself shall thereupon approve the virtual completion. The Defect Liability Period shall commence from the date of such certification.

27. DEFECTS AFTER COMPLETION:

27.1 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 Corporation's Engineer and within such reasonable time specified therein, be amended and made good by the Contractor at his own cost unless the CE shall decide that he ought to be paid for such amendment and for making good, and in case of default, the CE may employ and pay other persons to amend and make good such defects, shrinkage, settlement or other faults, and all damages, loss and expenses consequent thereon or incidental thereto shall be recovered from any monies due or that may become due to the Contractor. The CE 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 CE equivalent to the cost of amending such work. Should any defective work have been done or materials supplied by any Sub-Contractor employed on the work, who has been nominated or approved by the CE as provided in Clause No.16 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

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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.

28. PROVISIONAL SUMS, APPLICATION OF:

- 28.1 For all the work listed under items for which provisional sums are provided in the tender, the CE reserves the right to invite separate tenders or select or order from any manufacturer or firms at his discretion and reserves to himself the right of paying direct to persons or firms for any such work. The Contractor will not have any claims over these items, but if tenders are invited for such items, he will also be invited to quote along with others.
- 28.2 If ordered by the CE, Contractor shall be required to carry out provisional sum items at the same conditions and rates as applicable for this Contract.

29. OTHER PERSONS ENGAGED BY THE EMPLOYER:

- 29.1 CE 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.

30. SUSPENSION BY THE CONTRACTOR:

- 30.1 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 CE 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

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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 CE may proceed as provided in Clause No.31.

31. **DETERMINATION OF CONTRACT BY EMPLOYER:**

- 31.1 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 CE that he is able to carry out and fulfill the Contract and if required by the CE 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 CE 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 CE 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 CE written notice to proceed, or

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- 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 authorized 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 Corporation's Engineer 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 CE's instructions to the contrary sub-let any part of the Contract.

then and in any of the said causes, the CE 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 CE 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

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convenient, the CE 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 realized. The CE 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 CE shall be final and conclusive between the parties.

32. TERMINATION OF CONTRACT BY CONTRACTOR:

- 32.1 If payment of the amount payable by the Employer under any Certificate of the EE 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 CE 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.
- 32.2 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.

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

- 33.1 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 CE

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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.
- b. Where the Contractor desires to retain the surplus of approved materials (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 Chief Engineer, 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.

34. DISPUTES TO BE FINALLY DETERMINED BY CHIEF ENGINEER:

- 34.1 The Instruction, Decision, Opinion, Direction, Certificate or Valuation of the CE with respect to all or any of the matters under Clause (2), (3), (5), (6), (9), (14), (15), (18), (23), (27), (30), (31) and (33) hereof (which matters are herein referred to as EXCEPTED MATTERS) 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 CE or any refusal of the CE to give any of the same shall be subject to the right of Arbitration and review as given under Clause No.36.

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35. SECURITY DEPOSIT AND PERFORMANCE GUARANTEE:

35.1 Amount towards Security deposit shall be calculated as per details given under Serial No.9 of APPENDIX TO CONDITIONS OF CONTRACT in Part-II of the tender. Security Deposit can be either in Cash or in the form of Bank Guarantee.

In case of cash option, the EMD shall be retained as part of Security Deposit and balance Security Deposit shall be accumulated through deductions from Running Account Bills at 7.5% (maximum) of gross amount of bill. In case of Bank Guarantee option, 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. If the EMD is submitted in form of Bank Guarantee, then the Security Deposit should also be in the form of Bank Guarantee and if the contractor, having paid EMD in form of Bank Guarantee, wants to avail cash option for Security Deposit, then he has to deposit 1% estimated cost in form of Demand Draft/Pay Order drawn in favour of Life Insurance Corporation of India, payable at Patna within 21 days of intimation to the contractor of acceptance of tender and balance Security Deposit shall be accumulated through deductions from Running Account Bills at 7.5% (maximum) of gross amount of bill.

35.2 Performance Guarantee under 9(b) of Appendix to Conditions of Contract shall be only in the form of Bank Guarantee valid up to scheduled date of completion.

35.3 The Bank Guarantee/s shall be from any Nationalised / Scheduled Bank approved by the Chief Engineer, which is located at the Zonal Office Headquarters of L.I.C within whose jurisdiction the work falls or at the place of work.

35.4 Bank Guarantee/s (BGs) against Security Deposit (SD) and Performance Guarantee (PG) shall be executed as per the specimen pro-forma at Annexure B and C. These guarantee/s shall be submitted within 21 (twenty one) days from the date of acceptance letter.

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- 35.5 In case of failure by the contractor to furnish the Bank Guarantee against Performance Guarantee as per Cl.35.2 by the stipulated date or extended date if any, Employer shall without prejudice to any other right or remedy available in law, be at liberty to cancel the tender and forfeit the Earnest Money absolutely.
- 35.6 50% of the Security Deposit (cash option) shall be refunded after the certificate of virtual completion is issued to the contractor & provided that the employer has no claim for forfeiture of part or whole of the said deposit.
- 35.7 Balance 50% of Security deposit will be refunded to the contractor after the satisfactory completion of the defects liability period, subject to deductions for any appropriations thereof required to be made by the employer as per the conditions of contract.
- 35.8 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.
- 35.9 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.
- 35.10 Bank Guarantees towards Performance Guarantees (where applicable) shall be released after the virtual completion is issued.
- 35.11 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.
- 35.12 The Contractor should note that no interest will be allowed on any part of the Security deposit.
- 35.13 No deductions will be effected from the bills when the total security deposit is paid in the form of Bank Guarantee(s) and the EMD shall be refunded after acceptance of Bank Guarantee(s).

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- 35.14 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. However, where the contractor fails to furnish Bank Guarantee against Performance Guarantee the matter shall be dealt with as per Cl. 35.5 above.
- 35.15 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).

36. SETTLEMENT OF DISPUTES, ARBITRATION:

- 36.1 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 Chief Engineer within 15 (fifteen) days of any such matter arising. The CE 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 CE on any matter, other than EXCEPTED MATTERS, then and in any 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 (other than excepted matters) 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 CE shall be taken as final, binding and conclusive and shall not be open to arbitration.
- 36.2 Any disputes or differences that the employer may have with the contractor shall also be referred to Arbitration.
- 36.3 All disputes between the parties to the contract (other than those for which the decision of the CE 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

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referred to sole arbitration by an Arbitrator to be appointed by the Executive Director (Engineering), which shall be final and binding.

- 36.4 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.
- 36.5 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.
- 36.6 The Sole Arbitrator shall determine all matters in dispute other than EXCEPTED MATTERS (referred in Cl.No.34) which shall be referred to the Sole Arbitrator.
- 36.7 The Arbitration shall be conducted in accordance with the provisions of the Arbitration and Conciliation Act 1996 or any statutory modifications thereof.
- 36.8 The Contractor hereby also agrees that Arbitration under this Clause shall be a condition precedent to any right of action under the Contract.

37. LUMP SUM ADVANCE (APPLICABLE TO CONTRACT COSTING Rs.25 LAKHS AND ABOVE)

- 37.1 Loan will be available if required by the Contractor, and may be given as under on submission of application by him subject to other conditions being fulfilled.
- 37.2 A lump sum amount not exceeding 5% of the Contract sum may be advanced against a Bank Guarantee and at the interest rate as specified in Appendix to the Conditions of Contract, repayable half-yearly-compounded. The advance shall be utilized by the Contractor for the purpose of this Contract only and for no other purpose.
- 37.3 The Bank Guarantee (Performa at Annexure C) shall be for the equivalent amount of loan plus simple interest at specified rate plus 1% of loan amount to cover costs. The Bank Guarantee shall be from any Nationalized or approved scheduled Bank preferably located at Zonal Head Quarters of LIC or place of work and shall be valid till the date of completion as specified in Appendix to Conditions of Contract.

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- 37.4 The amount of loan which may be given to the Contractor shall be at the sole discretion of the CE and may be in one or more installments.
- 37.5 Recovery of the sums advanced by way of loan as above and of interest, thereon shall be made by deduction from the Contractor's running account bills in suitable percentages in relation to the progress of work as fixed by the CE subject to the condition that entire amount of loan with interest thereon shall be fully recovered by the time the work amounting to 75% of the Contract sum is completed or completion period whichever is earlier. Provided that if at any time the Contractor fails to execute the Contract to the satisfaction of the Employer for any reason whatsoever, the Employer shall be entitled to recall forthwith the entire amount so advanced with interest, cost and legal expenses, etc. and/or recover the whole/balance amount as the case may be, from the bill if any, payable to the Contractor or by enforcing the Bank Guarantee.
- 37.6 Whenever extension of time is granted to the Contractors for the completion of the project and where the loan is not fully recovered, Contractor shall furnish fresh Bank Guarantee for extended period of Contract for the outstanding loan amount together with specified simple interest for the remaining period and 1% of outstanding loan amount towards costs.
- 37.7 Whenever the full amount of loan plus interest has been fully recovered, the Bank Guarantee shall be released.
- 37.8 If the situation so warrants a second loan will be available if required by the contractor subject to the following conditions :
- At least 50% of the first loan stands recovered
 - The amount of the loan shall not exceed 5% of the balance amount of work.
 - The sum of amount outstanding plus amount of second loan shall not exceed 5% of the total value of work.
- 37.9 All other conditions applicable to lump-sum advance shall apply for the Second loan also.

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GENERAL INSTRUCTIONS TO CONTRACTORS FOR BUILDERS WORK

1. DRAWINGS:

- 1.1 Drawings shall be kept open for inspection at places as mentioned in the letter to the contractor from the Chief Engineer. Drawings generally include the site plan, floor plans, elevations and sections of the proposed work.

2. INSPECTION OF SITE:

- 2.1 The Tenderer shall visit and examine the site of work 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 Tenderer 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 Tenderer 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 his version of time and progress chart fitted within the specified overall period of completion (as stated in Appendix to Conditions of Contract) within 15 (fifteen) days of the communication of acceptance of the tender, to the Corporation's Engineer. In case of contractor does not come forward for any change in the time and progress

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chart as provided in the General Instruction to the contractors, it shall be presumed that the Time & progress Chart is accepted in full in letter and script to maintain the pace of the progress of the 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 or nominated Sub-Contractors 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.
- 4.4 Any failure on the part of the contractor to adhere to the starting and completion date of individual items mentioned in the chart shall entail application of the liquidated clause on whole or part at the discretion of the Chief Engineer, notwithstanding the over all period of completion stated in the appendix to the conditions of contract.

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 Corporation's Engineer likewise, be built in masonry at such places and in such a manner as the Corporation's Engineer may determine. Contractors's 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.

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7. ORDER OF WORK:

- 7.1 The Chief Engineer 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 The rate is percentage tender.

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 Sub-Contractors 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

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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.

13. **ELECTRICITY:**

13.1 The Contractor shall arrange with the concerned Electricity 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 & no dues certificate from the supplying authority along with his final bill.

14. **OFFICE FOR CORPORATION'S ENGINEER ON SITE:**

14.1 The Contractor shall at his cost, provide a separate office (of suitable size) for the Corporation's Engineer/s on site with writing tables, chairs, electric lights and fans, drinking water arrangements, etc. as directed by the Executive Engineer and clear away at completion of work and make good all work disturbed and pay all charges. The Contractor shall also provide facilities for having the Corporation Engineer's office cleaned every day and kept in good and hygienic condition.

15. **OFFICE ACCOMMODATION FOR CONTRACTOR'S STAFF :**

15.1 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.

16. **SECURITY AND PROTECTION:**

16.1 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.

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- 16.2 During inclement weather, the Contractor shall suspend concreting or plastering for such time as the Corporation's Engineer may direct and shall protect such work in course of execution from damage by approved measures.
- 16.3 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.
- 16.4 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.
- 16.5 All fences, trees, shrubs, grasses, lawn and other surfaces around the buildings or approaches thereto, which are required to be maintained are to be kept free from damage due to operations in connection with the work, at Contractor's expense.
- 16.6 The Contractor shall, at his expense, protect all projecting sills, jambs, copings, stone or concrete treads and mouldings and all concrete steps, wood work and joinery and the like from injury during the progress of the work.
- 16.7 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 CE at completion. Before giving possession, the Contractor must see that all doors, windows and ventilation etc. work easily and shall make all necessary adjustments for such smooth working.
- 17. SANITATION:**
- 17.1** 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.

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18. MINIMUM WAGES ACT:

18.1 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.

19. SHEDS FOR MATERIALS:

19.1 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.

20. TEMPORARY ROADS:

20.1 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 where so required by the Drawings at Contractor's expense unless the CE shall otherwise direct.

21. OBJECTS OF VALUE AND ANTIQUITY FOUND ON SITE:

21.1 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 Chief Engineer.

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

22.1 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



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

23. USEFUL EXCAVATED MATERIALS:

- 23.1** 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.
- 23.2** 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.

24. SIGN BOARD AND HOARDINGS:

- 24.1** 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 Chief Engineer.

25. SCIENTIFIC AND MEASURING INSTRUMENTS:

- 25.1** Theodolite, levelling instruments, 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 Corporation's Engineer.

26. TOOLS FOR MASONS:

- 26.1** 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 Site Engineer.

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27. CONTRACTOR'S MISTERIES AND SUPERVISORS:

27.1 The Contractor& Masson 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 Corporation& Engineer/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.

28. NO OVERLOADING OF SLABS:

28.1 Floors of buildings under construction shall not be loaded by stacks of materials during construction without the prior approval of Corporation& Engineer. 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.

29. ALTERNATIVE ITEMS:

29.1 In regard to alternative items, if any, specified in the Schedule of Quantities, Contractor should note that the Employer reserves the right to order the Principal item or its alternatives at the CE& discretion.

30. ATTENDANCE ON SUB-CONTRACTORS:

30.1 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.

30.2 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.

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- 30.3** 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.
- 30.4** 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 Builder's Work is completed and handed over
- 30.5** The Contractors shall, at all times, give access to workmen employed by the local or other authorities or any men directly employed on the buildings 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 Chief Engineer, 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.

31. OCCUPATION BY EMPLOYER:

- 31.1** The Employer reserves the right to occupy the works by sections as completed, as may be considered by the Chief Engineer both practicable and reasonable and without hindrance to the Contractor's progress.

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

32.1 The Contractors shall be responsible to pay all statutory levies imposed by the State and Central Government such as Income Tax/ Sales Tax/ Sales Tax on works contract, Value Added Tax (VAT), Service Tax, Excise Duty, Octroi, Building and other construction workers welfare cess tax, royalties payable to state Government on purchase of various materials like bricks, sand, aggregate etc. and the rates quoted in the tender shall allow for the same except service tax. In other words, the quoted rates shall be exclusive of Service tax. **The service tax is reimbursable to the contractor or payable by LIC to the Government of India as per financial act amended from time-to-time.**

- 32.2** Deduction at source of Income/Sales Tax on works contract and any other tax as decided by government shall be made by LIC of India as per the provisions prevailing from time to time from the Running Account or Final Bills and remitted to the concerned Taxation Authorities/State Government on behalf of the contractor.

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ANNEXURE –‘A’

PROFORMA FOR
ARTICLES OF AGREEMENT

ARTICLES OF AGREEMENT made at.....this.....day of20.....
between THE LIFE INSURANCE CORPORATION OF INDIA, a body corporate
constituted and established by the Life Insurance Corporation Act, 1956 (Act 31 of 1956)
and having its Central Office at "Yogakshema", Jeevan Bima Marg, Mumbai and its
Zonal Office at 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 é é é é é é é é é .(hereinafter called "**The Contractor**") of the other
part.

WHEREAS the Employer is desirous of constructing
theé .
and has prepared drawings and specifications and the Schedule of Quantities 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 and included in the said Abstract Schedule of Quantities at the item rates
therein set forth amounting to the contract sum of Rsé é é é é é .. hereinafter referred to
as "**the said contract Amount**".

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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 in the Specifications and/or the priced Schedule of Quantities.
2. The Employer shall pay the contractor the said Contract Amount or such other sum as shall become payable for the items and 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 _____ and only the Courts in _____ shall have jurisdiction to determine the same.
5. The contract comprises :-
 - i) Tender Documents Serial Pages é é é é é é é é ..
 - ii) Subsequent Correspondence Serial Pages é é é é é
 - iii) Architectural Drawings Serial Pages é é é é é é é é ..
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 initialled by the contractor and..... é é é é é é é
 _____ Engineer, _____ Zone, Life Insurance Corporation of India _____. The said officer is hereby authorised 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 LIFE INSURANCE CORPORATION OF INDIA, _____ ZONE, was thereto affixed and signed on its behalf by the Chief Engineer and by _____ on behalf of the

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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

CHIEF ENGINEER

1. Signature :

FOR AND ON BEHALF OF THE
LIFE INSURANCE CORPORATION
OF INDIA

Name :

Address :
.....

Date : é é é é é é é .

2. Signature :

Name :

Address :
.....

In the presence of

1. Signature :

FOR AND ON BEHALF OF THE
CONTRACTOR

Name :

M/S

Address :
.....

Date :

2. Signature :

Name :

Address :
é é é é é é é é .

CONTRACTOR

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ANNEXURE – 'B'**LIFE INSURANCE CORPORATION OF INDIA****(Refer Clause No. 35 of Conditions of Contract)****FORM OF BANK GUARANTEE IN LIEU OF SECURITY DEPOSIT****IN INDIVIDUAL CONTRACTS**

To

THE LIFE INSURANCE CORPORATION OF INDIA

In consideration of the Life Insurance Corporation of India having its _____ Zonal Office at _____ in the State of _____ (hereinafter called '**the Corporation**' 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 the Corporation 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 fulfilment 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 the Corporation 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 the Corporation 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 the Corporation on demand and without demur to the extent aforesaid.

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2. We, the said Bank further agree that the Corporation 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 the Corporation from time to time on account thereof and the decision of the Corporation in this respect shall be final and binding on us.

3. The Corporation 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 the Corporation and the said Bank shall not be released from its liability under these presents by any exercise by the Corporation 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 the Corporation or any indulgence by the Corporation 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 the Corporation 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 corporation 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

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from the expiry date, all the rights of the Corporation 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 the Corporation 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
LIFE INSURANCE CORPORATION OF INDIA.

For and on behalf of the LIC of India

(Name and Designation)

Dated:

Note No.1 * : FILL IN AS APPLICABLE

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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.**

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ANNEXURE – 'C'**LIFE INSURANCE CORPORATION OF INDIA****(Refer Clause No. 35 of Conditions of Contract)****FORM OF BANK GUARANTEE FOR PERFORMANCE GUARANTEE****IN INDIVIDUAL CONTRACTS**

To
THE LIFE INSURANCE CORPORATION OF INDIA

In consideration of the Life Insurance Corporation of India having its _____ Zonal Office at _____ in the State of _____ (hereinafter called '**the Corporation**' 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 the Corporation in connection with _____ (hereinafter called '**the said contract**') to accept a Deed of Guarantee and Indemnity as herein provided for Rs. _____ from the _____ 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 the Corporation 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 the Corporation 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 the Corporation on demand and without demur to the extent aforesaid.

2. We, the said Bank further agree that the Corporation shall be the sole judge of and as to whether the said contractor has committed any breach or breaches of any of the terms

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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 the Corporation from time to time on account thereof and the decision of the Corporation in this respect shall be final and binding on us.

3. The Corporation 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 the Corporation and the said Bank shall not be released from its liability under these presents by any exercise by the Corporation 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 the Corporation or any indulgence by the Corporation 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 the Corporation 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 corporation 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 the Corporation under this Guarantee shall cease and the Bank shall be released and discharged from all liability hereunder.

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6. We, the said bank lastly undertake not to revoke this guarantee and indemnity during its currency except with the previous consent of the Corporation 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
LIFE INSURANCE CORPORATION OF INDIA.

For and on behalf of the LIC of India

(Name and Designation)

Dated:

Note No.1 * : FILL IN AS APPLICABLE

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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.**

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ANNEXURE – 'D'

LIFE INSURANCE CORPORATION OF INDIA

(Refer clause 37 of Conditions of Contract)

FORM OF BANK GUARANTEE TO SECURE A LUMP SUM ADVANCE

To
THE LIFE INSURANCE CORPORATION OF INDIA

In consideration of the Life Insurance Corporation of India having its _____
Zonal Office at _____ in the State of _____ (hereinafter
called 'The Corporation' which expression shall unless repugnant to the subject or context
include its successors and assignees) having agreed under the terms and conditions of
contract vide its acceptance letter No. _____ dated
_____ made between _____*

_____ hereinafter
called the said Contractor and the Corporation in connection
with _____ (hereinafter
called the said 'Contract'), to make at the request of the contractor a lump sum advance of
Rs. _____ for utilizing it for the purpose of contract on his furnishing a
guarantee acceptable to the Corporation, we the _____** Bank (hereinafter
referred to as 'the said Bank') a company under the companies Act, 1956 and having our
registered office at _____ do hereby guarantee the due recovery by the
Corporation of the said advance together with interest and costs thereon according to the
terms and conditions of the said contract. If the said contractor fails to utilize the said
advance for the purpose of the contract and/or the said advance together with interest
thereon as aforesaid is not fully recovered by the Corporation, we the said Bank hereby
unconditionally and irrevocably undertake to pay to the Corporation on demand and without
demur to the extent of the sum of Rs. _____.

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1. We, the said Bank further agree that the Corporation shall be the sole judge of and as to whether the said contractor has not utilized the said advance or any part thereof for the purpose of the said contract and the extent of loss or damage caused to or suffered by The Corporation on account of the said advance together with interest and costs thereon not being recovered in full and the decision of the Corporation in this respect, shall be final and binding on us.
2. The Corporation shall have the fullest liberty without affecting in anyway 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 the advance 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 the advance or securities available to the Corporation and the said Bank shall not be released from its liability under these presents by any exercise by the Corporation 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 the Corporation or any indulgence by the Corporation 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 such liability.
3. It shall not be necessary for the Corporation to proceed against the contractor before proceeding against the Bank and the Guarantee herein contained shall be enforceable against the Bank notwithstanding any security which the Corporation may have obtained or obtain from the contractor shall at the time when proceedings are taken against the Bank hereunder be outstanding or unrealized.
4. Notwithstanding anything to the contrary hereinbefore contained the Bank's liability hereunder shall not exceed Rs. _____ (Rupees _____) in the aggregate. This Guarantee shall remain in force till the _____ day of the

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year 20é and the Bank's liability hereunder will cease to be operative unless any claim is lodged with the Bank within 6 (six) months thereafter.

5. We, the said Bank lastly undertake not to revoke this Guarantee during its currency except with the previous consent of the Corporation 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 Life Insurance Corporation of India.

For and on behalf of the

LIFE INSURANCE CORPORATION OF INDIA

(Name and Designation)

Note No.1 * : FILL IN AS APPLICABLE

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A) For Proprietary concerns:-

Shri _____ son of _____ resident of _____ carrying on business under the name and style of _____ at _____ (hereinafter called ~~the~~ 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~~ 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~~ 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.**CONTRACTOR****EMPLOYER**



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SPECIFICATIONS FOR BUILDER'S WORK

1. EXCAVATION AND EARTHWORK

1.01 GENERAL :

The excavation will generally refer to open excavation of foundation (including basement if necessary) wet or dry.

1.02 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 of the cost of the work involved.

1.03 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 stones, materials and rubbish of all kinds, slumps, bush 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 Corporation's Engineers will be handed over to the LIC. Rejected materials will be removed by the Contractor to his own dump at his own cost.

1.04 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 Corporation's Engineer and a proper record of these levels kept, which shall be jointly signed by the Contractor and the Corporation's Engineer. A block level plan showing all the ground levels of the plot shall be prepared and shall be jointly signed by the Contractor and the Corporation's Engineer.

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1.05 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 and get the same approved from the Corporation's Engineer. It shall be the responsibility of the Contractor to install substantial reference marks, bench marks etc. and maintain them as long as required by the Corporation's Engineer. The Contractor will assume full responsibility for proper setting out, alignment, elevation and dimension of each and all parts of the work.

1.06 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 basements where applicable) exactly in accordance with lines, levels, grades and curves shown on the drawings or as shall be levelled both longitudinally and transversely or stepped as directed by the Corporation's Engineer.

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

The contractors shall report to the Corporation's Engineer when the excavations are ready to receive concrete. no concrete shall be placed in foundations until the Contractor has obtained the Corporation's Engineer'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 Corporation's Engineer. 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 shall cover for the same. After the excavation is passed by

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the Corporation's Engineer (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 Corporation's Engineer on site. Refer I.S. 1200(Part-1)-1969 for classification of excavated material. Chief Engineer's interpretation regarding classification shall be final and binding on the Contractor. Excavated rock/boulders could be used for soling if approved by S.E./Executive engineer. Recovery at the market rate shall be made based on stack measurement after deducting 30% for voids.

1.07 **SHORING** :

The sides of the excavations should be timbered and shored in such a way as is necessary to secure them from failing in and the shoring shall be maintained in position as long as necessary. The Contractor shall be responsible for the 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.

1.08 **PROTECTION** :

All foundation pits, lift pits, well pits and similar excavations shall be strong fenced and marked with red lights at night 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 excavation, 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 being entirely responsible for any injury and damage to property caused by his negligence or accident due to his construction operations.

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1.09 STACKING OF EXCAVATED MATERIALS :

All materials excavated will remain the property of the L.I.C. and rate 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 such a way as to obstruct free movement of men, animals and vehicles or encroach on the area required for constructional purposes.

1.10 BACK FILLING :

All shoring and form work shall be removed after their necessity ceases and trash of any sort shall be cleaned out from the excavation. All space between foundation masonry or concrete and the sides of excavation shall be refilled to the original surface with approved excavated materials in layers 15 cm to 20 cm, in thickness, watered and rammed. The filling shall be done after concrete or masonry is fully set and done in such a way as not to cause undue thrust on any part of the structure. Where suitable excavated material is to be used for refilling, it shall be brought from the place where it was temporarily stacked and used in refilling. No excavations or foundations shall be filled in or covered up until all measurements of excavations, masonry concrete and other works below ground level are jointly recorded. Black cotton soil shall not be used for back filling or in plinth filling.

1.11 DEWATERING :

Rate 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 and 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 than the working foundation

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trench levels . The auxiliary pit shall be refill 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 Corporation's Engineer considers that the concrete/mortar is sufficiently set.

1.12 **SURPLUS EXCAVATED MATERIAL :**

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 TO INCLUDE :**

Apart from other factors mentioned elsewhere in this contract; rates for the item of excavation shall also include for the following:

- i. Clearing site
- ii. Setting out works as required and setting up bench marks 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 foundation/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 back filling or re-use as directed.
- vii. Back filling the trenches alongside masonry or concrete with approved excavated material 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.

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- ix. Removal of surplus excavated material as directed to Contractors 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 levels in regard to length and breadth and depth shall be computed from the concerned excavation levels and ground level 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 back filling the sides of excavations, 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. No borrow pits shall be opened on the site. Filling in plinth shall be done in layers of 15cm to 20cm thick, each layer being consolidated by ramming and 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.

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SPECIFICATION FOR CONCRETE

2. CONCRETE AND STEEL REINFORCEMENT 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 finalise the details in consultation with the Clerk-of works as per which from 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 Corporation's Engineers 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 test 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.

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2.6 LOADING OF FLOOR SLABS:

Materials shall not be stored or stacked on suspended floors and roofs without the Corporation's Engineer'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 Corporation's engineer before concreting operation 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 out in concrete without prior approval of the Corporation's Engineer.

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 the 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.

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2.10 MATERIALS : ALL MATERIALS SHALL BE OF APPROVED QUALITY.**2.11 CEMENT :**

- a. Ordinary port land cement shall conform to the I.S. specification I.S:269/1976. Portland Pozzolana cement shall confirm to I.S. 1489-1976. Portland slag cement shall confirm to I.S. 456-1989.
- 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 minimise 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 a base prepared of dry bricks laid on edge. The bags should not be piled against the wall. A space of 30cm shall be left all around between exterior walls and 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 he work site. The contractor shall satisfy himself that the cement brought to the work site conforms to the requirements of I.S. : 269/1976 or relevant Indian Standard and shall procure manufacturer's certificate to this effect. In his own interests. In case the Contractor has any doubt regarding the quality of cement brought on

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work site it is up to him to have it tested at his own expenses and make sure that cement is of right quality.

- d. In case Corporation's Engineer gets any doubt about quality of cements he can order the contractor to have cement tested or he can take sample 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 which there is doubt, shall not be used pending testing and satisfactory results. All cement not conforming to specifications and rejected by Corporation's Engineer and cement that is stored at site for a period long 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 AGGREGATE :**

- 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(3/16in.) and shall be graded down. The sand shall not contain any harmful material such as iron pyrites, coal mica, silt, clay, alkali, sea shells, organic impurities, loam etc. or in case of reinforced concrete work, any material which might attack the reinforcement or which might be detrimental to concrete. Aggregates which are chemically reactive with the alkalis of the cement, shall not be used, the maximum quantity of deleterious material 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.

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

TABLE 'IA'
GRADING OF FINE AGGREGATES

(In accordance with IS:2386/1963 Part-1) percentage passing for

Sieve	Zone-1	Zone-2	Zone-3
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 - 59	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 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

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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 reasonably uniform throughout the progress of work.
- d. Contractor shall arrange to supply coarse aggregates in single sizes, conforming in the case of each nominal size, to the grading given in the following table (Table 1B) under column "A", the single sizes shall be combined in suitable proportions to get desired overall grading of aggregates. The Corporation's Engineer, 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-1B under column "B".

TABLE 1- B COARSE AGGREGATES

COLUMN A

COLUMN B

**Percentage passing for single sized
aggregates**

**Percentage passing for graded
aggregates**

IS sieve Mm	63mm	40mm	20mm	16mm	12.50mm	10mm	40mm	20mm	16mm	12.50mm
80	100	-	-	-	-	-	100	-	-	-
63	85-100	100	-	-	-	-	-	-	-	-
40	0-30	85-100	100	-	-	-	95-100	100	-	-
20	0-5	0-20	85-100	100	-	-	30-70	95-100	100	100
16	--	-	-	85-100	100	-	-	-	90-100	-
12.50	-	-	-	-	85-100	100	-	-	-	90-100
10	0-5	0-5	0-20	0-30	0-45	85-100	10-35	25-55	30-70	40-85
4.75	-	-	0-5	0-5	0-10	0-20	0-5	0-10	0-10	0-10

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2.36	-	-	-	-	-	0-5	-	-	-	-
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e. Size of Aggregates:-

- (i) Nominal maximum size of aggregates in beams and columns should be restricted to 5mm less than the minimum clear distance between the main bars or 5mm 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 20mm 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 surround 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 45percent to 75 percent of the total aggregate (fine plus coarse) shall 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 10cm deep shall be left undisturbed while removing the material for use.

h. 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 Corporation's engineers. Washing the aggregates by means of hose pipe is not

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permitted. Silt and find dust permitted in coarse aggregate is only upto 1% by weight.

2.15 WATER :

Water used for both mixing and curing shall be potable and free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials or other substance that may be deleterious materials which are likely to affect the strength or durability of concrete or steel. Water containing any sugar shall not be allowed for use. Also water which fails to satisfy the following requirements shall not be used:-

- a. To neutralise 100ml. sample of water, using mixed indicator, it should not require more than 25ml. of 0.02 normal H_2SO_4 .
- b. To neutralise of 100 ml. sample of water, using phenolphthalein as an indicator , it should not require more than 5ml. of 0.02 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)	400 mg/litre.
Chloride(as Cl)	2000 mg/litre for P.C.C.
	500 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 / Design mix / RMC such as 1:4:8, 1:3:6, 1:2:4, 1:1.5:3, 1:1:2 / M15, M20, M25 etc.

2.17 BATCHING :

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The quantity of cement shall be determined by weight. Batching of cement and water shall be as specified in Paras 2.20 and 2.22 respectively.

2.18a. In proportioning concrete the quantity of cement shall be determined by weight. One bag of cement containing 50kgs. of cement shall be assumed to contain 35 litres (1;20Cft). The quantities of fine and coarse aggregates and water shall be determined by volume. If fine aggregate is moist allowance shall be made for bulking in accordance with filled method of determining the necessary adjustment for the bulking of fine aggregates. Moisture causes loosely filled sand to occupy a larger volume than it would occupy if dry. It is therefore necessary to increase the volume of sand by the % of baulking. The correction shall be made on the following lines :-

In a 250 cu. cm. measuring cylinder pour the sample of the fine aggregate (Sand) to be used at site, consolidate it by shaking, until it reaches 200 cu. cm. mark. Then fill the cylinder with water and air the sand well. The water must be sufficient to completely submerge the sand. The sand surface will be seen below its original level. Suppose other surface is at mark 'X' Cu. cm. The % of baulking of sand due to moisture shall be calculated from the following formula

$$\text{Percentage of baulking 'K'} = \left[\frac{200 - X}{X} \right] \times 100$$

$$\text{Therefore true volume} = \frac{100 \times \text{Measured Volume}}{K + 100}$$

- b. The water cement ratios shall not be more than those specified in Table it below. in case mechanical, vibrators are used, water content shall be suitably reduced, without reducing cement content, to avoid aggregation. 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 Corporation's Engineer shall be obtained for this purpose. When the water content is increased in the manner indicated above, the cement content also shall be increased

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proportionately so that water cement ratio given in Table II is maintained. Cost of extra cement shall be borne by the contractor.

TABLE II

Mix of concrete	Quantity of water 50kg Of cement. Max. litre
1:3:5	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 water content. Surface water shall be determined by one of the field methods described in IS:2386(Part II)/1963. In the absence of exact data, with the approval of the Corporation's Engineer 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 water in litre/Cu.M.
Very wet sand	120
Moderately wet sand	80
Moist sand	40
Moist gravel or crushed rock	20 to 40
Coarser the aggregate lesser water it will carry	

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

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test or compacting factor test shall be carried out at intervals as directed by the Corporation's Engineer. The slump test is suitable for slump of 5cm to 15cm.

2.20 **MIXING AND PLACING OF CONCRETE: MEASUREMENT OF MATERIALS:**

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 Corporation's Engineer 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 aggregates becomes, fine, and maximum size of coarse aggregates becomes larger.

i). For an average grading fine aggregate i.e. Zone II of IS: 2386/1963 Part I the ratios of fine aggregate to coarse aggregates shall be:

Maximum size of coarse aggregate	Maximum size of coarse aggregate
10mm	20 mm
1:1 ½	1:2

For fine aggregates within their grading zones the ratio shall be increased as the fine aggregate gets finer, that is, passes from zone I to III.

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

Zone I	Zone II	Zone III
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1:1.1/2

1:2

1:3

- b. The measuring boxes prepared for measuring the aggregates shall be of correct size. The measuring boxes are required to be certified by Corporation's Engineer before they are used on site. Internal dimensions of the boxes shall be generally 35cm x 25cm 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 Corporation's Engineer. Refer clause no- 2.18

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 ration is of utmost importance and adequate attention to this requirement by the Contractor to the satisfaction of Corporation's Engineer, 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: 1791/1963 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 Corporation's Engineer. 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

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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 rehandling 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 the initial setting time and shall not be disturbed subsequently. Concreting shall be carried out continuously upto 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 hacked, 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. REMOVED :**

All debris, saw dust, etc. shall be removed from the shuttering before any concrete is placed. Care shall be taken to see that the shuttering is watertight and has been properly treated with approved composition to prevent absorption of water.

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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 of beams and slabs shall be erected in such a way that the shuttering on the sides of the beams and soffits of slabs can be removed without disturbing the beam bottoms. Re-propping 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 1M deep in walls, columns and similar members. Concrete after placing shall be protected by use of covering to the approval of the Corporation's Engineer 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 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 stand by) of adequate capacities shall be used for compaction of concrete. Vibration 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

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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 mode 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 Corporation's Engineer. Rest pauses for meals etc. shall be subject to the Corporation's Engineer's approval.

2.30 **PACKING ROUND 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 concrete 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 effect the concrete over a radius of at least 450 mm(18") when used in concrete having slump of 25mm. A sufficient number of vibrators (at least one vibrator for a rate of concreting of 1.5 Cum.i.e 50 Cu. ft per hour) shall be employed so that vibration throughout the entire volume of each layer of concrete and complete compaction are secured.
- b. Manipulation of vibrators: Internal vibrators shall be keep constantly moving in the concrete and shall be applied at points uniformly placed not farther apart

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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 air bubbles have practically cease 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 of burlaps will not be allowed. In respect of concrete made out of pozzalana cement curing shall be continued for another eight days, viz. fifteen days in all.

2.33 **TRADING SUPERVISOR** :

It is essential that the contractor's supervisor who is in charge of the construction an all concrete works, 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.

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2.34 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 15cm 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
1:1 ½ :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 CRITERION 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 criterion 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 :

- 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

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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 despatch of cubes to laboratory will be carried out by the Contractor under the joint supervision of the Corporation's Engineer 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 for 28 days in a laboratory approved by the Chief Engineer.
- c. The cubes shall be initialled jointly by Contractor's representative and the Corporation's Engineer with a piece of wire on 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 Corporation's Engineer. 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 Corporation's Engineer with the following details entered and initialled by the contractor and the Corporation's Engineer:-
 - 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 cubes 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 Chief Engineer.

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- 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 take out shall be properly demarcated with cube references entered in the drawing at the relevant portions. This record shall be initialled by the contractor and maintained by the Corporation's Engineer.
- g. Samples size and acceptance criteria: All tests shall be carried out in accordance with IS:516-1959. The number of test specimens 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 :**

Seven days tests: 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 test result is not satisfactory all further work structurally interlinked with the concrete represented by the samples shall be stopped unless otherwise decided by Chief Engineer.

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 rate at the discretion of the Chief Engineer.
- c. If the average compressive strength of three cubes is less than 85% of the specified strength, Chief Engineer shall reject and get dismantled the defective portion of the work represented by the sample along with the structurally connected work as considered necessary at the risk and cost of the Contractor. In case of (b) and (c) above, Chief Engineer, 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. to be carried out. All the charges in connection

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with these additional tests shall be borne by the contractor. If on the basis of these additional tests the Chief Engineer 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 Chief Engineer does not accept the poor or defective concrete and orders the same to be dismantled then the contractor shall dismantle such concrete at his expense and reconstruct the same to the Chief Engineer's satisfaction. Concrete thus dismantled will not be measured and paid for. The additional work if any, required to be carried out for reconcreting, shall be to the contractor's account.

2.40 CONCRETE RETAINED WITH RECTIFICATION :

Where the Chief Engineer 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 measures to Chief Engineer's approval at his expense. The concrete thus strengthened and accepted shall however, be paid at reduced rate (for mixes of concrete refer table IV under para 2.34).

2.41 QUANTITY 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 Chief Engineer whose decision shall be final and binding on the contractor.

In all cases of Design Mix Concrete the sampling, strength of designed concrete mix, acceptance criteria, inspection and testing of structures, clause no – 15, clause no – 16 and clause – 17 (along with all sub clauses under clause no – 15, clause – 16, clause – 17) of IS 456 : 2000 shall be applicable.

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

AGGREGATE							CONCRETE					
Separation		Grading	Tests	Batching			Test					
Fine	Coarse		Moisture determination	Cement	Aggregates	Workability	Minimum number of Specimens (15 em cubes)		Strength (Works Test Only) Minimum Frequency			Criteria for Acceptance
							7 days	28 days	Quantity In M ³	No. of samples	In Terms of Period	
							Compressive Strength Test	Compressive Strength Test				
One Size	Single Sized aggregate in two sizes (20mm 10 mm) for maximum 20mm size aggregates or	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 corporation's Engineers.	3	3	1-5	1	As	Refer Para
	In three sizes (40mm, 20mm, 10mm) for max- 40mm sized aggregates or if approved by EE graded aggregates conforming to Table under Para 2.14 (d)								6-15	2	decided	2.38
									16-30	3	by	
									31-50	4	E.E.	
									51 & above	4+1 additional sample for each 50 M ³ or part thereof.		

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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 Corporation's Engineer and decision given regarding the acceptance with rectification or rejection of the same. If contractor patches up such defects without the knowledge of the Corporation's Engineer, the corporation's Engineer 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 Corporation's Engineer the honeycombing is harmful to the structure and where so directed by the Chief Engineer, the full structural members affected by honeycombing as decided by Chief Engineer shall be dismantled and reconstructed to Chief Engineer's approval at contractor's expense. The demolished concrete will not be measured and paid for.

Such honeycombed areas which are not severe in the opinion of Corporation's Engineering and can 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.

- c. Such honeycombed areas which are not severe in the opinion of Corporation's Engineer and can 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 10mm thick and each layer is given a scratch finish to secure bond with the succeeding layer.

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2.43 OTHER DEFECTS :

Any other defects in concrete shall be made good as directed by the Chief Engineer 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 1½ 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 locations where he proposes to provide construction joints and get them approved from the Corporation's Engineer prior to concreting.

b. Stop boards:

All vertical construction joints shall be formed with proper wooden stop board at the joint. Where directed the joint shall be rebated or joggled and be of approved shape.

c. Water bars:

Wherever water bars/stops are specified, the same shall be provided as per drawings or as directed. It is necessary to ensure that water bars form continuous diaphragms. When PVC water bars/stops are provided the joints shall be properly heated and fused as per manufacturers' specifications.



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2.46 CONSTRUCTION JOINTS IN BASEMENT :

- a. Location and formation:
Contractor shall prepare a drawing showing the proposed constructions joints and have it approved by the Corporation's Engineer. After 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 the 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 well 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 walls shall be rebated and care shall be taken to establish a proper and good bond between the hardened concrete and freshly laid concrete to produce a watertight joint which shall be contractor's responsibility. P.V.C. water bars shall be provided for horizontal joints in walls.

Wall slab junctions: 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 joint at the time of concreting the slab.



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2.47 TREATMENT OF CONSTRUCTION JOINTS IN BASEMENTS :

- 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 12mm layer or mortar composed of cement and sand in the same ratio as cement and sand in the concrete mix. This 12mm layer of mortar shall be freshly mixed and placed immediately before the placing of the concrete.
- b. Where 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 coated with thin 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 75mm below the lowest soffit of the beams meeting at the head of the column or 12mm below the top of anchor bar projected from the floor beam into the column which ever is lower. Concrete in the head of a column where one or more beams meet 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.



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c. **SLAB** :

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 with the materials used to form the expansion joints like fillers, G.I. strips etc.

c. Filler material for expansion joints shall be Shalitek 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 25mm from the exposed faces.

d. Contractor shall ensure that expansion joints are made watertight and the 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, walls, etc. Water tanks and the like where concrete of 1: 1½ :3 mix or richer mix is specified, will be considered as watertight concrete whether so specifically 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 Chief Engineer directs.



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2.51 FORM WORK : MATERIALS AND DESIGN :

- a. The form work shall be to timber or plywood or steel. If any particular material or materials be specified in the Schedule of quantities for form work 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 rigidity to hold concrete and withstand the pressure of ramming 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 RCC 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. A camber in all directions of 6mm for every 5M 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 of their being struck without jarring the concrete.
- d. Temporary opening shall be provided at the base of column form 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

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position until the newly constructed work is able to support itself. Props shall be securely braced against lateral deflection. Where timber props are used like bullies, they shall be of a minimum diameter of 10cm. 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 corporation's Engineer and any alterations suggested by him shall be carried out at contractor's expense. Bracing shall be provided as directed without extra cost. Contractor shall allow in his rates 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, shavings and sawdust, 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 authorised by the Corporation's Engineer and shall then be removed with care so as to avoid injury to concrete. In no circumstances shall forms be struck until the concrete reaches a 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 aggregates 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.

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2.55 STRIPPING TIME :

Removal of form work (stripping time): In normal circumstance and where various types of cements are used, forms, may generally be removed after the expiry of the following periods:

TABLE - VI

Type of form work	Minimum period before striking form work for OPC 33 grade	Minimum period before striking form work for OPC 43 grade	Minimum period before striking form work for PPC
(a) Vertical form work to column, walls, beams	16 ÷ 24 hrs.	16 ÷ 24 hrs.	24 ÷ 36 hrs.
(b) Soffit form work to slabs (Props to be refixed immediately after removal of form work)	3 days	3 days	4 days
(c) Soffit form work to beams (Props to be refixed immediately after removal of form work)	7 days	7 days	10 days
(d) Props to slabs: (i) Spanning upto 4.5m (ii) Spanning over 4.5m	7 days 14 days	7 days 14 days	10 days 20 days
(e) Props to beams: (i) Spanning upto 6.0m (ii) Spanning over 6.0m	14 days 21 days	14 days 21 days	20 days 30 days

Note 1: For other type of cement, the stripping time recommended for ordinary Portland cement may be suitably modified. Generally if Portland Pozzolana or low heat cement or OPC with direct addition of fly ash has been used for concrete, the stripping time will be 10/7 of the period stated for OPC with 43 grade cement above.

Note 2: The number of props left under, their sizes and disposition shall be such as to be able to safely carry the full dead load of the slabs, beam or arch as the case may be together with any live load likely to occur during curing or further construction.

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Note 3: For rapid hardening cement, 3/7 of above period for OPC 33 grade will be sufficient in all cases except for vertical side of slabs, beams and columns which should be retained for at least 24 hours.

Note 4: In case of cantilever slabs, beams, the centering shall remain till structures for counter acting or bearing down have been erected and have attained sufficient strength.

Note 5: Proper precautions should be taken to allow for the decrease in the rate of hardening that occurs with all types of cement in cold weather and accordingly stripping time shall be increased.

Note 6: Work damaged through premature or careless removal of forms shall be reconstructed within 24 hours.

2.56 FORM WORK IN LIFTS FOR CONTINUOUS SURFACES :

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 of mortar from the concrete and do 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 drawings 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 upto 4M in length, a tolerance upto 3mm will be allowed.
- b. On lengths of more than 4M tolerance of not more than 5mm will be allowed.

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- c. On the cross sectional dimensions of columns, beams, slabs, facia, chhajjas, mullions, grilles, fins, louvers and such other members tolerance of more than 2mm will not be allowed
- d. The top surface of concrete floor slab shall be within 6mm of the level and line shown on the drawings.
- e. Column and walls and other vertical members shall not be more than 3mm out of plumb in their storey height and not more than 6mm out of plumb in their full height.
- f. If the work is not carried out within the tolerances set out above in (a) to (e) , the cost of all rectification measures or dismantling and reconstructing as decided by the Chief Engineer shall be borne by the contractor. In case work is dismantled, the same shall not be measured and paid for.

2.59 CONTRACTOR'S RATES FOR CONCRETE TO INCLUDE :

The rates of contractor 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, vibrating, towelling, 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 include for providing and fixing from work as described inclusive of erecting, propping to required heights, bracing, providing slays, struts, bolts nuts and everything necessary to keep the forms rigid, smoothening the surface to receive concrete as per detailed drawings, striking and stripping form work after the concrete is cure, hacking the concrete surface required to receive plaster etc.

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- 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 around 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 for concrete items shall cover for any shape of structural members like columns, beams fascias, fins, louvers, etc. and of cantilevered 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 joints fillers like "shalitex" or other equal and approved make are specified, such materials shall be paid for 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 these 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 spill over of richer concrete in beams to natural angle of repose of wet concrete required from practical considerations, while concreting the junctions
- l. For forming chambers, bands and drip moulds in columns, beams, slabs, chajjas, fascias, sills, coping etc. and where shown in the drawings or as directed;
- m) For work at all levels.

2.61 STEEL REINFORCEMENT AND IRON WORK :MILD STEEL BARS: Mild steel reinforcement bars shall conform to IS 226-1962 "Standard Quality" or I.S.432-1960 "Grade 1" Other qualities of steel shall not be acceptable.

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HIGH STRENGTH DEFORMED BARS:

Wherever deformed high strength reinforcement bars are specified, the Contractor shall use one of the following, accompanied by a certificate from the Manufacturer.

- a. "Tistong-11" as manufactured by M/s TATA Iron & Steel Co. conforming to IS:1139-1966.
- b. "Tor steel" as manufactured by M/s Hindusthan Steel or other manufacturers under licence from M/s Istag Steel Corporation of Luxemburg, conforming to IS:1786-1966.
- c. Where "Tistrong -11" or "Torsteel" is specified, they shall be used as per the recommendations of the manufacturers.

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 drawing 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 secure in position and firmly supported or wedged by precast concrete blocks of suitable thickness, at sufficiently close in travels 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.

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2.64 BINDING WIRE :

The reinforcement shall be securely bound wherever bars cross or required with annealed steel binding wire of size not less than 0.9 mm and Conforming to IS 280-1962.

2.65 WELDING :

Welding of bars shall not be carried out unless specially authorised in writing by the Chief Engineer.

2.66 BENDS ETC :

Bends, cranks 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 of 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 bar to facilitate bending will not be permitted. The bars shall always be bent by heating with written permission of the Executive Engineer. 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 anyway in bending shall not be used on the work. High strength deformed bars shall in no case be heated to facilitate binding or cranking.

2.67 INSPECTION OF REINFORCEMENT :

No concreting shall be commenced until the Corporation's Engineer 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 Corporation's Engineer by the Contractor for inspection of reinforcement. If in the opinion of the Corporation's Engineer 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 Corporation's Engineer and to his entire satisfaction.

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2.68 NETT MEASUREMENTS :

Reinforcement shall be placed as shown on the structural drawings and payment will be made on the net measurement from drawings. Only such laps, dowels, chairs and pins on reinforcement as approved by the Executive Engineer of 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, 25mm or twice the diameter of such rod or bar, whichever is greater.
- b. For a longitudinal reinforcing bar in a beam, 25mm or the diameter of such rod or bar, whichever is greater.
- c. For tensile, compressive, shear or other reinforcement in a slab, 15 mm, or the diameter of such reinforcement, whichever is greater.
- d. For reinforcement in any other member such as a lintel, chhajja, Canopy or pardi, 13mm, or the diameters of such reinforcement, whichever is greater.
- e. For main reinforcement in isolated footings (side and bottom) clear cover be 50mm.
- f. For column bars clear cover shall be 40mm, unless otherwise specified in drawing.
- g. For bars in slabs of strip footings and mat foundations, the clear cover shall be 30mm. Beam bars shall be placed over slab bars in respect of beam and slab type foundations.

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2.70 STOCK AND PILLING OF STEEL :

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

2.71 RATES QUOTED 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 drawing.
- b. Cost of binding wire required as described. The weight of binding, wire will not be accounted for in the measurements.
- c. Cost of precast concrete cover blocks to maintain cover and holding reinforcement in position.
- d. For fabricating and fixing reinforcement in any structural member irrespective of its location, dimensions and level.
- e. Removal of rust and every other undesirable substances, using wire brush etc. as described.
- f. Stock piling of reinforcement as described.
- g. Work at all levels.

2.72 RATE FOR M.S. RAILING, GRILLS, ROLLING SHUTTER, GRILL DOOR, LADDER, RUNG LADDER, WELDMESH GRILLS, FAN HOOKS ETC., SHALL INCLUDE FOR THE FOLLOWING:-

- a. Fabrication, cutting and bending to required size and shape, drilling, punching, counter sinking, welding, fitting, etc. finishing erecting, fixing in position.
- b. Wherever the M.S. grills/railing/rolling shutter/M.S. Weld mesh grille are required to be fixed to brick/concrete jambs/floor, they shall be fixed by means of required size and number of M.S. lugs and embedded/grouted in cement

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concrete block 1:2:4 and/or fixed by means of suitable counter sunk screws with rawl plugs.

- c. Wherever the M.S. grills are required to be fixed to frames of steel windows and ventilators, they shall be fixed by welding.
 - d. Grille door shall be fixed by means of M.S. holdfasts of required numbers, size and shape as approved, embedding/grouting the holdfasts in 1:2:4 cement concrete block and/or rag bolts and nuts of approved size.
 - e. Both legs of both ends of M.S. ladders shall be fixed to concrete floor/slab by embedding/grouting in 1:2:4 cement concrete block/base of required size.
 - f. M.S. rung ladders shall be fixed in brick/concrete work by embedding/grouting as required in 1:2:4 cement concrete.
 - g. In case of M.S. grill doors the contractor shall provide and fix G.I. pipe pieces of suitable size wherever required, duly inserted in brick/concrete jambs to accommodate the sliding rod of aldrop.
 - h. The fixing accessories like M.S. holdfasts, lugs, screws, rawl plugs, concrete for embedding/grouting, bolts and nuts of any type, G.I. pipe pieces and such other accessories for fixing, shall not be considered in the measurement of the weight/quantity and shall not be paid separately.
 - i. Rates quoted for M.S. guard bars/M.S. grills to windows and ventilators shall also include for making holes in frames of windows and ventilators/fan lights wherever required.
- 2.73** Except for bar reinforcement, all exposed steel, cast iron, wrought iron and mild steel work shall be painted with two coats of synthetic enamel paint (first quality) of approved colour and shade over a coat of red oxide primer, manufactured by M/s Alkali and Chemical corporation of India, M/s Garware paints, M/s Goodlass Nerolac, M/s Jenson & Nicholson, M/s British paints or other equal and approved. Rate quoted shall include for above. Although, three coats of paint are specified, Contractor will have to do additional coats of paint if well finished surface is not obtained to the satisfaction of the S.E./E.E. and there shall be no extra payment on account of this.

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2.74 M/s rounds for M.S. guard bars to windows/ventilators and M.S. rounds for rung ladders shall be supplied by contractor.

2.75 **MEASUREMENT :**

Weight of the steel reinforcement bars (mild Steel and high strength deformed bars) used in the construction shall be on the basis of the length incorporated in concrete and shall be computed in accordance with the table given below:

Diameter	mm.	Weight per Metre length in kgs.
6		0.222
8		0.395
10		0.617
12		0.888
16		1.579
20		2.467
22		2.985
25		3.855
28		4.836
32		6.316

(The weight per metre of bars given in the table above are calculated on the basis that steel weights 7.85 g/cm³. In case of any error or omission in this table, the weight per metre length in kgs. shall be computed on the basis of actual area and taking the density of steel as 7.85 g/cm³).

2.76 For measurement of rolling shutter the area of the actual opening covered shall be considered.

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3. UNCOURSED RUBBLE MASONRY

3.1 GENERAL :

Stones to be used in the masonry shall be hard, sound, free from cracks, flaws or defects and shall be from approved quarries.

3.2 QUALITY OF RUBBLE STONE :

Rubble stones for hearting shall be of approved quality, sound, hard, dense and durable, free from segregation, seams, cracks, weathered portions and other structural defects or imperfections tending to affect their soundness and strength. Stones shall generally be freshly quarried with sharp edges, and clean faces. They shall be free from rounded, worm or weathered surfaces, or skin or coating which prevents the adherence of mortar. Size and shape of stone shall be as per the requirement.

3.3 QUALITY OF OTHER STONES :

Stones to be used as headers, quoins, copings, etc., shall comply with the requirements of facing and hearting as may be relevant and shall further comply with the requirement of size and shape.

3.4 FACE STONES :

Face stones shall generally comply with specifications 3.2 above. The face stones shall be selected from the mass of quarry stones for their greater size, and good beds, close grain and uniform colour. 50% of the stones shall be more than 0.010 cum. or 10 litres, in walls up to 50 cm. in thickness and 0.015 cum. or 15 litres in thicker walls. The beds and joints shall have an average bearing of not less than 2 cm.

3.5 HEARTING AND BACKING STONES :

These stones shall comply with specification 3.4 above in walls of 50 cm. and less about 30 % of the stones shall not be less than 0.010 cum. or 10 litres and for thicker wall about 30 % of stones shall not be less than 0.015 cum., or 15 litres.



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3.6 QUOINS :

The quoins shall be of selected stone and shall normally be 19 cm x 24 cm x 39 cm or as directed by the E.E. The faces of quoins shall be rough tooled with 40 mm chisel drafts at the corner edges

The beds and tops shall be dressed square to the face and rough tooled to 10cm. from the face and vertical joints similarly dressed to 40 cm from the face. In the embedded portion the length of the side shall not be less than that of the exposed side opposite by more than 8 cm. for the longer side and 5 cm. for the shorter side.

3.7 THROUGH STONES :

One through stone shall be provided per half square metre of facing evenly distributed in a staggered pattern. They shall be about 0.03 sqm. in face area and shall a tailing of the full width of the masonry when the width of the masonry is 60 cm. or less. If the wall or masonry be over 60 cm. thick a line of header over lapping each other by at least 15 cm shall be laid right through the wall from face to back. The length of the interior headers shall not be less than 45 cm and their average cross sectional area shall not be less than 0.025 sqm. face header shall be distinctly marked on its face.

3.8 SAMPLES :

Samples of stones including quoins and headers to be used in the work shall be got approved by the E.E. before the work is started and such samples shall be maintained in the Corporation's Engineer's Office at site.

3.9 MORTAR :

Unless otherwise mentioned the mortar for masonry work shall be composed of 1 part of cement : 5 parts of coarse approved sand. Sand for masonry mortar shall be as per I.S. 2116-1965 as applicable to unreinforced masonry work.

3.10 SCAFFOLDING :

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 logs are removed after ensuring that the holes behind are solidly filled in with 1:4:8 cement concrete.

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3.11 **CONSTRUCTING DETAILS :**

The masonry shall be laid to lines, levels, curve and shapes as shown on the drawings. Fixtures, plugs, frames, pipes, conduits, etc. if any shall be built in at places shown on the plan or as directed while laying the masonry and not later by removing the stones already laid.

- a. Stones in the hearting shall be laid on their broadest face which gives better opportunity to fill the space between stones.
- b. Stratified stones must be laid on their natural beds. All beds joints shall be normal to the pressure upon them.
- c. In battered walls, the beds of stone and the place of course should be at right angles to the batter.
- d. If masonry is to be laid directly on the excavated bed or on concrete footing the bed or footing shall be cleared of all loose materials, cleaned and wetted just before laying masonry. Buildings shall not project more than 40mm in faces where joints are to be pointed or struck and 12mm in faces proposed to be plastered. Quoins in the unexposed portions shall have uniform chisel drafts of 40mm in the exposed portions and up to 15 cm. below the finished ground level, quoins shall be rough tooled, with 40mm chisel drafts at the corner edges.
- e. The face stones shall be laid without any pinning on the exposed faces. In each course the headers or lines of headers as the case may be shall be kept in position as specified intervals and with specified laps where such laps are required before the masonry of the layer is commenced to ensure that they are being laid properly and in required numbers and intervals. They shall be embedded in mortar as masonry in that layer progresses. Quoins shall be laid stretcher and header wise as seen on each face and shall correspond to the arrangement of quoins in the same course.

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- f. The stones shall be wetted before laying in mortar. Each mason shall be supplied by the Contractor with a vessel full of water and tumbler for wetting stones, care being taken not to spill any water on green masonry. The bed which is to receive the stone shall be cleaned, wetted and covered with a layer of fresh mortar. All stone shall be laid full in mortar both in bed and vertical joints and settled carefully in place with a wooden mallet immediately on placement and solidly bedded in mortar before it has set. Clean chips and spells, carefully selected to fit in the spaces shall be wedged in to mortar joints and beds wherever necessary, to avoid thick beds or joints of mortar. When the foundation masonry is laid directly on rock, the face stones of the first course shall be dressed to fit into the rock snugly when pressed drawn in the mortar bedding over the rock. No dry or hollow space shall have at the embedded faces completely covered with mortar. If a portion of masonry is dismantled every stone must be found with mortar adhering fast to all its embedded surface and there shall be no hollows. This will be one of the tests in deciding if the masonry is good or bad if need arises. Where hollows or other defects are suspected a stone here or there may be removed for confirmation. If these are confirmed such portions shall be dismantled and rebuilt at the cost of the Contractor.
- g. Face work and hearting shall be brought up evenly but the top of each course shall not be levelled up by use of flat chips.
- h. No face joints shall exceed 16mm and the same shall be struck while mortar is fresh.
- i. The face joints should be properly struck while the mortar is fresh. When no pointing or plastering is to be done, but its plastering and pointing is required to be done, the joints shall be raked out when the mortar is fresh.

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- j. Stones in corners of walls and angles which are to be plastered shall be rounded. The corners shall also be rounded in plaster while plastering. The frames of doors, windows, cupboards, etc., shall be housed into the masonry while laying the masonry only. Chisel dressing for the width of door and window frames shall be done to obtain good fit between the frame and the masonry. Jambs shall be made up of quoins only. Where shown to other than square than square the jambs shall be splayed to conform to the drawings or the instructions of E.E. and shall be true to the template. Quoins of the full thickness of the wall shall be provided at the rate of 3 of each side of the door opening and 2 for each side of the window opening when the wall is 40mm thick or less in thicker walls, two quoins may be used to make up the full thickness of the wall with break of joint of not less than 8cm with stones above and below.
- k. Holes of the required size and shape shall be left in the masonry during construction alone for fixing pipes, service lines, passage of water etc. after the service lines, pipes etc., are fixed the extra hollow left shall be filled with 1:3 cement mortar or 1:3:6 cement concrete and the face shall be finished with matching stones.
- l. The top of masonry, on which coping, R.C.C. slab or other flooring is to be laid, shall be finished level or to the required slope with stones and mortar to give an even bearing. Bed blocks of stone or R.C.C. shall be built up in the masonry under the beams, if separately provided in the tender.

3.12 RATE OF RAISING MASONRY :

The rate of raising uncoursed rubble masonry brought up in uniform levels may be limited to a height of 69 cm per day in case of cement mortar and 45 cm in the case of lime mortar. But no fresh course shall be laid over masonry previously laid within 4 hours of its laying for cement mortar and 8 hours for lime mortar.

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3.13 WATERING :

All masonry work shall be kept well watered for 14 days after laying. Where pozzolana cement is used for mortar, the curing shall be extended by one week at the Contractor's expense.

3.14 RATE TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the rate for items to masonry work shall include for the following :-

- a. Constructing stone masonry work, including quoins, headers etc., in cement mortar to lines, levels, batters, piers, pillars curves and to any position or shape, to any heights or levels including raking out joints and housing frames fixtures, pipes, rawl plugs, making grooves, rebates, chamfers, making square or splayed jambs, and raking out joints for plastering/pointing and striking out joints wherever directed.
- b. All labour materials, use of tools, equipment and other items incidental to the satisfactory completion of stone masonry.
- c. Erecting and removing of all scaffolding, ladders and plant required for the execution of the work to the height and depths and shapes as shown on the planor as ordered by the E.E.
- d. Curing the stone work.
- e. Removing of all stains and adhering mortar pumps on the stone work surfaces.

3.15 MODE OF MEASUREMENT :

- a. Stone masonry work shall be measured in cubic metre. When measuring walls, the thickness shall be measured to the nearest one centimetre, namely fractions including 0.5 cm and above shall be measured as one centimetre and fractions below 0.5 cm. shall be ignored.

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- b. No deduction or addition shall be made on any account for :-
 - i. Ends of dissimilar materials (i.e., joists, beams, lintels, posts, girders, rafters, purlins, trusses, corbels, steps etc.) up to 500 cm² in section.
 - ii. Openings up to 0.1 m² in sections.

NOTE :

In calculating the area of opening, any separate lintels or sills shall be included along with the size of the openings but the end portions of lintels shall be excluded (see (b)) (i) and the extra width of rebated reveals, if any, shall also be excluded.

Wall plates and bed plated, and bearing of slabs, CHAJJAS and the like, where the thickness does not exceed 10 cm. and the bearing does not extend over the full thickness of the wall.



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4. BRICK WORK

4.1 BRICKS :

- a. The bricks shall be table moulded first quality of regular and uniform size, shape and colour, uniformly well burnt through out 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 first faces.
- b. They shall give a clear 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, lamination, cracks, airholes, soluble salts causing efflorescence of other defects which may in any way impair their strength, durability, appearance or usefulness for the purpose intended. They shall not have 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 60 cm.
- d. Bricks of one standard size shall be used on one work unless specially permitted by the Executive Engineer. In part of Eastern Zone (i.e., West Bengal, Assam and Bihar etc.) bricks which are commonly of size 25 x 12.5 x 7.5 cm. shall be used. 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 of minus	1.5mm (About 1/16")

- e. After immersion in water, absorption by weight shall not exceed 20 percent of the dry weight of the brick when tested according to I.S.S. No. 1077-1976.

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- f. Unless otherwise specified, the load to crush the brick when tested according to I.S.S. No. 1077-1976 shall not be less than 50 Kg / Sq.cm.

4.2 **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 thick wall. Other specifications for mortar in brick work shall be as per I.S.S. 2116-1965.

The particle size grading of sand in mortar for unreinforced masonry work shall be within the limits specified below :-

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

4.3 **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 openings or for adjusting the dimensions of different course

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and for closers, in which case, full brick shall be laid at comers, the bats being placed in the middle of the coarse.

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 and no hollows left anywhere. Bricks shall be handled carefully so as not to damage their edges. They should not also 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 in 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 and not later by removal of brick already laid. Care shall be taken during construction to see that edges of bricks at quoins, walls, heads etc., are not damaged.

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

d. **BOND:**

Unless otherwise specified, brick work shall be done in English bond.

e. **JOINTS:**

Joints shall not exceed 10mm (About 3/8") 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.



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f. **UNIFORM RAISING** :

Brick work shall be carried up regularly 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 stepped 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.

4.4 **SCAFFOLDING** :

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 logs are removed after ensuring that the holes behind are solidly filled in with 1:4:8 cement concrete.

4.5.1 **CURING** :

All brick work shall be kept well watered for 14 days after laying. Where pozzolana cement is used for mortar, the curing shall be extended by one week at the Contractor's expense.

4.6 **EXPOSED WORK** :

Where exposed brick work is prescribed, 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 wrinkled on which have irregular edges or corners shall be used. Depending on the quality of bricks and if instructed by the Corporation's Engineers, the exposed face of every brick shall be rubbed before laying without extra charge. Wooden fillets 10 mm thick and 10mm wide shall be placed at the edge of joints so that no mortar comes on the surface of the bricks and a



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regular thickness of joints is maintained. The surface shall be rubbed down with brushes of bricks if necessary, and thoroughly washed. No mortar shall be allowed to stick to the surface, which shall be left clean to the Corporation's Engineer's satisfaction with all joints even and true to a straight line. Double scaffolding shall be used in exposed brick work.

4.7 REINFORCEMENT IN HALF BRICK THICK WALLS :

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

4.8 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the rate 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 depths and shapes as shown on the plan or ordered by the Engineer.
- c. Constructing brick work to lines, levels, batters, pillars, curves and to any position or shape, to any heights or levels including raking of joints and housing frames, fixtures etc.
- d. Curing the brick work.
- e. Removing of all stains and adhering mortar lumps on the brick work surfaces.

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4.9 MEASUREMENTS :

- a. Half brick thick 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 Cum. Brick walls up to and including 3 bricks in thickness should be measured if multiples of half bricks which shall be deemed to be inclusive of mortar joints. Widths of more than three bricks in walls 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 cm² in section and
 - ii. Openings up to 0.1 m² in section.

NOTE :

- i. 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 the extra width of debated reveals, if any, shall be excluded.
- ii. Wall plates and bed plates, and beating of slabs, CHAJJAS and the like which the thickness does not exceed 10 cm and the bearing does not extend over the full thickness of the wall.



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5. STEEL DOORS, WINDOWS AND VENTILATORS

5.1 I.S. SPECIFICATION :

Unless otherwise stated, the Indian Standard Specification applicable for steel doors, windows and ventilators shall be IS-1038-1957 - "Specification for Steel Doors, Windows and Ventilators"

5.2 OPENING :

All the window and ventilator shutters should open outside unless otherwise specified.

5.3 FLASH WELDING :

Both the fixed and opening frames of the doors, windows and ventilators shall be formed by cutting sections to required lengths, and mitred. The corners shall be electrically flash welded. Sash-bars of the units shall be tenoned and reveted into the frames. Slots shall be cut in the fixed frames and hinges shall be inserted inside and welded to frames.

5.4 HANDLES, PEGSTAYS :

Each side hung shutter shall be provided with suitable protruding hinges and pegstays arms 300 mm (12") long and shall have holes to keep the shutter open in three different positions up to 90 degree (The peg and the arm for the pegstay shall be riveted). The handle shall be mounted on a handle plate and the plate shall be welded to the opening frame. The handle shall have a two point nose which will engage with suitable tapered striking plate provided on the fixed frames to keep the shutter open in a slightly open position as well as in a last position.

5.5 TOP/BOTTOM HUNG VENTILATORS :

Top hung and bottom hung ventilators shall be provided with two plain hinges, with 300 mm (12") pegstay arms, which will keep the shutter open in three different positions and will act as a stopper too.

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5.6 CENTRE HUNG VENTILATORS :

Centre hung ventilators shall be made with two outer frames with mastic waterproof compound embedded between these two other frames. They shall also be provided with a spring catch which when pulled by a cord, the upper half shall open inside and the lower half shall open out.

5.7 BEADING :

Where wooden or metal beading is specified in the Drawing or elsewhere for the glazing, the Contractor should provide windows with threaded holes for fixing the beading with screws.

5.8 SAMPLE OF WINDOW :

A typical approved sample window for each building should be kept in the office of the Executive Engineer of the Corporation until the satisfactory completion of the building. All windows and ventilators supplied and fixed at site should be of the same quality as of the approved sample ; otherwise they shall be rejected. The decision of the Chief Engineer or his Authorised Representative whether a window or ventilator compares well with the approved sample shall be final and binding on the Contractor.

5.9 CHIEF ENGINEER'S APPROVAL :

All windows and ventilators are subject to the approval of the Chief Engineer or his authorised representatives and they shall be strictly in accordance with the specifications without any bends, dents etc.

5.10 AS PER DRAWINGS :

All windows and ventilators shall be manufactured as per drawings supplied to the Contractor.



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5.11 FIXING TO BRICK WORK/CONCRETE :

Steel windows and ventilators shall be fixed to brick work by means of standard M.S. lugs of size 100x16x3 mm and to concrete work by means of 125mm long counter sunk screws with rawl plugs after drilling into concrete with a power drill. Steel windows/ventilators etc., shall be fixed as per manufacturer's recommendations or I.S. specifications. Holdfasts shall be grouted in concrete of 1:2:4 mix of dimensions as directed. Quoted rates to cover for all these factors.

5.12 IMPORT LICENCE :

No import licence shall be made available for obtaining any material not available in India.

5.13 STRUCTURAL SUFFICIENCY OF WINDOWS :

All windows, doors and ventilators shall be manufactured from standard extruded sections of approved, appropriate size suitable for the particular type and size of the window etc. Detailed shop drawings indicating the full design of every type of window and ventilators shall be furnished for approval before undertaking the work. Contractor shall assume full responsibility regarding soundness of the window, doors and ventilators and adequacy of the sections used for the particular sizes required to provide appropriate stiffness and strength. If, in the opinion of the Chief Engineer deficiencies in the sections used are found the Contractor shall replace the windows, ventilators, etc. at his expense by windows and ventilators etc., made from approved sections.

5.14 ALL TYPES OF WINDOWS :

Rates quoted for steel windows and ventilators shall cover for all types of windows and ventilators whether of standard sizes or purpose made. Where composite or continuous windows over long lengths (In plan) are required, rates shall cover for mullions, transoms at vertical or horizontal junctions of approved design. Rates should also cover for partly open-able type of continuous windows, shutters of any type like side hung, centre hung, top hung etc., as per drawings.



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5.15 PAINTING :

All steel windows, doors and ventilators etc. to have two coats of ready mixed oil paint of approved shade, colour and manufacture (M/s Jenson & Nicholson or other equivalent and approved) over a coat of red oxide primer. Contractors rates to be inclusive of such painting. If a proper and even surface is not obtained to the satisfaction of Chief Engineer in the number of coats specified, Contractor shall carry out additional coats of painting to approval at his expense.

5.16 RATES TO COVER :

Unless otherwise stated Contractor's rates for steel windows, ventilators shall, apart from any other factors mentioned elsewhere in this contract, include for providing and fixing the following.

- a. Windows/Ventilator frames and shutters with hinges as described,
- b. M.S. holdfasts or lugs as specified projecting 100mmx16mmx3mm in the positions and as per design in I.S. Specification or where fixed to concrete 125 mm long counter sunk screws with rawl plugs,
- c. Rolled Steel Mullions
- d. Transoms with projecting weather bars for side hung shutters and plain ones for fixed windows
- e. Aluminium beading with brass screws
- f. Bolts, nuts, screws
- g. Handles and peg stays
- h. Manganese brass spring catches
- i. Chords for centre hung windows
- j. Painting as described in these specifications
- k. Grouting of holdfasts in 1:2:4 concrete.

5.17 MEASUREMENT :

Measurement shall be in Sqm.

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6. WOOD WORK AND JOINERY

6.1 TIMBER

- i. Unless otherwise specified all timber for frames and shutters for doors, windows, ventilators, cupboards etc., shall be first class, sound, well seasoned, C.P. Balarshah or other equivalent and approved teak and shall be free from knots, shakes, fissures, flaws, sun cracks and other defects. The planned surface shall be smoothened free from blemishes and discolorations. Timber shall be wrought, framed and cut to shape as shown on drawings and/or as directed.
- ii. All timber for carpentry and joinery in touch with masonry or concrete shall be coal tarred or creosoted before fixing. All rough frame work in partitions, suspended ceilings and veneering to walls etc., shall be treated with approved wood preservative 'Bison' or other equivalent and approved as per manufacturer's instructions and specifications. The rates quoted shall provide for such treatments.
- iii. All fully fabricated timber shall be air seasoned on site of work for a period of not less than two months to allow for any shrinkage that may take place. The preparations of timber for joinery is to commence simultaneously with the beginning of the project work generally and should proceed continuously until all the wood work is prepared and fixed/stacked on or near the site as the case may be. Generally wood shall be free from knots, however, wood with knots may be permitted provided individual hard and sound knot shall not be more than 40 mm in diameter and aggregate area of all the knots shall not exceed one half percent of the area of the piece
Teak wood shall be approved incorporating in the work Contractor should ensure wood work does not warp or show other defects due to lack of proper seasoning.

6.2 HOLD FASTS :

Three hold-facts shall be fixed to each post of the door from and two to each post of the window frame. Unless otherwise mentioned in the item, the M.S. Hold-fasts shall be of the Size 300mm x 35 mm and 6 mm and shall be fixed to the frames by means

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of screws and not nails . The other. End of the hold fast shall be fixed into jambs within 1:2:4 P.C.C if dimensions as directed .

Whenever asked for, rawl plugs or bolts as directed shall be used for rough grounds framing hangers etc. The rates quoted for wood work and joinery shall allow for all types of hold fasts as directed (Horns in frames shall be cut and shall not be used as hold facts)

6.3 **WORKMANSHIP AND CONSTRUCTION :**

i. The workmanship shall be first class and to the approval of the E.E. Scantling and boarding shall be accurately sawn and shall be of required width and thickness. All carpenter's work shall be wrought except where otherwise described. The workmanship and joinery shall be accurately set out in strict accordance with the drawings and shall be framed together and securely fixed in approved manner and with properly made joints. All work is to be properly tenoned, shouldered, wedged, pinned, braded etc. and properly glued with approved quality glue to the satisfaction of the E.E.

ii. **SCREWS :** All screws to be used in wood work and joinery shall be of brass and not iron.

iii. **TOLERANCES :**

15mm (1/16") will be allowed for each wrought face of the sizes specified except where described as 'finished' in which case they shall hold to the full dimensions. For door/window frames tolerance shall be +/- 2/3 mm. in cross sectional dimensions and for shutters +/- mm in thickness +/- 2/3 mm in width of styles and rails. For flush door shutters tolerance in width/height shall be +/- 3 mm and on thickness +/- 1.2 mm.

iv. **PROTECTION :**

All wood work and joinery edges of timber frames etc., shall be protected from being damaged during construction by the Contractor.



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- v. If it is decided by the Employer to provide antitermite treatment, the Building Contractor shall coordinate his work suitably as directed by the Executive Engineer.
- vi. Door/Window frames shall have cut rebates. Planted rebates shall not be permitted.

6.4 WOODEN FLUSH SHUTTERS (SOLID CORE TYPE)

- a. Solid core flush shutters shall be of commercial or Teak veneered type as specified in the item manufactured by M/s Sita Board Mysore Commercial Union Ltd., or other equivalent and approved quality. An approved sample shall be deposited in the office of the Corporation's Engineer on site for reference. The shutters will be provided with lipping. Finished thickness of the shutter shall be as mentioned in the item.
- b. **PARTITION BOARD** : Shall be of waterproof quality 'NOVA TEAK SUPER' (Phenol bonded, 3 layers flat pressed), manufactured by M/s Plywood Manufacturing Ltd., Bombay or other equal and approved.

6.5 TEAK WOOD PANELLED SHUTTERS :

Solid wood panels for shutter shall be of pattern and size specified. Wherever possible each panel shall be in a single width piece. But where two pieces are used, width of each piece should not be less than 12.5 cm. In order to avoid warping, splitting and cracking, normally pieces not exceeding 20 cm. in width should be used. When made from more than one pieces. The pieces shall be jointed with a continuous tongued and grooved joint and glued together and reinforced the longer dimension of the panel. Planes shall be framed in to grooves to the full depth of the groove leaving an air space of 1.6 mm and the faces shall be closely fitted to the sides of the groove. Mouldings to the edges of panel openings shall be scribed at the joints.



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6.6 FIXTURES AND FASTENINGS :

Unless otherwise specified in the Schedule of Quantities each shutter shall be hung with three iron butt/parliamentary hinges of approved quality size and make with iron screws the things and screws bolt should be copper Oxide coated and the Contractors rate shall cover for providing and fixing hinges to the shutters. Unless otherwise specified in the Schedule of Quantities other fittings, if ordered, shall be paid separately as prime cost items. Hardware for doors and windows shall be of M/s Bivon, M/s Manmatha Hari & Sons, M/s De's Lock Industries, M/s Godrej, M/s Garnishor other equivalent and approved make.

6.7 FINISHING :

The wood work shall be finished by 3coat of painting. French polishing or wax polishing as specified in the item.

6.8 RATE TO INCLUDE :

Apart from other factors mentioned elsewhere in this Contract, the rate for item of wood work and joinery shall include for the following :-

- i. All labour, materials and equipments for carrying out the work.
- ii. Providing and fixing frames and shutters, fastening and fixtures including embedding in the floor about 40/50 mm deep and labour for fixing hardware fittings, supplied by L.I.C.I. or purchased under prime cost items.
- iii. Bison or other equivalent wood preservative treatment to rough frame work in partitions, suspended frame work in ceilings and timber veneering to walls etc.
- iv. Coal tarring / creosoting of embedded parts of woodwork in masonry and concrete.

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- v. Unless otherwise specified, sheet glass (plain or frosted) for shutters of doors/windows/fanlight, as manufactured by M/s Hindustan Pilkington or other equal and approved.
- vi. T.W. beadings/T.W. planted beads for fixing panels of shutters of doors, wherever required to be provided.
- vii. Providing T.W. cover mould of approved size.
- viii. 3 coats of 1st quality synthetic Enamel paint of approved colour and shade including primer as manufactured by M/s The Alkalis & Chemical Corporation of India Ltd. (With I.S.I. trade mark), M/s Goodlace Nerolac, M/s Jenson & Nicholson or equal and approved, 3 coats of French or wax polishing to approval as specified in the item.

6.9 MODE OF MEASUREMENT :

Timber Doors/Windows shall be measured in Sqm. over door, window frames if the item specified is composite one otherwise only shutter shall be measured in Sqm. Length shall be measured nearest to centimetre.



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7. RUBBLE SOLING

7.1 RUBBLE :

The rubble shall be trap, granite, or any other approved stone and shall be sound, hard, tough, durable, dense, clean, free from laminations, soft spots, cracks, decay, weathering and other defects. The stones shall be broken rubble with water absorption as low as possible but not more than 5%. The shape of the stones shall be regular as can be obtained by quarrying without attempt at shaping or dressing. They shall be sufficiently flat bedded. The stones shall be broken with the smallest dimensions equal to the specified, thickness of soling. The length and breadth shall not generally exceed twice its thickness. Each stone shall not be less than 0.04 Cum. in size and shall be in one piece for the full depth of soling.

7.2 PREPARATION OF SUB-GRADE :

All the fittings shall be watered and compacted to get maximum consolidation. All the necessary trimming of filling for the laying of the soling in line 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.

7.3 LAYING SOLING :

Unless otherwise specified the thickness of the rubble soling shall be 20/25 cm. The stones shall be closely hand packed on the prepared bed with the largest face downwards and in contact with each other. The stones shall break joints as far as possible. The full thickness of soling shall generally be made with one stone only. As the laying of rubble advances, the soling shall be hand packed by wedging and packing with stones of smaller size in the joints of the soling and driving them by crow bars and hammers etc., so as to fill the voids as completely as possible. Such filling of the interstices shall be carried out simultaneously with the placing in position of the large stones and shall in no case be permitted to lag behind. The soling shall be laid and hand packed true to grade and level. The soling thus laid shall be finished by



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knocking out projecting stones and filling depressions by chips to come up to the required level.

7.4 CONSOLIDATING :

The soling shall be watered and rammed with wooden rammers of approved weight. Hollows which appear during ramming shall be made good with smalls. Ramming and making good shall continue till a closely knit compacted surface conforming to the required levels is obtained. Earth on no account shall be used for making good or blinding purposes and it approved by Executive Engineer, sand or gravel as directed shall be used for blinding purposes. Water shall be lightly sprinkled if required and directed by the Executive Engineer.

7.5 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the Contractor's rate quoted shall include for the following :

- i. Preparing the sub-grade.
- ii. Providing and laying rubble soling including hand packing.
- iii. Consolidating, watering, ramming and blinding with approved sand or gravel as directed.
- iv. All labour, materials and use of equipments and tools required for carrying out the work satisfactorily.

7.6 MODE OF MEASUREMENT :

The measurement for rubble soling shall be in square metre as provided of specified thickness.

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8. BRICK ON EDGE SOLING

8.1 The bricks, 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.

8.2 PREPARATION OF SUB-GRADE :

All the filling shall be watered and compacted to get maximum consolidation. All the necessary trimming of filling for the laying of the soling in line 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.

8.3 LAYING 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 Herring bone 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.

8.4 CONSOLIDATING :

The soling shall be watered and rammed with wooden rammers of approved weight. The brick soling shall not be rammed with heavy rammers, as the bricks are likely to be crushed. Ramming shall continue till closely knit compacted 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 Executive Engineer, sand shall be used for blinding purposes. Water shall be lightly sprinkled if required and directed by the Executive Engineer.



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8.5 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the Contractor's rate quoted shall include for the 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 work satisfactorily.

8.6 MODE OF MEASUREMENT :

The measurement for brick on edge soling shall be in square metre as provided.



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9. CEMENT CONCRETE FLOORING AND CEMENT SKIRTING OR DADO,
PLAIN CEMENT CONCRETE FLOORING IN SINGLE LAYER.

9.1 CEMENT CONCRETE :

Unless otherwise specified, the proportion of cement concrete shall be 1:2.5:3.5 (Cement fine aggregate : coarse stone aggregate : coarse stone aggregate of size 12 mm and below by volume. Cement however, shall not be measured in volume but by weight. One bag of cement of 50 Kgs. 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 approximate cubicle shapes affording good interlocking. Elongated or thin flake like fragments should be avoided. The maximum size of coarse aggregate shall be 12mm. 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. 383-1970 and shall be washed clean if necessary.

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

9.2 PREPARATION OF SUB-GRADE :

Before placing the concrete flooring the sub-grade shall be got approved by the Executive Engineer. The top surface of the sub-grade, shall be thoroughly cleaned 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 sub-grade shall be slightly rough and shall have the required slope. The sub-grade shall be mentioned before laying the concrete flooring without forming any pools of water.

9.3 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 decided should be supported by flat iron or wood duly oiled to prevent sticking. Their depth shall be same as that proposed for the

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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. A.C. glass strips or approved separators shall be provided if specified in the item.

The concrete shall be laid immediately after mixing. While being place, 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 lift sand drops alternating with small lateral shifts. While concreting the adjacent bays, care shall be taken to ensure that the edges of previously laid bays are not broken by careless or hard tampering. 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 trowelling after the surface has hardened sufficiently to prevent excess of fine material from working to the surface. The finish shall be brought to a smoothened eve surface, free from defects and blemished 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 mixture of dry cement and sand shall be 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.

9.4 **CURING** :

The surface shall be protected from direct sun when it is green. As soon as the surface had hardened sufficiently to prevent damage to it, it shall be kept continuously moist



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for at least 14 days by means of wet gunny bags, 50mm thick layer damp sand spread over the surface or pooling water on the surface.

9.5 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the rates 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 A.C. or glass of approved separators to form panels when specified
- iv. Curing
- v. All labour, materials and use of equipments and tools required for carrying out the work satisfactorily.

9.6 MODE OF MEASUREMENT :

The measurements shall be in square metre of cast in situ of cement flooring as provided

9.7 CEMENT DADO AND SKIRTING :

- a. The walls to which skirting or dado is to be done shall have all joints raked out to a depth of 10mm, if not already done. R.C.C. surface shall be properly hacked to get good key to the 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 Executive Engineer.

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 I.S. : 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.

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c. APPLICATION :

The mortar shall be firmly applied with some what more than the 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 plane 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 intimately when set and there should be no hollow sound when struck. All corners, angles and junctions shall be truly vertical and neatly horizontal as the case may be , carefully and neatly finished. Care shall be taken to see that the top edge of the skirting or dado shall be straight in line and square and jointed with plaster above as required. When neat cement finish is specified over the plaster surface, a coat of pure Portland cement slurry 1.5mm thick shall be applied and well rubbed to the plaster surface while the plaster surface is still fresh. When the 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.

9.8 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the rates for the items of dado or skirting shall include for the following :

- i. Preparing the surface.
- ii. Providing and applying cement mortar of specified mix, 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.

9.9 MODE OF MEASUREMENT :

- a. Dado shall be measured in square metre as provided .
- b. The height of skirting shall be specified in the item and shall be measured in R.M. (Skirting up to 30 cm. in height shall be measured in running metres.)

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10. WHITE GLAZED TILES IN FLOORING AND DADO

10.01 TILES

White glazed tiles including specials shall be of approved make and quality and shall conform to IS-777-1961 in all respects. Samples of tiles shall be got approved by the Chief Engineer, who will keep them in his office for verification as to whether the materials brought for use conform to the approved samples. White glazed tiles shall be of the size 152x152x 5 mm.

10.02 MORTAR BEDDING :

Unless otherwise specified the tiles in Flooring shall be laid In the cement mortar 1:6 bedding . The amount of water added shall be minimum necessary to give just sufficient plasticity for laying and satisfactory bedding. Care shall be taken in preparing the mortar to ensure that there are no hard lumps that would interfere with the even bedding of the tiles. Before spreading mortar, sub-floor or base shall be cleaned of all dirt, scum, loose materials and laitance if any, by scrubbing with coir or steel wire brush or by hacking if necessary and then well wetted without forming any pools of water on the surface. Before laying, the mortar , the sub-grade shall be got approved by the Executive Engineer in case of R.C.C. floors, the top shall be left a little rough. All points of level for the finished paving surface shall be marked out. The mortar shall then be evenly and smoothly spread over the base by the use of screed battens only over so much area as will be covered with tiles before the setting of the mortar. The thickness of the mortar bed shall not be less than 20 mm.

10.03 LAYING, FINISHING, CURING AND CLEANING :

The tiles before laying shall be soaked in water for at least 2 hours. Tiles which are fixed in the floor adjoining the wall shall be so arranged that the surface of the round edge tiles shall correspond to the skirting or dado. Neat cement grout of honey like consistency shall be spread over the bedding mortar just to cover so much area as can



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be tiles within half an hour. The edges of the tiles shall be smeared with neat white cement slurry and fixed in this grout one after the other, each tile being well pressed and gently tapped with a wooden mallet till it is properly bedded and in level with the adjoining tiles. There shall be no hollows in bed of joints. The joints shall be kept as close as possible and in straight lines. The joints between the tiles shall not exceed 1.5mm wide. After fixing the tiles finally in an even plane, the flooring shall be covered with wet saw dust. The tile flooring shall be cured for 14 days.

After the tiles have been laid in a room or the day's fixing work is completed the surplus cement grout that may have come out of the joints shall be cleaned off before it sets. Once the floor has set, the floor shall be covered with oil free dry saw dust which shall be removed only after completion of the construction work and just before the floor is occupied.

10.04 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the Contractor's rate quoted include for the following.

- i. Cleaning the base and providing and laying bedding mortar and levelling.
- ii. Providing and fixing the tiles including all specials like round edges corner cups, angles etc. in neat cement float over the bedding mortar.
- iii. Filling the joints of tiles with neat white cement slurry.
- iv. finishing, curing and cleaning.
- v. All labour, materials and use of tools for carrying out the items as specified above.

10.05 MODE OF MEASUREMENT :

Measurement for flooring tiles shall be in square metres as provided.

10.06 WHITE GLAZED TILES DADO :

a. TILES

White glazed tiles shall be same as described under white glazed tiles flooring.

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b. MORTAR BACKING :

All joints in the face work shall be raked out to a depth equal to not less than the width of the joints or as directed by the Executive Engineer. Concrete surfaces shall be properly hacked. All dirt, soot oil, or any other material that might interfere with satisfactory bond shall be removed. The surface shall be cleared and scrubbed with fresh water and kept wet for 6 hours prior to applying backing mortar. The dado work shall not be commenced unless the preparatory work is passed by the Executive Engineer. The proportion of mortar bedding shall be 1:3 cement mortar. Sand in mortar bedding shall be from approved source, and shall conform to I.S.1542-1960 as applicable to internal wall and ceiling plastering and external wall plastering. The thickness of mortar backing shall not be less than 12mm and not more than 20mm.

c. FIXING DADO TILES :

Dado work shall be done after fixing tiles on the floor. The white glazed tiles shall be soaked in water for atleast 2 hours before being used for dado work. Tiles shall be fixed when the cushioning mortar is still plastic and before it gets very stiff. The back of tiles shall be covered with a thin layer of neat cement paste and the tile shall then be pressed in the mortar and gently tapped against the wall with a wooden mallet. The fixing shall be done from bottom of wall upwards without any hollows in the bed or joints. Each tile shall be fixed as close as possible to the one adjoining. The tiles shall be jointed with white cement slurry. Any difference in the thickness of tiles shall be evened out in cushioning mortar so that all tiles faces are in one vertical place. The joints between the tiles shall not exceed 1.5mm in width and they shall be uniform. The tiles shall be fixed with straight joints. After fixing the dado, they shall be kept continuously wet for 14 days. If doors, windows or other openings are located within the dado area, the sills, jambs angles etc., shall be provided with white glazed tiles and appropriate specials according to the foregoing specification and such tiled area be measured net along with the dado.



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d. **CLEANING :**

After the tiles have been fixed the surplus cement grout that may have come out of the joints shall be cleaned off before it sets. After the complete curing, the dado or skirting work shall be washed thoroughly clean.

10.07 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the rates for the item or dado or skirting shall include the following:-

- i. Backing mortar.
- ii. Providing and fixing tiles including all specials like round edges, angles, capping etc. in neat cement float over backing mortar.
- iii. Jointing of the tiles with white cement slurry.
- iv. Curing.
- v. Cleaning.
- vi. All labour, material, use of tools and equipments for carrying out the items as specified above.

10.08 MODE OF MEASUREMENT :

Dado shall be measured in square metres as provided.



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**11. POLISHED KOTAH/SHAHABAD/TANDUR STONE FLOORING, DADO/LINING
AND SKIRTING FLOORING**

11.1 STONE SLABS :

The stone slabs shall be hard, sound, durable, resistant to wear. Unless otherwise specified, stone slabs shall be square in shape 30 x 30 cm size and 25mm thick. The stone slabs shall be without any soft veins, cracks or flaws and shall have a uniform colour. A tolerance of 3mm in thickness at any point shall be permitted. The exposed surface of stone slabs, shall be machine polished to a smooth even and true plan and the edges to be chiselled to half its depth, true and square to ensure uniform width of joint. The edges of stone slabs shall be machine cut square to the required shape, if necessary. The stone slabs shall be of approved colour and shades. A few approved samples of stone slabs to be used shall be deposited by the Contractor in the office of the Corporation's Engineer.

11.2 MORTAR BEDDING :

Lime mortar shall be prepared in mortar mill or pan. The amount of water added shall be the minimum necessary to give just sufficient plasticity for laying and satisfactory bedding. Care shall be taken in preparing the mortar to ensure that there are no hard lumps that would interfere with the even bedding of the stone slabs. Before spreading the mortar the sub-floor or base shall be cleaned of all dirt, scum, loose materials and laitance if any by scrubbing with coir or steel wire brush or by hacking if necessary, and then well wetted without forming any pools of water on the surface. Before laying the mortar, the sub-grade shall be got approved by the Executive Engineer. In case of R.C.C. floors, the top shall be left a little rough. All points of level for the finished paying surface shall be marked out. The mortar shall then be evenly and smoothly spread over the base by the use of screed battens, only over so much area as will be covered with slabs within half hour. The thickness of the mortar bedding shall not be less than 15mm and not more than 25mm. The required slope shall be given to the bed. Unless otherwise specified, the proportion of mortar bedding shall be 20 mm thick



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average cement mortar 1:6 and where lime bedding is specified in the scheduled of the quantities proportion of Lime mortar shall be 1:3 1 lime : 3 sand).

11.3 **LAYING, CURING, POLISHING, FINISHING AND CLEANING :**

Before laying the stone slabs shall be thoroughly wetted with clean water. Neat cement grout of honey like consistency shall be spread on the mortar bed over as much area as could be covered with the slabs within half an hour. The stone slabs shall be laid on the neat cement float and shall be evenly and firmly bedded to the required level and slope in the mortar bed. The stone slabs shall be laid in the approved pattern in single or two tone colour. Each stone slab shall be gently tapped with a wooden mallet till it is firmly and properly bedded. There shall be no hollows left. If there is a hollow sound on gently tapping of the stone slab, such stone slabs shall be removed and reset properly. The mason shall make the joint of uniform thickness and straight lines. The thickness of joints shall not exceed 1.5mm. The joints shall be grouted with neat cement slurry. No border stone slabs shall be less than 100mm in width, unless otherwise approved by the Executive Engineer.

When the bedding and joints of the flooring have been completely set, the surface shall be machine polished to give a smooth, even and true plane to the floor and thoroughly cleaned.

11.4 **RATES TO INCLUDE :**

Apart from other factors mentioned elsewhere in this contract, the Contractors rate quoted shall include for the following :

- i. Cleaning the base of providing and laying bedding mortar and levelling.
- ii. Providing and fixing the stone slabs in neat cement float on the bedding mortar.
- iii. Filling joint of stone slabs with neat cement slurry of required colour to match the colour of the stone slabs.
- iv. Chiselling, polishing, finishing and cleaning.
- v. All labour, materials and use of tools for carrying out the item as specified above.

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11.5 MODE OF MEASUREMENT :

Measurement for flooring, stone slabs shall be in square metre as provided.

11.6 DADO / LINING AND SKIRTING

The stone slabs shall be as specified above for flooring unless otherwise mentioned. The stone slabs shall be in approved lengths to match the flooring. The exposed edges of stone slabs such as in dado/lining and skirting, jams, soffits, sills etc, shall be machine cut and polished smooth.

a. MORTAR BACKING :

All joints in the face work shall be raked out to a depth equal to not less than the width of the joints or as directed by the Executive Engineer. Concrete surfaces shall be properly backed. All dirt, oil or any other materials that might interfere with satisfactory bond shall be removed. The surface shall be cleaned and scrubbed with fresh water and kept wet for 6 hours prior to applying backing mortar. The dado/lining or skirting work shall not be commenced unless the preparatory work is passed by the Executive Engineer. The proportion of mortar for backing shall be 1:3 cement mortar. Sand in mortar bedding shall be from approved sources and shall conform to I.S. 1542-1960 as applicable to internal wall and ceiling plastering and external wall plastering. The thickness of mortar backing shall not be less than 12mm and not more than 20mm.

b. FIXING DADO/LINING OR SKIRTING STONE SLABS :

Dado/lining or skirting shall be done only after fixing stone slabs on the floor. The stone slabs shall be thoroughly wetted in water before being used for Dado/lining or skirting work. The stone slabs shall be fixed when the backing mortar is still plastic and before it gets stiff. All the stone slabs shall be covered with an additional layer of neat cement paste and stones shall then be pressed in mortar and gently tapped against the wall with wooden mallet. The fixing shall be done from the bottom of wall upwards without any hollows in the beds or joints. Each stone slab shall be fixed as close as possible to the adjoining stone slab. The stone slab shall be jointed in neat cement slurry to match the colour of the stones. The joints shall not exceed 1.5mm in width and they shall be uniform. While fixing the stone slabs in dado/lining or skirting work, care shall be taken to see that the joints in the adjoining flooring below, matches with



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the joints in the dado/lining or in skirting, as the case may be, or shall be staggered as directed. When specified brass cramps and bins etc. of approved size shall also be used for fixing dado/lining.

c. **POLISHING :**

When stone slabs are completely set, polishing shall be done by hand with approved type of polishing stone. A smooth and even polished surface shall be obtained to match the finished surface of the flooring.

d. **CURING :**

The dado/lining or skirting shall be kept wet for 14 days.

11.7 **RATES TO INCLUDE :**

Apart from other factors mentioned elsewhere in this contract the rate for the item of dado/lining or skirting shall include the following :-

- i. Backing mortar.
- ii. Providing and fixing stone slab with exposed edges machine cut including all special tiles and finishing the edges with plaster.
- iii. Providing and fixing brass cramps and pins etc., for dado/lining where specified.
- iv. Joints of the stone slabs filled with coloured cement slurry to match the stone slabs.
- v. Curing.
- vi. Chiselling, polishing, use of tools and equipments for carrying out the items as specified above.

11.7 **MODE OF MEASUREMENT :**

- a. Dado/lining 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 30 cm. in height shall be measured in running metres)

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12. CAST IN SITU MARBLE MOSAIC FLOORING, DADO AND SKIRTING.

12.1 CAST IN SITU MARBLE MOSAIC FLOORING :

i. **PREPARATION OF SUB-GRADE** : The sub-grade shall be prepared as for the cement concrete flooring.

ii. **FLOORING COMPOSITION** : This will compose of two layers, the bottom one called the 'Under coat' and the top one called the 'Top coat'. The bottom coat shall be 30mm thick and the top coat shall be 10mm thick. The total thickness shall be 40mm unless otherwise stated.

a. **UNDER COAT :**

The under coat will have the same proportion and consistency as for cement flooring and shall be mixed and placed in the same manner, except that no finishing shall be done to make the surface smooth ; the top surface of concrete in the under coat shall be kept sufficiently rough to form a key to the top coat.

b. **ALUMINIUM STRIPS :**

While laying the under coat, aluminium strips of 10 gauge and 40mm wide as separators shall be provided to form approved panels. The area of each panel in the flooring shall not exceed 1.5 Sq. Metres the longest side of any panel not exceeding 2 metres. The cost of providing aluminium strips in the flooring shall be included in the rate quoted for mosaic flooring.

c. **TOP COAT :**

The grading, proportion and colour of the marble chips shall be got approved from the Executive Engineer after preparing a few samples of cast in situ mosaic flooring. The proportion of white cement, grey cement, coloured cement, pigments and marble chips in the top coat shall be got



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approved from the Executive Engineer to get light shades, medium shades and dark shades as required. The proportion of cement to marble chips shall be 1:2. The top coat shall be laid as per I.S.:2114-1962.

iii. **POLISHING AND FINISHING :**

After the top coat has hardened enough to prevent dislodgement of aggregate particles, the surface shall be machine polished and finally washed with 'TATRI' and then wax polished to give a smooth and shining surface.

iv. **CURING :**

The flooring shall be kept covered and damp till it is properly set and given final finish.

v. **RATES TO INCLUDE :**

Apart from other factors mentioned elsewhere in this contract, the rates shall include for the following:

- a. Providing and laying 1:2:4 cement concrete for under coat in panels.
- b. Providing and fixing aluminium strips to form panels.
- c. Mixing the ingredients of terrazzo mix in white cement grey cement coloured cement/approved pigments and marble chips of approved quality, maximum size and graded down as required and laying it in the top coat.
- d. Curing
- e. Machine polishing and finishing as specified above.

vi. **MODE OF MEASUREMENT :**

The measurement shall be in Square Metre of cast in situ mosaic flooring provided.

12.2 DADO AND SKIRTING :

- a. Dado and skirting shall be laid in two layers, the under coat being laid as plaster and the top coat with marble chips in white/grey/coloured cement as required.

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b. UNDER COAT :

The under coat shall be in 1:3 cement mortar and shall be applied to the wall surface as per plaster. The thickness of the plaster shall be 12mm for brick and concrete faces, and 20mm for stone faces. The surfaces of the under coat shall be kept rough to form a key for the top coat of the marble chips in white/grey/coloured cement as required in different proportions.

c. ALUMINIUM STRIPS :

Aluminium strips shall be provided minimum 10 gauge and width to suit the thickness of the dado (Inclusive of top coat). The aluminium strips shall be fixed in plaster when it is green. Spacing of aluminium strip shall not exceed 2 metres.

d. TOP COAT :

This shall be similar to the top coat in cast-in-situ mosaic flooring.

e. POLISHING :

The finished surface shall be rubbed with Carborandum stone and finally washed with "Tatri" and then wax polished to get smooth and shining surface. The surface shall be kept damp till it is properly set.

12.3 RATES TO INCLUDE :

Apart from other mentioned elsewhere in this contract, the rates shall include for the following :-

- i. Applying under coat in 1:3 cement mortar and roughening the surface.
- ii. Providing and fixing aluminium strips.
- iii. Mixing the ingredients of terrazzo mix as required and laying it in top coat.
- v. Curing.
- v. Polishing and finishing the dado/skirting.

12.4 MODE OF MEASUREMENT :

- i. Dado shall be measured in Square Metre.
- ii. Skirting less than 30 cm. height shall be measured in Running metre.

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13. PLAIN OR COLOURED CEMENT TILES OR TERRAZZO TILES FLOORING DADO AND SKIRTING

13.1 FLOORING :

13.2 TILES :

Plain or coloured cement tiles and terrazzo tiles shall be manufactured as per I.S.: 1237-1980 using grey or white cement and pigments and marble chips of sizes as required. Tiles shall be of the size 250x250x22 mm (10"x10"x7/8") or any other approved size. Tiles shall be of tiles to be used shall be deposited by the Contractor in the office of the Corporation's Engineer.

13.3 CONCRETE BASE AND MORTAR BEDDING :

The base of cement or lime concrete shall be laid and compacted to a reasonably true plain surface and to the required slopes and below the levels of the finished floor to the extent of the thickness of the tiles and mortar bedding. Cement concrete or lime concrete base shall be paid under a separate item. Lime surkhi-mortar for bedding shall be prepared in a mortar mill. The amount of water added shall be minimum necessary to give just sufficient plasticity for laying and satisfactory bedding. Care shall be taken in preparing the mortar to ensure that there are no hard lumps that would interfere with the even bedding of the tiles. Before spreading mortar, sub-floor or base shall be cleaned of all dirt, scum, laitance and all loose materials and then well wetted without forming any pools of water on the surface. In case of R.C.C. floors, the top shall be left a little rough. All points of level for the finished paving surface shall be marked out. The mortar shall then be evenly and smoothly spread over the base by the use of screed battens only over so much area as will be covered with tiles before the setting of the mortar. The thickness of the mortar bedding shall be 1:1:1 (1 lime putty : 1 surkhi : 1 sand). Sand for mortar bedding shall be as per I.S.S. No. 2116-1965 as applicable to unreinforced masonry work. Skirting, dado and raisers of steps/staircase shall be fixed on backing of cement mortar 1:3, 12mm thick with thick cement paste.

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13.4 LAYING CURING, POLISHING, FINISHING AND CLEANING :

Before laying, the tiles shall be thoroughly wetted with clean water. Tiles shall be laid as per approved pattern on the mortar bed and floated in neat cement slurry. The joints of the tiles shall not be more than 1.5 mm wide and shall be filled with neat cement slurry of required colour to match the colour of the tiles if required, the border tiles shall be cut to proper sizes and the rate quoted shall cover for the same. No border tile shall be less than 100 mm in width, unless otherwise approved by the Executive Engineer.

Flooring shall be kept wet for 14 days.

Polishing and cleaning of the whole floor shall be done according to I. S. 1443-1959

13.5 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the contractor's rate quoted shall include for the following :-

- i. Cleaning the base and providing and laying bedding mortar and levelling.
- ii. Providing and fixing the tiles in neat cement float on the bedding mortar.
- iii. Filling the joints of tiles with neat cement slurry of required colour to match the colour of the tiles.
- iv. Polishing finishing and cleaning. All labour, materials and use of tools for carrying out the item as specified above.

13.6 MODE OF MEASUREMENT :

Measurement for flooring tiles shall be in Square Metre as provided.

13.7 NOTE :

- a. Tiles with white cement shall be considered as light shade tiles.
Tiles approximately 50% white cement and 50% ordinary cement shall be considered as medium shade tiles.
- c. Tiles with ordinary cement shall be considered as dark shade tiles.
- d. Marble chips for terrazzo/marble mosaic tiles shall be varying from the smallest up to 20mm size.

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13.8 DADO AND SKIRTING :

- a. Tiles shall be as specified above for flooring, except that in the case of skirting the height of tiles may be less than the height of 1 full tile.

b. **MORTAR BACKING :**

The proportion of mortar for backing shall be 1:3 cement mortar. Sand in mortar bedding shall be as per I.S. No.1546-1960 as applicable for under coat of internal plastering.

c. **FIXING DADO OR SKIRTING TILES :**

Dado or skirting shall be done only after fixing tiles on the floor. The tiles shall be soaked in water before being used for dado or skirting work. The tiles shall be fixed when the backing mortar is still plastic and before it gets stiff. All the tiles shall be covered with an additional layer of neat cement paste and tiles shall then be pressed in mortar and gently tapped against the wall with wooden mallet. The fixing shall be done from the bottom of wall upwards without any hollows in the beds or joints. Each tiles shall be fixed as close as possible to the adjoining tile. The tile shall be jointed in neat cement slurry to match the colour of the tiles. The joints shall not exceed 1.5mm in width and they shall be uniform. While fixing the tiles in skirting or in dado work care should be taken to see that the joints in the adjoining flooring tile below matches with the joints in the skirting or the dado tiles, as the case maybe, or shall be staggered as directed.

d. **POLISHING :**

Polishing may be done by hand with approved type of polishing stone. A smooth and even polished surface shall be obtained to match the finished surface of the flooring.

- e. **CURING :** The dado or skirting shall be kept wet for 14 days.

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13.9 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract the rate for the item of dado or skirting shall include the following :-

- i. Backing mortar.
- ii. Providing and fixing the tiles including all special tiles and finishing the edges with plaster.
- iii. Joints of the tiles filled with coloured cement slurry to match the tiles.
- iv. Curing.
- v. Polishing and cleaning the dado and skirting.
- vi. All labour, material, use of tools and equipments for carrying out the items as specified above.

13.10 MODE OF MEASUREMENT :

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



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14. MARBLE FLOORING

14.1 MARBLE SLABS :

The marble shall be of approved shade and sources as mentioned in the Schedule of Quantities and their size and the thickness shall be as shown on the drawings and as approved by the Executive Engineer. They shall be of selected quality, dense, uniform and homogeneous in texture and free from cracks or other structural defects. It shall have even and crystalline grains. The surface shall be machine polished to and even and perfectly plain surface and edges machine cut true and square. The rear face shall be rough enough to provide a key for the mortar. No slab shall be thinner than the specified thickness at its thinnest part. The dimension of slabs shall be as specified . A few approved samples of finished slabs to be used shall be deposited by the Contractor in the office of the Corporation's Engineer. Unless otherwise mentioned, the thickness of the marble shall be minimum 20 mm.

14.2 CONCRETE BASE AND MORTAR BEDDING :

The base of cement or lime concrete shall be laid and compacted to a reasonably true plain surface and to the required slopes and allow the level of the finished floor to the extent of the thickness of the slabs and mortar bedding. Cement concrete or lime concrete base shall be paid under a separate item. Cement concrete for bedding may be mixed manually or by a mechanical mixer as directed. Lime mortar shall be prepared in a mortar mill The amount of water added shall be the minimum necessary to give just sufficient plasticity for laying and satisfactory bedding. Care shall be taken in preparing the mortar to ensure that there are no hard lumps that would interfere with the even bedding of the stones. Before spreading the mortar, sub-floor or base shall be cleaned of all dirt, scum or laitance and of loose materials and then well wetted without forming any pools of water on the surface. In case of R.C.C. floors, the top shall be left a little rough. All points of level for the finished paving surface shall be marked out. The mortar shall then be evenly and smoothly spread over the base by the use of screed battens only over so much area as will be covered with slabs within half an hour. The thickness of the mortar bedding shall not be less than 12mm (about 1/2") not more than 25mm (about 1").

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14.3 LAYING MARBLE SLABS :

Before laying, the marble shall be thoroughly wetted with clean water. Neat cement group of honey like consistency shall be spread on the mortar bed cover as much area as could be covered with the slab with 1/2 an hour. The specified type of marble slabs shall be laid to pattern as directed on the neat cement float and shall be evenly and firmly bedded to the required level and slope in the mortar bed. Each slab shall be gently tapped with a wooden mallet till it is firmly and properly bedded. There shall be no hollows left. If there is a hollow sound on gentle tapping on the slabs such slabs shall be removed and reset properly. The joints as shall be hair fine width and in straight line grouted with neat coloured cement slurry to match the colour of the marble. The joints shall be struck smooth but there shall be no smearing over the mortar of the slabs. The edges of the adjoining slabs shall be in one plane.

14.4 The flooring shall be kept undisturbed at least seven days and wet for fourteen days. Marble flooring shall be given a final coat of wax polish of approved make. Polishing and cleaning of marble flooring shall be done according to I.S. No. 1443-1959.

14.5 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the rate for item of marble flooring shall include for the following :-

- a. All labour, materials and equipments, cleaning the sub-base, laying mortar bed and cement grout and fixing marble slabs as specified above and making up the joints and wax polishing.
- b. Any cutting and waste if required.
- c. Curing.
- d. Cleaning the floor from all stains etc.

14.6 MODE OF MEASUREMENT :

The measurement shall be in Sq. metre for the actual marble flooring provided.

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15. CEMENT POINTING RECESSED/FLUSH RECESSED POINTING :

15.1 PREPARATION OF SURFACE :

The joints in the masonry shall be raked out to a depth not less than the width of the joint as directed, when the mortar is green. The joints are to be brushed clean of dust and loose particles, with stiff brush. The Ares shall then be washed and the joints thoroughly wetted before pointing is commenced. All dust and oily matters if any, shall be removed.

15.2 PROPORTION OF MORTAR :

The proportion of cement mortar shall be as described in item. The sand shall be from approved source free from foreign matter, washed clean if necessary and shall conform to I.S. 1542-1977. 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 wet cement. Mixing platform shall be so arranged that no deleterious extraneous material shall get mixed with mortar, not the mixing water of the mortar shall flow out.

15.3 APPLICATION :

Waterproofing compound of approved make, shall be added according to manufacturer's specifications to make the mortar waterproof. The raked out joints shall be filled with mortar of the specified mix and the required consistency and well pressed and rubbed smooth. A semi-circular depression 3 mm dia shall be made in the joint by pressing clean string with trowel keeping the string exactly horizontal and on the centre line of the joint. The vertical joints shall be similarly marked. These depressed lines will then be immediately rubbed with a nayla till they become uniformly 5 mm deep and



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6mm wide and assumed fairly blackish colour intersections of the horizontal and vertical shall be finished neatly with the vertical line just touching the horizontal line but not crossing it. All superfluous mortar shall be removed with the trowel. The brick surface shall be cleaned and no stain shall be allowed to remain.

When joints are not horizontal or vertical as in the case of uncoursed rubble masonry, the pointing shall be made along the centre line of joints to uniform width and depth as directed and junctions of pointing made nearly. The pointing mortar shall not spread over the adjoining stones. Mortar pointing shall be restricted to the width of the joints and all superfluous mortar shall be removed with a trowel.

15.4 CURING :

All pointing work shall be kept damp, continuously for a period of 14 days.

15.5 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract rates for the item of pointing shall include for the following :-

- i. Erecting, dismantling and removing scaffolding.
- ii. Preparing the surface and watering.
- iii. Providing and filling in the joints with cement mortar, including approved waterproofing compound.
- iv. Curing and cleaning the surface.
- v. All labour, materials, use of tools and equipments to complete the work as per specification.

15.6 MODE OF MEASUREMENT :

Pointing shall be measured in square metres as in the case of plaster.

15.7 FLUSH POINTING :

This item shall be carried out, when joints are not struck, while the masonry is being laid. All the specifications of recessed pointing shall apply to this as well except that instead of making the lines with string and forming groove etc., the joints shall be kept flush with face of joints in the masonry.

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16. INTERNAL CEMENT PLASTER WITH / WITHOUT NEERU FINISH :

16.1 REPARATION OF SURFACE :

The walls to be plastered to have all joints raked out to a depth of 10 mm if not already done. R.C.C. surface shall be properly backed 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.

16.2 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 I.S. 1548-1960 as applicable to internal wall and ceiling plastering. No more cement mortar shall be prepared than that can be used within half an hour.

16.3 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 junction 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 12mm over the roughest part of the surface of brick wall and R.C.C. surfaces and 20mm over stone walls. Plaster for ceiling shall not be more than 12mm.

16.4 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 for



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preparing neeru shall be fat lime and shall be of approved quality and source. Lime shall be slaked and mixed with sufficient with 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 (3 mm mesh) to remove all unslaked particles and foreign matter and allow 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 of approved fine sieved sand by volume. Jute fibres finely chopped shall be added to the above mortar at the rate of 4 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 no more than what can be consumed in 15 days shall be prepared at time.

Neeru shall be applied to the prepared and partially set but somewhat plaster surface with steel trowel to a thickness slightly exceeding 1.5 mm (About 1/16") 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 trowelling is going on soap stone powder contained in thin muslin bags shall be dusted over the surface and worked in.

Moisturing 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.

16.5 NEAT CEMENT FINISH:

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

16.6 TROWEL FINISH :

When no finish is specified, the plastered surface shall be rubbed well to an even plane with wooden flat for external surface and finished smooth with a steel trowel for internal surface.



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16.7 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere to this contract, rates for the item of plaster shall include for the following :-

- i. Erecting, dismantling and removing the scaffolding.
- ii. Providing the surface to receive the plaster.
- iii. Providing cement plaster of specified average thickness.
- 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.
- vi. 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.

16.8 MODE OF MEASUREMENT :

Plaster shall be measured in square metres.

a. WALLS :

- i. The measurements 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.

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ii. **DEDUCTIONS :**

A. For jambs, soffits, sills, etc., for openings not exceeding 0.5 m² each in area and opening not exceeding 3 m² 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 finishing the plaster around ends of joists, beams, posts etc.

b. Deductions for openings exceeding 0.5 m² but not exceeding 3 m² each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills etc., of these openings :-

1. When both faces of wall are plastered with the same plaster, deduction shall be made for one face only.

2. When two faces of wall are plastered with different plasters or if one face is plastered and the other pointed, deduction shall be made from the plaster or pointing out 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 above 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. Ceilings with projected beams shall be measured over beams and the plastered sides of beams shall be measured and added to plastering on ceilings.



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17. EXTERNAL CEMENT PLASTER WITH SAND FACED/COMBED /ROUGHCAST FINISH

17.1 PREPARATION OF SURFACE

The walls to be plastered to have all joints raked out to a depth of 10mm , if not already done, R.C.C. 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 oil 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 moistured again to restore uniform surface.

17.2 PROPORTION OF MORTAR :

Unless otherwise mentioned, the proportion of external cement plaster for brick or concrete surface shall be 1:4 (1 cement : 4 sand). Sand shall be from approved source free from foreign matter, washed clean if necessary and shall be as per I.S. 1542-1977. 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 and 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 wet cement. Mixing platform shall be so arranged that no deleterious, extraneous material shall get mixed with mortar not the mixing water of the mortar shall flow out.

17.3 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 15 cm x 15 cm shall be put on about 3 m apart as



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gauges to ensure even plastering in one plane. The thickness of the under coat in any part shall not be less than 8 mm and more than 12mm. The mortar shall be firmly applied with somewhat more than the required thickness and well pressed into the joints and on the surface and rubbed and levelled with a flat wooden rules to give required thickness. Long straight edges shall be freely used to ensure 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 combing it with wavy horizontal lines about 12mm apart and 3mm 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 material. The proportion of cement to sand shall be 1:4. The finishing coat shall be of such thickness as to make total average finish to thickness equal to the required plaster thickness as described. The finishing coat shall be not less than 4mm or not more than 8mm thick. The finished surface shall be true and even and shall be present uniform texture throughout and all joining mark shall be eliminated. After application the surface should be finished with a wooden float lying 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 while working up, but patches showing signs of premature drying may be patted with a damp float. When the finishing coat has hardened, the surface shall be kept moist continuously for 14 days. In any continuously and day to day breaks made to coincide with Architectural breaks in order to avoid unsightly junctions. All mouldings shall be worked true to template and drawn neat clean and level. All exposed angles and junctions with door frames etc. shall be carefully finished as directed.

- 17.4** All plaster work shall be kept moist continuously for a period of 14 days. To prevent excessive evaporation on the sunny or windward side of the buildings in hot dry weather, matting or gunny bags may be hung over on the outside of the plaster in the beginning and kept moist.

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17.5 RATES TO INCLUDE : Apart from other factors mentioned elsewhere in the contract, rates for the item of plaster shall include for the following :

- i. Erecting, dismantling and removing scaffolding.
- ii. Preparing the surface to receive the plaster.
- iii. Providing cement plaster of the specified average thickness, in two coats, including waterproofing compound.
- iv. All labour, materials, use of tools and equipment to complete the plastering as per specifications.
- v. Curing 14 days.
- vi. Any 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 shall quantities, making good and pipes, conduits, timbers, sills, brackets railings, etc. and making good after all the subcontractors or nominated sub-contractors have done their work.

17.6. MODE OF MEASUREMENT :

All plastering work shall be measured in square metres. Dimensions shall be measured and quantity worked out correct upto 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. For jambs, soffits, sills, etc. for openings not exceeding 0.5m² each in area ends of joists, beams posts, etc. not exceeding 0.5m² each in area and openings not exceeding 3m each deductions and additions shall be made in the following manner :

- a. No deduction shall be made for ends of joints, beams, posts, etc. and opening not exceeding 0.5m² 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.
- b. Deductions for openings exceeding 0.5m² but not exceeding 3m² each shall be made as followed and no addition shall made for reveal, jambs, soffits, sills, etc. of these openings :

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- 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 plasters or if one face is plastered and the other pointed, deduction shall be made from the plaster or pointing on 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.

In case of openings of area above 3m² each, deductions shall be made for the openings but jambs, soffits and sills shall be measured.

17.7 COMBED FINISH :

All the specification given above for sand 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.

17.8 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 under coat 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 wet mix and shall be left in rough condition. The mortar of the finishing coat shall consist of coarse aggregates of crushed stone or fine gravel of size generally 6 to 12 mm as approved by Executive Engineer and specially graded mixture, mixed with approved sand and cement. The proportion of cement to sand and aggregate/gravel shall be generally 1: 1½ : 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.

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18. WHITE WASHING, COLOUR WASHING AND DISTEMPERING:

18.1 WHITE WASHING :

A. MATERIALS :

White wash 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 cream. The wash shall be taken out in small quantities and strained through a clean coarse cloth. Clean gum dissolved in hot water shall then be added in suitable proportion of two grams of gum arabic to a litre of lime to prevent the white wash coming off easily when rubbed. Rice seize may also be used instead of gum., gum Regd. Neel colour added for whiteness .

B. SCAFFOLDING :

This shall be double or single according to requirements and as directed. If ladders are used pieces of old gunny bags or cloth bags shall be tied on their tops to avoid damage or scratches to the plastered surfaces, etc. proper stage scaffolding shall be erected when white washing the ceiling

C . PREPARATION OF SURFACE :

The surface shall be prepared by removing all mortar droppings and foreign matter other means as may be ordered by the corporation's Engineers to produce an approved clean and an even surface. All loose pieces and scales shall be scraped of and holes, cracks etc. stopped with mortar to match with the surrounding finish. In case where the surfaces have been previously white washed or colour washed, the old white or colour wash shall be entirely removed and surfaces broomed down before the new white wash is applied. In case the old white wash cannot be removed by brooming, the surfaces shall be cleaned by scraping.



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D. APPLICATION OF WHITE WASH :

On the surface so prepared, the white wash shall be laid on with a brush. The first stroke of the brush shall be from top downwards, another from bottom upwards 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 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 white washed first. Thereafter, the whole surface shall be white washed with the required number of coats. For new work, the white washed surface shall present a smooth and uniform finish. 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 TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the rates for white wash shall include for the following.

- i. All labour material, equipment required for white washing.
- ii. the surface for white wash including the scaffolding. Scaffolding including erection and removal.
- iii. Providing and preparing the white wash.
- iv. Preparing
- v. Applying the white wash in three coats minimum. If a proper even surface is not obtained to the satisfaction of the Executive Engineer in 3 coats, contractor shall carry out additional coats of white wash to approval at Contractor's expenses.

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F. MODE OF MEASUREMENT :

The measurement shall be in sq. metre. The mode of measurement shall be as applicable to that for plaster.

18.2 COLOUR WASH :

MATERIAL :

This shall be prepared by adding approved colouring matter to the white wash (prepared for white washing) according to that required. In all other respects the same conditions and specification as applicable to white wash shall also be applicable to colour wash.

18.3 DISTEMPERING :

POWDERED/DRY DISTEMPER :

a. MATERIAL :

The powdered/dry distemper shall be of approved colour and shade manufactured by M/s Blundell 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 surfaces defects shall be repaired with gypsum and allowed to set hard. All irregularities shall be sand prepared smooth and wiped clean. The surface so prepared must be completely dry and free from dust before distempering is commenced. In the case for walls newly plastered, special care shall be taken

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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 flaking 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 prepared smooth and wiped clean. But in case the surfaces are coloured or white washed, 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 makers 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 prepared as clean and smooth as possible.

e. APPLICATION OF DISTEMPER :

The instructions 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 a day's work. Hot water should be used to prepare the mixture. Distempers shall be applied in dry weather with a broad stiff 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 Executive Engineer. Two more coats of distemper shall be given in exactly the same manner as the first one but only after the earlier coat laid has thoroughly dried.

f. RATED INCLUDES :

The rate shall include all labour, materials, equipment and tools for carrying out the following operations :

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- 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 Executive Engineer 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.

18.4 OIL BOUND DISTEMPER :

The specification and conditions for this shall be the same as that applicable for dry distemper above except that oil bound distemper or approved make, shade and colour shall be used after applying priming coat of petrifying liquid or other primer as may be recommended by the manufacturers of distemper or as directed.



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19. PLASTIC EMULSION PAINT :

19.1 MATERIAL :

The emulsion paint and primers in general shall be of approved quality colour and shade as manufactured by M/s Goodlass Nerolac or other equal and approved.

19.2 SCAFFOLDING :

This shall be double or single as required and directed. If ladder are used, pieces of old gunny bags or cloth rags shall be tied on their tops to avoid damage of scratches to the plaster surfaces and flooring , etc. Proper stage scaffolding shall be erected when painting the ceiling.

19.3 PREPARATION OF THE SURFACE :

a. New surface :

The surface to be painted shall be cleaned and all cracks, holes and surface defects shall be repaired with plaster of Paris for spot filling and with filler prepared with whiting, water and little quantity of paint for filling and levelling the wider areas.

19.4 PRIMING COAT :

The priming coat of the approved shade shall be applied over the completely dry surface in the manner as recommended by the paint manufacturers. The emulsion paint, in the priming coat, may be thinned down with 20% water or as recommended by the paint manufacturer. Turpentine or any other solvent shall not be used for thinning the paint.

19.5 APPLICATION OF EMULSION PAINT :

The recommendation of approved paint manufacturers, whose product is used shall be followed regarding the preparation of the surface and the application of the priming and finishing coats. The contractor shall arrange for technical assistance and

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supervision from the paint manufacturer, during the execution of the painting work. After the priming coat has been applied and is perfectly dried all holes scratches if any, shall be repaired as mentioned in "preparation of surface" and then the second coat 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 primer coat. If a proper and even surface is not obtained to the satisfaction of the Executive Engineer 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 materials do not settle or disfigure the various coats.

19.6 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the rate for the item of plastic emulsion paint shall include for the following :

- i. All labour, materials and equipment necessary to carry out the work.
- ii. Supplying the approved emulsion paint for priming and finishing coats.
- iii. Preparing the surfaces for receiving the primer and finishing coats.
- iv. Scaffolding including its erection and dismantling.
- v. Application of one primer coat and minimum two coats of finishing. If a proper and even surface is not obtained to the satisfaction of the Executive Engineer, in 3 coats, contractor shall carry out additional coats of painting to approval at Contractor's expense.
- vi. Protection to painted surface till dried and handed over.
- vii. Expenses, if any, for supervision and technical assistance supplied by the approved paint manufacturer.

19.7 MODE OF MEASUREMENT :

The measurement shall be in square metre. The mode of measurement shall be as applicable to that for white washing.

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20. PAINTING FRENCH POLISHING, WAX POLISHING :

20.1 POLISHING :

20.2 MATERIAL :

Ready mixed oil paints and primers, in general shall be of approved quality, colour and of approved manufacturer. These materials shall be in sealed tins and shall be opened in the presence of the Corporation's Engineer on site.

20.3 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 anything foreign material. In case of rusted surface, it shall be first cleaned with wire brush till the corroded rust is removed. The prepared surface shall be shiny and free from brush marks, patches, blisters and other irregularities. The surface thus finished shall be got approved for painting.

b. **WOOD WORK** :

All surfaces to be painted shall be thoroughly cleaned, sand papered and removed of all foreign materials. In case of surfaces 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.

20.4 APPLICATION :

After preparing the surface a primer coat shall be applied. The primer coat should be ready mixed of approved make and manufacturer. 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

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carefully applied to achieve smooth and even surface after the previous coat has dried up. Minimum 3 coats of paint shall be applied to inclusive of a primer coat. If a proper and even surface is not obtained to the satisfaction of the Executive Engineer 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.

20.5 RATES TO 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 surfaces including knotting and stopping for receiving the primer and finishing coats.
- iv. Scaffolding including its erection and dismantling.
- v. Application of one primer, coat and two coats of finishing minimum. If a proper and even surface is not obtained to the satisfaction of the Executive Engineer in 3 coats. Contractor shall carry out additional coats of painting to approval at Contractor's expense.
- vi. Protection to painted surface till dried and handed over.

Mode of measurement :

Normally painting to wood work and steel shall be included in the concerned items of work and shall not be measured separately. If painting is to be measured separately the same will be as per I.S.:1200-1964. part i 15

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20.6 FRENCH POLISHING :

French polish to be used shall comply with I.S. 348-1952 in the requirements of quality and methods of test. Before French polish is applied, the surface of wood work shall be prepared in the same manner as for painting. The wood to be polished should be first painted with a filler composed of 1 part of whiting mixed with 0.53 part of methylated spirit. After drying, it should be finely sand papered. On the wood work thus treated a thin coat of French polish shall be applied and allowed to dry. After drying the surface shall be lightly rubbed with a lime sand paper prior to the second and third coat. The surface shall show an even polished surface and be approved by the Executive Engineer (Corporation's Engineer).

20.7 RATES TO INCLUDE : Similar to that of painting.

20.8 MODE OF MEASUREMENT : Similar to that of painting.

20.9 WAX POLISHING :

- a. The polish shall be of approved manufacture (e.g., Mansion Brand) or shall be prepared as under :
- b. A mixture of Bee's wax and turpentine in proportion of 2:1 by weight shall be used. The wax is melted and added to the turpentine, mixed well and allowed to cool.
- c. The surface of wood work shall be prepared as for oil painting before mixing. The wood work shall be measured with the mixture and allowed to remain overnight so that the mixture may soak into the pores of the wood. In the morning the superfluous wax shall be wiped off and the surface rubbed up with a soft flannel to a fine polish.

20.10 RATES TO INCLUDE : Similar to that of painting.

20. 11 MODE OF MEASUREMENT : Similar to that of painting.

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21. CEMENT PAINTING :

21.1 MATERIAL :

External waterproof painting shall be of approved colour. Manufacture - Snowcem/ Durocem or other equivalent and approved quality.

21.2 PREPARATION OF SURFACE :

Before painting is commenced on surface, all dirt, oil, grease, efflorescence and organic material shall be completely removed. The surface shall be wetted by sprinkling of water with 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.

21.3 APPLICATION :

Cement paint solution shall be applied to the surface with hair brushes in a number of coats to get uniform finish. After the first coat of paint is 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.

21.4 CURING :

Cement paint work shall be kept damp at least for 7 days.

21.5 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the rate of providing cement paint shall include for the following :

- a. All labour , materials and equipment to provide cement paint.

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- b. Scaffolding including erecting and removing.
- c. Preparing the surface as stated above.
- d. Applying 3 coats of approved Snowcem paint. If a proper and even surface is not obtained to the satisfaction of the Executive Engineer in the 3 coats applied, the Contractor shall provide additional coats painting to approval, at Contractor's expense.
- e. Curing as stated above.

21.6 MODE OF MEASUREMENT :

Measurement shall be in Square Metre and as applicable to white wash. Nothing extra shall be allowed for painting the rough surface, for example, external sand faced plaster rough cast plaster etc.



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22. LIME CONCRETE (BRICK BAT COBA) WATER PROOFING OF THE ROOF:

22.1 COARSE AGGREGATE :

Coarse aggregate shall be broken from sound and thoroughly well burnt brick. These shall be strong, durable, clean and free from impurities and shall not contain any soft or powdery material. These aggregate shall be graded having a maximum size of 25mm generally conforming to I.S.3068 ĩ 1986 and approved by the Executive Engineer. Burnt brick aggregate shall be soaked thoroughly in water for a period not less than 6 hours before use in the concrete mix.

22.2 PREPARATION OF BASE :

The base shall be thoroughly rubbed, cleaned and slightly wetted and shall be got approved by the Executive Engineer before laying the concrete.

22.3 PREPARATION OF CONCRETE :

Lime and surkhi shall conform the relevant I.S. Specification. One part of Slaked Lime and two part of Surkhi by volume shall be mixed on a water tight platform. These shall be sprinkled with the required quantity of water and shall be well ground in a Mill or using mechanical grinders. The lime concrete shall be obtained by thoroughly mixing, the aggregate and lime surkhi mortar in the proportion of 2.5:1 part by volume. Concrete shall be mixed on a level impervious platform. The aggregate and mortar shall be and thoroughly incorporated by being turned over and over, backwards and forwards not less than 3 times, until every particle of the coarse aggregate is fully coated with mortar. No more concrete shall be mixed than can be laid in place and removed the same day. When it is necessary give greater fluidity to concrete, this shall be effected by adding where to mortar and remixing mortar and not to the mixed concrete.



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22.4 LAYING :

Unless otherwise specified the average finished thickness of lime concrete shall not be less than 10 cms thick, after compaction, and minimum compacted thickness of the concrete layer shall no where be less than 7.5 cms. The top of concrete surface shall be given necessary slope as directed. After the lime concrete is laid, it shall be initially rammed with a rammer not more than 2 Kg. and finish brought to the required evenness and slope. The ramming shall be done rightly and rapidly to get the required compaction and to allow all the interstices to be filled with mortar. Further consolidation shall be done using wooden thapis by preferably female labour who will sit close together and beat the surface lightly and in rhythm and move forward gradually. Special care shall be taken to properly consolidate concrete at its junction with the parapet wall. The beating will normally have to be carried on for at least 7 days until the weight makes no impression on the surface and rebounds readily from it when struck. If the surface during the process of compaction becomes so uneven that water lodges in pools, the surface shall be pricked up and fresh lime concrete spread and consolidated as is necessary, so as to ensure proper slopes and levels. While the beating is in progress, the surface shall be sprinkled liberally with lime water and small proportion of sugar solution prepared by mixing about 3 Kgs. of jaggery and 1 1/2kg. 'Bael' fute to 100 litres of water. On completion of beating, the mortar that comes on the top shall be smoothened with a towel or float, if necessary with the addition of sugar solution. Lime Concrete can be compacted with lime concrete tamping machine developed by CBRI, Roorkee. For the information of Contractors it may be informed that CBRI, Roorkee has developed the lime concrete tamping machine which gives the rapid, uniform and satisfactory compaction. This machine is being marketed by the following firms :

1. M/s M.S.S. Road, New Delhi - 5
2. M/s Roorkee Engineer and Co.,
16/67-68, Faiz Engineering Works,
Civil Lines, Roorkee (UP)

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22.5 CURING :

The lime concrete after compaction shall be cured for six days until it hardens by covering with a thin layer of grass or straw which shall be kept wet continuously. Watering shall be done at frequent intervals, from a watering can through a perforated rose, in moderate quantity so as to ensure thorough setting of the concrete.

22.6 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in this contract, the Contractor's rate quoted shall include for the following :

- i. Preparation of base.
- ii. Providing, laying and ramming lime concrete as directed above.
- iii. Compacting with lime, sugar and 'Bael' fruit solution as described above.
- v. Curing.
- v. All labour, material and use of tools and equipments necessary for satisfactory completion of work.

22.7 MODE OF MEASUREMENT :

Lime concrete shall be measured in square metre as provided mentioning the average consolidated thickness.



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23. CEMENT CONCRETE FLOORING IN TWO LAYERS:

23.1 PLAIN CEMENT CONCRETE FLOORING :

Unless otherwise mentioned in the item, concrete in flooring shall be 40mm thick overall and shall be laid in two layers. The concrete in under layer, unless otherwise specified, shall be in the proportion of 1:2:4 (Cement : Fin Aggregate : Coarse stone aggregate of size 12.5 mm 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 cement of 50 Kgs, 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 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, the cement concrete in under layer shall 25mm thick and the top wearing layer shall be 15mm thick. The concrete shall be as stiff as possible and the amount of water added shall be minimum necessary to give just sufficient plasticity for laying and compacting . For improving the workability of the mix thorough mixing for a longer period rather than addition of more water shall be resorted to generally a water cement ratio of 0.5 (By weight) should suffice. Mix shall be used within half an hour of the addition of water for its preparation.

23.2 PREPARATION OF SUB-GRADE :

Before placing the concrete flooring the sub-grade shall be got approved from the Corporation's Engineer. The top surface of the sub-grade, shall be thoroughly cleaned 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 sub-grade shall

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be slightly tough and shall have the required slope. The sub-grade shall be moistured before laying the concrete flooring without forming any pools of water.

Before commencement of laying under layer of concrete on the prepared sub-grade, "Screeds" 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 and even surface and imparting necessary slope to the under layer with average thickness of 25mm or as specified in the item shall be provided. The screed 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 'Screed'.

23.3 LAYING :

The concrete flooring shall be laid in alternate bays not exceeding 2x2M each. The edge of each panel into which the floor is divided should be 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. A.C. glass aluminium strips or other approved separators (Depth to be same as that 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 or honey-comb 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 alternate bays, care shall be taken to ensure that the edges of previously laid bays are not broken by careless hard tamping. Immediately after laying the concrete, the



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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 surface of the concrete in 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 then be immediately laid over the rough but green surface of under layer and thoroughly tamped, struck of level, and the surface floated with wooden float. The surface shall then be tested with a straight edge and mason's spirit level to detect any undulation in the surface which, if any, shall be made good immediately. The surface shall then be finished smooth as stated below.

23.4 FINISHING THE SURFACE :

After the concrete has been fully compacted it shall be finished by trowelling. 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 and atmospheric conditions. The surface shall be trowelled 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 trowelling is carried out. The object of trowelling is to produce as hard and close knit a surface as possible. The time interval allowed between successive trowelling is very important. Immediately after laying top wearing layer, only just sufficient trowelling shall be done to give a level surface Excessive trowelling in the earliest stages shall be avoided as this tends to work a lay rich in cement to the surface. Sometime after the first trowelling the duration depending upon the temperature, atmospheric conditions and the rate of set of cement used, the surface shall be retrowelled to close any pores in the surface, and to bring to surface and scrap off any excess water in concrete or laitance (It shall not be trowelled back into the topping). The final trowelling shall be done well before the concrete had become to hard but at such a time that considerable pressure is required to make any impression

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on the surface. The finished surface shall be smooth and even. Trowelling of 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 bays has set, the joints (If permanent separators are not provided) of the panel shall be filled with cement paste as directed. The joints shall be straight both ways i.e., along with 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 specifically mentioned in the item, the surface shall be obtained rough with parallel broom marks before the concrete sets.

- 23.5** If coloured cement 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 pigment of required colour thoroughly mixed with cement when dry. Quantity of approved mineral pigment 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 or Dark shade as specified in the item) be got approved from the Executive Engineer before commencement of flooring work.

23.6 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 ten days by means of wet gunny bags, 50mm thick layer of damp sand spread over the surface or pooling water on the surface. During this period the flooring shall not be exposed to any traffic.



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23.7 HAND GRINDING AND POLISHING :

Wherever 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 surface is 3-4 days old and sufficiently hardened and cured. The first grinding should be done with Carborandum stone of coarse grade and fine sand 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 and 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 fell till the surface has acquired required gloss.



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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 waster. The rubbing must be continued until the flooring ceases to be sticky.

23.8 RATES TO INCLUDE :

Apart from other factors mentioned elsewhere in the contract, the rates shall include for the following :-

- i. Cleaning and preparing the sub-grade.
- ii. Providing and laying concrete of specified mixes and finishing the surface as described above.
- iii. Providing and fixing A.C. glass/Aluminium strips or the 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.

23.9 MODE OF MEASUREMENT :

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



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24. THERMOLITHCRETE PARTITIONS:

24.1 THERMOLITHCRETE PARTITIONS :

Moisten the Thermolite Blocks (Do not soak in water) before use and back or roughen surface of the blocks so as to enable them to hold the plaster rigidly.

24.2 Use 1 to 4 ratio of cement sand mortar for jointing Thermolite Blocks. The joints between blocks should be staggered (Break joints) and should be not more than 12mm thick.

24.3 At every alternate layer of Thermolite Blocks, provide a hoop iron strip horizontally to give extra rigidity to the wall. At the time of erecting the wall not more than 3 layers of Thermolite Blocks should be laid at a time, otherwise the lower layer will go out of plumb. The same process may be repeated next day.

24.4 After the wall is erected, the joints should be sprinkled with water. Then allow the wall to dry for a minimum of 8 to 12 days or more. If possible, before commencing the plastering work. Electric conduits or plumbing pipe fittings should be embedded in the wall before the final plastering.

24.5 For plastering use 1 to 4 cement sand mortar. The plaster shall not be more than 12mm thickness. Finishing of the plaster can be done in any surface i.e., in Neeru or rough cast. After the plastering is done, it should be cured by spraying with water for at least four days. If the Thermolite Block Walls are in flush line with walls or beams, a chicken mesh over the joints should be provided over lapping 23 cm. on either sides.

24.6 For making a cavity wall, by using two layers of 75mm thick blocks of Thermolite on each side keeping about 100 mm hollow space in between two layers, a cross stay of a Thermolite Block piece to hold both walls together, should be provided at every alternative layers at a distance of every 1.2 M to 1.5 M.

24.7 Teak wood or steel frames of doors can be fixed in the same manner as the doors are fixed in brick walls. Hold-fasts can be fixed on the frames and embedded in the Thermolite Block walls.

24.8 When fixing teakwood door frames, first cut off the top 'horns' which project out of the frames and which are normally embedded in walls and covered by plaster. In this case the plaster generally cracks at the top corners but if the horns are cut off, and the top corners are square, the plaster will not crack at these corners.

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25. RANDOM RUBBLE MASONRY SECOND SORT

All the specifications for random rubble masonry second sort shall be same as for 'UNCOURSED RUBBLE MASONRY' (Refer page nos. 104 to 110) except for the following :

25.1 FACE STONE :

Height shall not be greater than breadth of face and no stone shall have its length less than 1 1/2 times its height. All the sides of the stones on the face shall be dressed in straight lines and all the sides in the face shall be in one plane. Individual stones shall have generally a face area of not less than 0.05 sqm. They shall be as far as possible of equal size on the face.

Faces shall be only hammer dressed as explained below. The bed and the joint faces shall afford a square bearing of 2.5 cm. average from face by hammer dressing or chiselling. The sharp and irregular projections on the face shall be knocked off by the flat end of scabbing or spelling hammer. The surface shall be further dressed by lifting the hammer and then allowing the pointed end to drop on the surface freely. This process shall be continued till a fairly uniform and even stone surface is obtained. Chisel may be used to obtain straight edges for the sides and square surfaces for the beds and joints.

25.2 HEARTING AND BACKING STONES :

These stones shall not be less than 15 cm, in any direction for hearting. Backing stones shall conform to "Uncoursed Rubble Masonry" when it is to be plastered.

25.3 QUOINS :

The faces of quoins shall be rough tooled and side joints with masonry shall be vertical.

25.4 THROUGH STONES :

One through stone shall be provided per half square metre of facing evenly distributed in a staggered pattern. They shall be about 0.05 sqm. in face area.

25.5 CONSTRUCTION DETAILS :

The width of the joints shall not be more than 12mm.

25.6 RATE TO INCLUDE :

Rate shall include for construction of random rubble masonry second sort as per specification above.

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26. CRAZY MARBLE MOSAIC FLOORING/CRAZY MARBLE FLOORING :

GENERAL :

The item refers to the provision of crazy marble mosaic surface (Broken marble, mosaic tile pieces) set in cement mortar or lime mortar as specified, well compacted and finished and laid in the required positions with ordinary or coloured cement float.

MATERIALS :

26.1 BROKEN MARBLE MOSAIC TILE PIECES :

These shall be obtained from broken marble mosaic tiles (20mm thick) broken marble slabs of approved shade and manufacture and conforming to I.S.1257-1959. The sizes of pieces should be suitable to obtain the correct pattern of flooring as shown on the drawings or as directed by the Executive Engineer.

26.2 MORTAR BEDDING :

The base of lime concrete shall be laid and compacted to required slopes as shown on the drawings or as directed by Executive Engineer. Lime Concrete base shall be paid under separate item. Unless otherwise mentioned the proportion of mortar shall be 1:4 (1 cement : 4 sand) in case of cement mortar and 1:1:1 (1 lime putty : 1 surkhi : 1 sand) in case of lime surkhi mortar. Lime Surkhi mortar for bedding shall be prepared in a mortar mill. The amount of water added shall be minimum necessary to give just sufficient plasticity for laying and satisfactory bedding. Care shall be taken in preparing the mortar to ensure that there are no hard lumps that would interfere with the even bedding of the tiles. Before spreading mortar, sub floor or base shall be cleaned of all dirt, scum, laitance and all loose material and then well wetted without forming any pools of water on the surface. The sub grade or the base shall be got approved from the Executive Engineer. All points of level for the finished paving surface shall be marked out. The mortar shall then be evenly and smoothly spread over the base by the use of screed battens only over so much areas as will be covered with tiles before the setting of the mortar. The thickness of the mortar bed shall not be less than 25mm.



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Sand for mortar bedding shall be as per I.S.S. No. 2116-1965 as applicable to unreinforced masonry work.

26.3 LAYING, CURING, POLISHING, FINISHING AND CLEANING :

Mosaic tile/marble pieces shall be thoroughly wetted before fixing them. Ordinary coloured cement grout as required of honey-like consistency shall be spread over the mortar bedding when the mortar is still plastic. In this cement float, mosaic tile/marble pieces shall be fixed piece by piece to the required slope and pattern. The fixing shall be done by keeping the joints between the places as thin as possible. The flooring shall be laid to the correct level and slopes and compacted by striking the surface with hard weights and straight screed tamper. The grout shall cream up to the surface. The junctions of the flooring extended up the wall for 15 cm. After the flooring has been laid or the Day's fixing work is completed the surplus cement grout that may have come out of the joints on compacting shall be cleaned off.

The flooring laid shall be kept moist and allowed to mature undisturbed for 10 days to allow the bedding and flooring to set properly. After this, the surface shall be polished with a machine. Once the floor has set and is polished it shall be carefully washed clean and dried. When dry, the floor shall covered with oil free dry saw dust which shall be removed only after the construction work is completed.

26.4 RATES TO INCLUDE

Apart from other factors mentioned elsewhere in this contract, the Contractor's rate quoted shall include for the following :

- i. Providing and laying the mortar bedding to required slopes.
- ii. Providing and fixing mosaic tile pieces in masonry or coloured cement float on the bedding to the required pattern and compacting.
- iii. Approved waterproofing compound (If specified in the item).
- iv. Curing
- v. Polishing and cleaning the floor.

26.5 MODE OF MEASUREMENT :

The Contractor's rate shall be per square metre of the floor area covered. All work shall be measured net as provided including rounding at the junction of parapet walls and flooring.

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**WATER SUPPLY, INTERNAL SANITARY INSTALLATIONS
AND DRAINAGE WORK - GENERAL SPECIFICATION**

1. GENERAL

- 1.1** All water supply, internal sanitary installations and drainage work shall be carried out by skilled and licensed plumbers manner complying in all respects with the requirements of the relevant by-laws of the Municipal or of the 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 Executive Engineer, to be securely plugged to walls with hard wood or any other approved plugs or set in cement as required and are to be left in a clean, sound and perfect condition.
- 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 expense at such times and in such manner as Executive Engineer shall direct and to the latter's satisfaction. The Contractor shall also make arrangements for the disinfections of all mains and tanks intended for potable water to the satisfaction of the Executive Engineer and rates quote shall include for same. The mains and tanks should be thoroughly flushed with clean water after disinfections.
- 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 Executive Engineer at the Contractor's Expense.
- 1.6** All the materials shall be in accordance with the specifications and shall be approved by the Executive Engineer before bulk supplies are brought to site. The Contractor shall furnish well in time before work commences, at his own cost, any samples of materials or workmanship that may be called or by the Executive Engineer 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

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work to which they apply. Where materials are specified to complete with an Indian Standard Specification, the Contractor shall, if required, furnish the Manufacturer's Certificate that the materials satisfy plumbing works, typical samples proto types shall be erected in position for approval before undertaking work. Rates quoted shall cover for such preliminary work. Materials rejected shall be removed forth with by the Contractor off the Premises.

Sewers 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.

II. WATER SUPPLY :

2. CAST IRON PRESSURE PIPE AND SPECIALS.

2.1 Pipes and Specials : All pipes and specials shall be of cast or spun iron, straight with spigot and socket ends or with flanged ends as specified and shall conform to the latest edition of the Indian Standards Specification for class 'LA' pipes. Class A pipes may be used when the test water pressure exceeds 120 metre of head. The pipes and special shall be suitable for jointing 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 anti-corrosive paint having a tar or other suitable base.

2.1.2 Excavation of trenches for C.I. pipes and Specials :

2.2.1 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.

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2.2.2 The gradient is to be set out by means of boning rods and should the required depth be exceeded at any point the trench shall be refilled as directed by the Executive Engineer 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 Executive Engineer 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 laces of sheeting shall be such as to provide not less than 20mm clearance on either side of pipe. Trench shall be of such extra width when required as will permit the convenient placing of timber support, strutting and planning and handling of specials.

2.2.2 Road Crossing : All road crossing 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 crossing shall be tiled 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 foundations.

2.2.3 Protection of Existing Service : 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 Executive Engineer. Such mains will be hung from timbers placed across the trench. Care shall be taken not to disturb the electrical



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and communication cables, removal of which if necessary shall be arranged by the Executive Engineer.

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 precautions 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 AND SPECIALS :

2.3.1 Stacking : The pipes and specials shall be lined up on one side 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 subject to the approval of the Executive Engineer, the damaged portion of the cracked pipe may be cut 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, shearings, chain, ropes etc., in no case the pipes shall be rolled and dropped into the



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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 to 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 up hill.

2.3.2.4 Any deviation either in plan or elevation of less than $11\frac{1}{4}$ (Degree) percent 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 $2\frac{1}{2}$ degree 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 Anchorage : 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 chaulked with lead and these shall be paid for separately, unless otherwise specified.

2.5 LEAD CAULKED JOINT :

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 yard for joints : This shall be of best quality preferably white, it shall be free from oil, tar or greasy substances and shall be soaked in hot coaltar or bitumen and dried before use.



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2.5.3 JOINTING :

The yarning materials 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 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 without causing overlap. The ends of the strands shall 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	Spunyarn/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 yarn given in this table are provisional and a variation of 20 % is permissible.

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2.5.5 CAULKING :

After the joints have been run they must be thoroughly caulked until they are perfectly water-tight. Caulking of joint 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 and any lead, outside the socket shall be removed with a flat chisel and then the joint caulked round three times with caulkings tools of increasing thickness and a hammer of 2 to 3 Kg. weight. Lead joints shall not be covered till the pipe line has been tested under pressure but the rest of the pipe line 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 woollen lead for joints they may be made with lead wool inserted in strings not less than 6mm thick and thoroughly caulked.

2.6 FLANGED JOINTS :

C.I. pipes may also be jointed by means of flanges cast on where specified. The jointing material between flanges of pipes shall be compressed fibre board of rubber of thickness between 1.5 mm to 3mm. The fibre board shall be impregnated with chemically neutral mineral oil and shall have a smooth and hard surface. Its weight per Sqm. 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 back-filled except at the joints. Completed pipe line shall be subjected to the following tests :

- a. Pressure test at a pressure of at least double the maximum working pressure ; pipe and joints shall be absolutely water tight under the test.
- b. Leakage test (To be conducted after the satisfactory completion of the pressure test) for a duration of two hours.

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2.7.1 Where any section of a main is provided with concrete thrust blocks 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 valued section of the pipe shall be slowly filled with water and all air shall be expelled from the pipe through hydrants and blow offs. If these are not available at high places, necessary tapping may be made at points of highest elevation before the tests 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 Executive Engineer. 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 recaulked 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 materials 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 valved 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 filling 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 each filling shall be done in regular layer of 15 cm (Watered and rammed at each layer). All surplus earth shall be disposed of as directed by the Executive Engineer.



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3. G.I. PIPES AND FITTINGS :

3.1.1 Pipes and fittings : The pipes shall be of the class specified in the Schedule of quantities and shall be galvanised steel welded and seamless, screwed and socketed and shall conform to the latest Indian Standard

3.1.2 Specifications for such pipes. They shall be manufactured by a firm of repute. All fittings shall be of malleable iron galvanised fittings of approved make.

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

Nominal Bore	Light	Medium	Heavy
15 mm	0.96	1.23	1.46
20 mm	1.42	1.59	1.91
25 mm	2.03	2.46	2.99
32 mm	2.61	3.17	3.87
40 mm	3.29	3.65	4.47
50 mm	4.18	5.17	6.24
65 mm	5.92	6.63	8.02
80 mm	6.98	8.64	10.30
100 mm	10.20	12.40	14.70

(The above weights are for black pipes and theoretical weights of galvanised pipes are of about 6% higher).

3.1.2 The pipes shall be tested to withstand a pressure of 50 Kg/Sqcm. 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

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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 12mm 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 and again painted with one coat of anti-corrosive bitumen of approved quality and rates quoted shall include for same. Cutting long lengths 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 synthetic enamel paint of approved quality, manufacture, colour and shape, 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 Executive Engineer. 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.
- 3.4** Jointing : Where pipes have to be cut or re-threaded ends shall be carefully filed out so that obstruction to bore is offered.
- 3.4.1** In jointing the pipes, the inside of the soaked and the screwed end of the pipe shall be rubbed over with white lead and few turns of home yarn wrapped round the screwed end of the pipe which shall then be screwed home in the socket with a pipe wrench.

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Care must be taken that all pipes 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/Sqcm. 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. WATER METERS, SLUICE VALVES AND OTHER APPLIANCES :

4.1 WATER METERS (DOMESTIC TYPE) :-

Water meters up to 50 mm nominal size shall conform to I.S. specifications for water meters (Domestic Type) I.S.779 of Type A unless otherwise specified. The meter body shall be of bronze gun metal 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 laid easy to remove and clean and 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 stainer 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 for such additional strainer, cost of testing and sealing by local municipal authorities.

4.1.1 CONNECTIONS :

The meter casing shall be lifted in the pipe line by two conical or cylindrical nipples or tail pipes with connecting nuts which shall be provided with each meter. The nipples of waters shall be made of the same materials as specified for body.

4.1.2 MAKINGS :

Each meter shall be marked with the following information :

- a. Nominal Size.

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- b. Direction of flow.
- c. ISI Certification mark
- d. Manufacturers name and trade mark.

4.2 WATER METERS (BULK TYPE) :

These shall conform I.S. : 2373 and shall be of size 50mm 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 casing shall be fitted into the pipe line 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) for suitable materials not susceptible to electrolytic corrosion and rates quoted by Contractor shall include for the same. Meters shall be provided with makings as described in Clause 4.1.2 above.

4.3 FERRULES :

Brass ferrules shall conform to IS : 2962. Necessary saddle pieces of approved type shall be used for all take of the service connections and rates quoted shall include for the same.

4.4 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. Valve 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.



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4.4.1 SURFACE BOXES FOR SLUICE VALVES :

This shall conform to I.S.3950 with a cast iron frame and mild steel hinge pin. The upper surface of the cover shall have non slip surface. The surface boxes shall be coated with a composite on 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.

4.5 AIR VALVES :

These are placed at every summit in the pipe line to permit the escape of air when the main is filled and if any air is carried into the main. Fixing of air valves may be done by means of fixing saddle pieces on pipes and drilling the same where necessary. Rates quoted shall include for the same.

4.6 Brick Masonry Chambers for housing meters, valves and appurtenances : These shall be constructed as per size as indicated. This shall be measured and paid for separately. The bricks used shall be of best quality 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 20 mm thick cement plaster 1:3. The foundation concrete shall be of P.C.C. 1:4:8 and 75 mm thick. The top slab shall be of 100mm thick R.C.C. 1:2:4 unless otherwise specified.

INTERNAL SANITARY APPLIANCES

5. SQUATTING PATTERN W.C.PAN :

5.1. W.C. PAN :

The pan shall be of white vitreous china of specified size and pattern ("Orissa" or "Long pattern" as specified) with an integral flushing rim. It shall have the flushing horn in the front unless it is not possible to accommodate cistern to suit this design. The pan shall be approved quality conforming to I.S. specifications IS: 2556 (part iii). It shall have 100 mm C.I. or porcelain trap 'P' of 'S' type, with effective seal 50mm and 50mm vent arm.

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5.1.1 FIXING :

The W. C. pan shall be sunk in floor sloped towards in a workman like manner, care being taken not to damage the pan in the process of fixing. If damaged in any way, it shall be replaced at Contractor's cost. It shall be fixed on a proper cement concrete base of 1:3:6 proportion taking care that the cushion is uniform and even without having any hollows between the concrete base and pan and finished just below level of run of pan to receive the specified thickness to the floor finishing. A pair of foot rests for long pattern pans shall be fixed at a convenient angle where specified.

5.1.2 The joint between the pan and the trap shall be made with cement mortar 1:1 and shall be leak proof.

5.2 Flushing Cistern : The flushing of the W. C. pan shall be done by pull and let go flushing cistern of the valve less siphonic type conforming to IS:774 unless otherwise specified. The cistern shall be of cast iron, mosquito proof, of 12.5 litres capacity or other specified together with cover lever, G.I. chain and pull of specified quality, ball valve with copper or plastic float as specified and necessary unions etc. for connection with inlet and outlet pipes and overflow.

5.2.1 Brackets : The cistern shall be fixed on cast iron or rolled steel cantilever brackets which shall be firmly embedded in the wall in CM 1:3 or fixed by using wooden plugs and screws, to the satisfaction of the Executive Engineer.

5.2.2 Overflow : The cistern shall be provided with 20mm G.I. overflow pipe with fittings which shall terminate into mosquito proof coupling secured in a manner which will permit it to be readily cleaned or renewed when necessary. The length of the overflow shall be as per Municipal requirements.

5.2.3 Flush pipe : The outlet of flush pipe from the high level cistern shall be of 32 mm galvanised wrought iron pipe not less than 1.00 mm thick or light quality G.I. pipe B class or lead pipe of minimum thickness 2.6mm as specified, which shall be connected

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to the WC pan by means of an approved type of joint. The flush pipe shall be fixed to wall by using holder bat clamps or embedded as required. Where lead pipe pieces are required to be used in conjunction with G.I. Flush pipes for ensuring proper connection, the contractor shall do so at his own cost and rates quoted shall include for the same.

5.2.3.1 If the connection between the cistern and the W.C. pan is made with G.I. pipe, the bends and off sets shall be made cold, and connection to the pan may be made means of an approved type of joint or while lead mixed with chopped hemp.

5.2.4 PAINTING :

Inside of cistern and fittings shall be painted with approved bitumastic paint and outside of the cistern, brackets, overflow and flush pipe etc. shall be painted with a priming coat or red oxide, and finishing two or more coats of white zinc or any other colour and shade to match with the painting of surround-ing walls. The cost of such painting shall be included in the rate quoted for the flushing cistern.

Plastic Flushing Cistern (Low Level) :The low level plastic flushing Cistern shall be clock valve based on buoyancy principal and controlled by a water clock, designed for feather operation and shall conform to IS : 7231-1984 . The cistern tank shall have plastic body and shall be fixed in position along with all internal parts as per manufacture. The cistern shall have capacity of 10 litres. It shall be fixed in position along with all internal parts as per manufactures manual. There shall be a provision of 15 mm dia overflow outlet from which 15 mm dia G.I. B class (Medium quality) over flow pipe shall be provided to be terminated with a P.V.C mosquito proof coupling at 75 mm above W.C. floor level or as per municipal requirements if any. The out let or flush pipe from the cistern will be 32 mm P.V.C. Pipe which shall be connected to the W.C. pan with approved type of joint .

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Rates Quoted for the low level flushing cistern should include for :-

- (1) Flushing cistern with all internal fittings and concealed brackets, flushing handle (Knob) etc.
- (2) P.V.C. inlet pipe connection piece 15 mm dia with brass nuts.
- (3) 15 mm dia C.P. brass stop cock weighing not less than 400 gms.
- (4) 32 mm dia P.V.C. flush pipe (15 mm dia G.I. medium quality B class overflow pipe if required length shall be measured & paid extra under relevant item of the trade .)
- (5) Painting of G.I. overflow pipe with 3 coats of first quality synthetic enamel paint including a coat of primer.

6. PEDESTAL WASH DOWN WATER CLOSET :

6.1 W.C. PAN :

The W.C. pan shall be of white vitreous china of one piece construction of wash down type with integral 'P' or 'S' trap as required. it shall be of approved quality and pattern conforming to IS Specification IS 2556 (part - II).

6.2 SEAT & COVER :

The seat with lid shall be of well seasoned teakwood varnished or Mahogany polished or plastic seat as specified with rubber bullers and shall be fixed in position by using Chromium plated (CP) brass hinges and screws. The seat shall be non absorptive and free from cracks and crevices in the material. The plastic seat and cover where specified shall conform to I.S. Specifications and shall be black colour unless otherwise specified.

6.3 FLUSHING CISTERN :

The flushing of the W.C. pan shall be done by high level or low level valve less siphonic flushing cistern of approved quality, as specified. In the former case the specifications will be same as those for flushing cisterns of squatting pattern W.C. pans. In the latter case there shall be white glazed vitreous china or porcelain

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enamelled or plastic as specified of 12.5 litre or of other capacity cistern as specified with all internal fittings, brackets and C.P. brass flushing handle, Which shall be fixed at low level and connected to the W.C. pan by means of 40mm diameter white enamelled porcelain bend and rubber or 'Light' quality G.I. pipe or 2.6mm thick lead pipe connection or as other specified.

6.3.1 OVERFLOW :

There shall be 20mm overflow with mosquito proof coupling of approved design which shall conform to the specification as stated under squatting pattern W.C. pan.

7. BOWL URINAL :

7.1 BOWL URINAL :

The urinal shall be flat back or angular pattern lipped from basin or required dimensions of white vitreous China and one piece construction with integral flushing box rim or an approved make as specified. it shall be fixed in the position by using wooden plug embedded in the wall with screws of proper size. Each urinal shall be connected to a 40mm embedded in the wall with screws of proper size. Each urinal shall be connected to a 40mm diameter waste lead pipe unless otherwise specified, which shall discharge into a channel or a floor trap, or as specified. The connection between the urinal and flush or waste pipe shall be made by means of white lead mixed with chopped hemp. The flush pipe and waste pipe shall be concealed where directed.

7.2 FLUSHING :

The flushing of the urinals shall be done by automatic flushing cisterns conforming to I.S. specifications. Then cistern shall be of cast iron not less than 5mm body thickness or other specified having valveless siphon automatic flushing arrangement of specified capacity. It shall be supported on a pair of R.S. or C.I. cantilever brackets which shall be embedded or fixed to wall by means of wooden plugs and screws. The cistern shall be connected to the urinal basin by means of a G.I. Medium Quality or a lead or



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specified type of flush pipe with fittings. The pipe shall be fixed by using proper holder bat clamps or concealed by embedding as directed. The body thickness shall not be less than 6mm in the case of vitreous sanitary cistern and 1.60mm before coating in the case of pressed steel cistern. The latter should be procelain enamelled against corrosion.

7.2.1 **CAPACITY :**

The capacity of the flushing cistern and the size of the flush pipe for the number of urinals in a range will be as follows :-

Number of Urinals in a range	Capacity of flushing cistern	Main	Size of pipe distribution.
1.	5.0 litres	-	15mm
2.	10.0 litres	20mm	15mm
3.	12.5 litres	25mm	15mm
4.	12.5 litres	25mm	15mm

7.2.2 The joint between the urinal basin and flush and waste pipe shall be made by means of putty or white lead mixed with chopped hemp or as specified in case of lead pipes.

7.2.3 Painting : The inside and the outside of the cast iron cistern the fittings and brackets shall be painted as given under flushing cistern for squatting pattern W.C. pan.

8. **STALL URINALS :**

8.1 **URINAL STALLS :**

The urinal stall and its screens shall be of white vitreous china of approved quality and manufacture. the stall shall be 114cm high and 46cm wide and 40cm deep. The stall shall be provided with 84cm x 36cm division plates. In case of range of two more urinals, there shall be further division plates similar to end screens. The range shall have 15cm deep tread plates of fire clay unless otherwise specified.



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8.2 FLUSHING :

The stall be provided with white glazed vitreous china automatic flushing cistern or proper capacity with 6mm minimum body thickness unless otherwise specified. The cistern shall be complete with fittings and brackets which shall be fixed to the wall. The cistern shall be connected to the stall through standard size C.P. brass flush pipe with spreader arrangement and clamps unless otherwise specified. Capacity of flushing cistern and relevant sizes of flush pipe for stall urinals shall be the same as specified for bowl urinals.

8.2.1 OUTLET :

Each range of stalls shall be provided with C.I. urinal trap with vent arm having C.P. brass outlet grating of size 50mm for one or two stalls and 75mm for more stalls or as specified.

9. SQUATTING PLATES :

9.1 SQUATTING PLATES :

The urinal plates shall be of white glazed vitreous china with integral flushing rim of size 600 mm x 350 mm as specified. There shall be white glazed vitreous channel with stop and outlet pieces in front. The plate and channel shall be of approved quality and conform to IS Specifications 2556 (Part VI).

9.2 FLUSHING :

Each set of plates shall be provided with automatic C.I. cistern complete with G.I. flush pipe with fittings and spreaders arrangements fixed with holder-bat clamps or embedded as specified. There shall not be more than four plates in a range fed by a single cistern.

9.2. 1 CAPACITY :

The capacity of the flushing cistern and the size of the flush pipe for the number of squatting plate urinals in a range will be as follows :



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Number of Urinals in a range	Capacity of flushing cistern	Main	Size of pipe distribution.
1.	5.0 litres	-	20mm
2.	10.0 litres	25mm	20mm
3.	12.5 litres	32mm	20mm
4.	12.5 litres	32mm	20mm

9.2.2 The cistern shall be fixed R.S. or C.I. cantilever brackets which shall be embedded or fixed to the wall by means of wooden plugs and screws.

9.2.3 The joint between the urinal plate and the flush pipe shall be made with putty or white lead mixed with chopped hemp.

9.2.4 Painting : The inside and outside of the cistern, the fittings and brackets shall be painted as described for flushing cistern for squatting pattern W.C. pan.

9.3 Outlet : The squatting plate or a range of squatting plates shall be provided with a 65mm diameter standard urinal C.I. trap with vent arm having 65mm C.P. brass outlet grating or as specified.

9.4 Walling : The squatting plate shall have 1.22M high wall in front and on either side, this shall be lined as specified.

10. WASH BASINS :

10.1 Basins : The wash basins shall be of white vitreous china of approved quality, make and pattern conforming to I.S. Specifications. It shall be of one piece construction with an integral combined, overflow. The size of the basin shall be as specified.

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- 10.2** Fittings : Each wash basin shall be provided with 15mm C.P. brass pillar taps as specified, 32mm C.P. waste with C.P. brass bottle trap or G.I. trap and plug as specified, C. P. chain and rubber plug, unions, joint etc. complete in all respects of approved quality.
- 10.3** Fixing : The basin shall be supported on a pair of R.S. or C.I. cantilever brackets embedded or fixed in position by means of wooden cleats and screws. These brackets shall be painted to the required shade as given under flushing cistern for squatting pattern W.C. The wall plaster shall be cut to rest over the top edge of the basin. After fixing the basin, plaster shall be made good and surface finished to match with the existing one.
- 10.4** Waste connection : The waste pipe shall discharge into a floor trap leading to a gully trap, on ground floor and on upper floors it may be connected to a waste pipe stack. The C.P. brass bottle trap and Union shall be connected to 32mm G.I. light class waste pipe or lead pipe as specified which shall be suitable bent towards the wall and/or concealed in the wall as directed.

11. SINKS :

- 11.1** Sinks : The sink shall be of white glazed fine clay with wire type overflow conforming to I.S. Specifications unless otherwise specified . The size of the sink shall be as specified. The sink shall be of approved quality and manufactured.
- 11.2** Fittings : Each sink shall be provided with 40mm C.P. brass waste coupling and union of standard pattern C.P. brass chain and 40mm rubber plug may be provided where specified.
- 11.3** Fixing : The sink shall be supported on C.I. cantilever brackets embedded, fixed into position. These brackets shall be painted to the required shade as given under flushing cistern for W.Cs. The wall plaster on the rear shall be cut to overhang the top edge of the sink.

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11.4 Waste connection : The waste pipe shall discharge into a floor trap leading to a gully trap on ground floor and may be connected to a waste pipe stack on upper floors. C.P. brass coupling and union shall be connected to 40mm G.I. light quality waste pipe provided with suitable tee and plug for cleaning purposes.

12. TOILET REQUISITES :

12.1 MIRROR :

The mirror shall be of approved make glass with bevelled edges. The size and shape of the mirror shall be as specified. It shall be mounted on an asbestos sheet and shall be fixed in position by means of C.P. brass screws and washers over rubber washers and wooden plugs firmly embedded in the wall. C.P. brass clamps with C.P. screws may be and alternative method for fixing.

12.2 GLASS SHELF :

The shelf shall be of glass of approved quality with edges rounded off. The size of the shelf shall be as specified. The shelf shall have C.P. brass guard rail with rubber washers on positions resting on glass plate and C.P. brass brackets which shall be fixed with C.P. brass screws to wooden plugs firmly embedded in the wall.

12.3 TOWEL RAIL :

The towel rail shall be of C.P. brass with two C.P. brass brackets. The size of the rail shall be as specified. The bracket shall be fixed by means of C.P. brass screws to wooden cleats firmly embedded in the wall.

12.4 TOILET PAPER HOLDER :

The paper holder shall be wooden or of C.P. brass or vitreous china as specified. The wooden paper holder shall be made of well seasoned teakwood finished with beeswax. These shall be fixed in position by means of C.P. brass screws and wooden cleats embedded in the wall.



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12.5 LIQUID SOAP HOLDER :

This shall be of glass or C.P brass as specified. It shall be fixed in position by means of C.P. brass screws and wooden cleats embedded in the wall. The liquid soap holder shall be of approved size and make.

12.6 SHOWER ROSE :

The shower rose shall be of C.P. brass swivelling type approved size, make and design. Where specified , the same shall be provided with a C.P. brass shower arm with necessary C.P.brass wall flange and fitting.

12.7 WATER CONNECTORS :

Water connection to flushing cistern, wash basins etc. shall be by means of lead pipe or white polythene pipe connection pieces as specified with C.P. brass connectors on either ends and a stop cock. The size of the lead pipe or polythene pipe connection and stop cock will depend upon the size of water connection and shall be as specified. The length of the connecting pieces shall be at least 375 mm.

13. CAST IRON SOIL, WASTE, VENT AND RAINWATER PIPES AND FITTINGS

13.1 CAST IRON PIPE AND FITTINGS :

Cast iron soil, waste, vent and Rainwater pipes and fittings where specified shall conform to the latest Indian Standards Specifications for these pipes. The pipes shall have spigot and socket ends and shall be with or without ears as directed by the Executive Engineer.

13.2 WEIGHTS :

The standard weights and thickness of pipes are given below and a tolerance up to minus 10% may however be allowed against these standard weights.



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SOIL WASTE AND VENT PIPE						
SAND CAST			SPUN IRON		RAIN WATER	
Nominal dia of pipe	Minimum Thickness	Nominal weight for 2 m long pipe exclusive of ears	Minimum thickness	Nominal weight for 2m long pipe	Minimum thickness	Nominal weight for 1.8 m long pipe exclusive of ears
Mm	mm	kg	mm	kg	mm	kg
50	5	12.65	3.5	9.2	3	7.5
75	5	18.36	3.5	13.8	3	11.0
100	5	24.15	4.0	21.0	3	14.0
150	5	35.66	5.0	38.5	4	26.0

13.2.1 These shall be free from cracks and other flaws. the interior of pipes and fittings shall be clean and smooth. These pipes shall be coated internally and externally with suitable coating material having a tar or other approved base, in accordance with relevant I.S. Specification for these pipes.

13.2.2 The access door fitting shall be of proper design so as not to form any cavities in which filth may accumulate. Doors shall be provided with 3mm rubber insertion packing and when closed and bolted they shall be watertight and airtight.

13.3 FIXING :

The pipes and fittings shall be fixed to walls at least 5cm clear of the finished surface of wall by using proper holder bat clamps. The pipes shall be fixed perfectly vertical or in a line as directed. The spigot end shall abut the shoulder of the socket and leave no annular space in between. The pipes shall be strongly supported at the foot by a bed of cement concrete 1:3:6, 150 mm thick and rates quoted shall include for provision of the same. All soil pipes shall be carried up above the roof and shall have a suitable cowl. The bends in the bottom most soil or waste stack shall necessarily be of long radius and preferably made of two 135 degree C.I. bends.

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13.3.1 Connections between main pipe and the branch pipes shall be made by using proper branches and bends invariably with access doors for cleaning.

13.4 CEMENT MORTAR JOINTS :

Where specified, the pipes jointed with cement mortar joints shall be as under :

Closely twisted spun yarn gasket of such diameter as required to support the spigot of pipe at the proper grade and make truly concentric joints, and in one piece of sufficient length to pass around the pipe and lap at the top, shall be thoroughly saturated in cement paste. This gasket shall be laid in the socket for the lower third of the circumference of the joint and covered with cement mortar 1:1. The spigot of the pipe shall be thoroughly cleaned with a wet brush, inserted and carefully driven home after which a small amount of mortar shall be inserted in the annular space around the entire circumference of the pipe and solidly rammed into the joint with a caulking tool the mortar previously placed being driven ahead of the gasket. The remainder of the joint shall then be completely filled with cement mortar 1:1 and bevelled off at an angle of 45 degrees with the outside of the pipe.

13.4.1 Where any water closet pan or earthen ware pan connected to such pan is to be jointed with C.I. soil pipe, the joint between the pan/trap and the socket of the C.I. pipe shall always be of a flexible nature and such joint shall be made with a mixture of bitumen and chopped asbestos fibre (not dust).

13.5 LEAD CAULKED JOINTS :

Where the pipes are to be jointed with lead caulked joints, the same shall be done as follows :

The annular space between the socket and spigot will be first well packed in with spun yarn leaving 25mm from the tip of the socket for lead. The joint may be leaded by using proper leading rings or if they are not available by wrapping a ring of hemp rope covered with clay round the pipe at the end of the socket, leaving a hole through which lead shall be poured in (for pipes with sockets facing upwards 12mm high clay bound on the socket edge may be used).

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13.5.1 The lead shall be rendered thoroughly fluid and each joint filed in one pouring. Before caulking, the projecting lead shall be removed by flat chisels and then the joint caulked round with proper caulking tools and a hammer of 1 to 1 ½ kg. in weight in such a manner as to make the joint quite sound. After being well set up the joint is to be let flush, neat and even with the socket.

13.6 TESTING :

All cast iron pipes and fittings including joints will be tested for gas tightness by a smoke test and hydraulic performance by a water test and left in working order after completion.

13.6.1 SMOKE TEST :

Smoke shall be pumped into the drains at the lowest end from a smoke machine which consists of a blow and burner. The materials usually burnt are greasy cotton waste which form clear pungent smoke which is easily detectable by sight as well as by smell if leaking at any point of the drain.

13.6.2 WATER TEST :

The water test may be applied before the appliances are connected and may be carried out in sections so as to limit the static head to 4.5 metres.

13.6.3 The contractor will have to rectify all defects traced in such tests at his own expense to the satisfaction of the Executive Engineer.

13.7. PAINTING :

All the exposed C.I. pipes and fittings shall be painted with two coats of oil paint of approved quality, manufacture, colour and shade to match the surroundings. The cost of such painting should be included in the contractor's rates.

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13.7.1 The surface of the pipes and fittings to be painted shall be cleaned thoroughly. Red oxide or other approved primer shall be painted and allowed to dry. The finishing shall be done by painting 2 or more coats with paints in an approved colour and shade.

13.8 On no account shall lime mortar or lime concrete come in direct contact with C.I. pipes.

14. ASBESTOS CEMENT RAIN WATER, SOIL, WASTE AND VENT PIPES AND FITTINGS :

14.1 PIPES AND FITTINGS :

Asbestos Cement Rainwater, soil, waste and vent pipes and fittings shall conform to the latest Indian Standard Specifications for these types of pipes. The pipes shall have spigot and socket ends. The access door fittings shall be of proper design so as not to form any cavities in which filth may accumulate. Doors shall be provided with 3mm rubber insertion packing and when closed and bolted they shall be water, light and airtight.

14.2 THICKNESS AND SIZES :

The standard thickness and sizes with permissible tolerance of the dimension for pipe and fittings shall be as given below.

Nominal diameter of pipe of Fitting	Thickness of pipe or Fitting	Permissible variation in thickness	Permissible Variation in External Diameter.
mm	mm	mm	mm
50	6.5	+/- 1.0	+/- 1.5
60	6.5	+/- 1.0	+/- 1.5
80	8.0	+/- 1.0	+/- 1.5
90	8.0	+/- 1.0	+/- 1.5
100	8.0	+/- 1.0	+/- 1.5
125	9.5	+/- 1.0	+/- 2.5
150	9.5	+/- 1.0	+/- 2.5

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14.3 FIXING :

The pipes and fittings shall be fixed to walls at least 5 cm clear by using proper holder bats weighing 1 to 1½ Kgs each. The spigot end shall be abut the shoulder of the socket and leave no annular space in between. All soil pipes shall be carried up above the roof and shall have an A.C. Cowl . The bends in the bottommost soil or waste stack shall necessarily be of C.I. long radius and preferably made of two 135 Degree C.I bends

14.3.1 Connections between main pipe and the branch pipes shall be made by using proper branches and bends invariable with access doors for cleaning .

14.4 Jointing: A.C. pipes shall be jointed with cement Mortar Joints 1:1 as described for Cast iron pipes.

14.5 Testing : The joints of Pipes shall be tested by smoke test and water test as described for Cast iron pipes.

14.6 Painting : A.V. Pipes shall be painted to match the surroundings and rates quoted shall included to cover the same.

15. LEAD PIPES :

15.1 Lead Pipes : All lead pipes shall be hydraulic drawn and of equal substance throughout and shall conform to the relevant I.S. Specifications. When not supported on bearers, all lead pipes shall be supported by strong lead tracks at least 40 mm wide soldered on to the pipes at suitable intervals .The Size and weights of these pipes for flushing and soil, waste and ventilating pipes shall be given.

15.2 WIPED SOLDER JOINTS :

All joints of lead pipes shall be wiped solder joints as described below :

The pipe ends to be jointed shall be cleaned with a wire brush and freed from oxide if any. Chalk shall then be rubbed to kill the greasy nature of the lead. After this,



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plumbers black shall be applied. The length of the joint as given below shall then be marked on the pipe. a fine shaving of lead shall be removed from this length with a shave hook. Tallow shall then be smeared over the prepared surface. The molten solder, an alloy composed of 3 parts of tin and 7 parts of lead, shall be poured in a thin stream from a ladle moved in an elliptical direction over the joint position including a portion of the coiled pipe at each end beyond the mark. When sufficient solder has been poured the joint shall be wiped with a pad of wiping cloth with long continuous movements in one direction only so as to leave a neatly formed elliptical shaped joints. Surplus solder remaining on the joint shall be removed with a tool called "draw of".

15.2.1 The minimum and maximum length of the wiped solder joint shall be 8 cm & 9cm respectively.

15.2.2 The joints shall be watertight, airtight and shall be free from tears, burrs, strings, rebinds or droppings.

15.3 CLEANING ACCESS :

Brass screw cleaning access shall be provided on lead pipe wherever necessary and directed Rates quoted shall include for the above.

15.4 LEAD PIPE CONNECTION :

The joints between lead pipe and C.I. or stoneware pipe shall be made as under:
Where any stoneware or C.I. pipe or trap is connected with a lead soil, waste, or vent pipe or trap, there shall be inserted between the two, a 4.5 mm thick brass ferrule or thimble 150 mm long which shall be slipped into or over the lead pipe and jointed to it by means of a wiped solder joint. The other end of the ferrule shall then be inserted into the socket of the cast iron or stoneware pipe. In the case of former, the joint shall be made with molten lead 9 lead caulked) and in case of the latter with cement mortar 1:1 as in stoneware pipe drains.

15.4.1 The joints between outgo of a W.C. pan and a lead pipe shall be made as under :

The lead pipe shall be slipped into a brass thimble or socket and jointed to it by a wiped solder joint. The outgo of a W.C. pan shall then be inserted into the socket and jointed by using cement mortar as in stoneware pipe drains.



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15.5. PAINTING :

All exposed lead pipes shall be painted as in cast iron pipes and fittings. The cost of such painting should be covered in the contractor's rates.

16. PLUMBERS BRASS WORK AND WATER AND WASTE FITTINGS :

16.1 General : Generally, the whole of plumbers brass work or gunmetal fittings shall be of heavy quality and approved manufacture and pattern. They shall in all respects comply with the latest Indian Standard specifications. Brass castings for valves, unions, thimbles, ferrules, taps, traps, waste etc., shall be in all respects sound and good, free from laps, blow holes fittings, plugs, burns stops or patches. The fittings shall be fixed in the pipe line in a workman like manner. Care shall be taken to see that joints between fittings and pipes are made leak proof. The fittings and joints shall be tested to a pressure of 20 kg. per sq. Cm. unless otherwise specified. The defective fittings and the joints shall be required, redone or replaced Brass work requiring connection to lead pipes shall have tinned ends.

16.2 Screws down bib and stop taps : These shall be of cast brass of bronze, or 'polished bright' or 'chromium plated' finished and of size as specified and shall conform to I.S. 781.

16.2.1 Unless otherwise indicated, the minimum finished weights of bib taps and stop taps shall be as given below :

Minimum finished weight in kg.

Size in mm	Bib taps	Stop taps
15	0.40	0.40
20	0.75	0.75
25	1.25	1.30
32	-	1.80
40	-	2.25
50	-	3.85

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16.2.2 Washers for cold water taps shall be of selected leather, rubber asbestos composition or of plastics as directed. Washers for hot water taps shall be of good quality fibre or rubber asbestos composition as directed.

16.3 Piller Taps : Pillar Taps shall be of cast brass of chromium plated finished and of size as indicated and shall conform to I.S. 1795. Washers shall be of materials as for bib taps and stop taps.

16.3.1 Unless otherwise indicated the minimum finished weights of pillar taps shall be as given below :

Size in mm	Minimum finished weight in kg.
15	0.60
20	1.00
25	1.50

16.3.2 Ball valves : Ball valves shall be of high pressure type, made of (excluding the float or ball) brass of size indicated and shall conform to IS : 1703. The float shall be of copper sheet or polythene as indicated. unless otherwise indicated, the minimum finished weights of ball valves exclusive of the float) and those of copper floats shall be as below :

Nominal size in mm	Weight in kg.		Diameter of float in mm
	Ball valve exclusive of float	Copper	
15	0.30	0.22	127
20	0.47	0.32	152
25	0.87	0.68	203
32	1.20	0.92	229
40	1.65	1.05	254
50	1.92	1.53	305

16.4.1 The minimum thickness of the copper sheet used for making floats shall be 0.55 mm.

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- 16.5** Siphon traps (Galvanised malleable iron or brass) : Traps for lavatory basins, sinks and baths shall be of C.P. brass unless otherwise specified or G.I. of approved manufactures. Traps for lavatory basins and sinks shall have one inspection eye, fitted with screw plug and washer, while for baths the traps shall have 2 branches screwed externally, one of which shall be fitted with washered cap and other with a vent tail pipe and union nut for overflow connection. A loose coupling nut shall be fitted to the inlet for coupling to the waste and the outlet shall be either plain tails for lead pipe or screwed with pipe thread and provided with union tail and pipe.
- 16.6** Waste fittings : Waste fittings shall be brass chromium plated conforming to I.S. 2963. Sink waste shall be of 40 mm bore and wash basin waste shall be 32 mm bore, unless otherwise specified.
- 16.7** Waste plug and accessories : Waste plug shall be of hard rubber or other equally suitable material and shall conform to IS : 3311. The depth and thickness of the plug shall be such as to provide the required rigidity and water tightness. Each waste plug shall have a loose shackle. The shackle and other metal components shall be of corrosion resistant material.
- 16.7.1** Plug chains shall be made of brass or bronze wire, of diameter not less than 1.80 mm, with brazed oval links approximately 13mm in length.
- 16.7.2** Chain stays shall be of brass or bronze and shall be of bolt or screw type as indicated.
- 16.8** **LEAD TRAPS :**
- These shall be of size and pattern as indicated. The weights of lead sheets used in manufacture of traps shall be not less than 30 kg/sq.m.
- 16.8.1** The traps shall be supplied with brass screw caps, the screw of which shall be lead burnt or soldered to the trap with a well reinforced joint. Neither the screwed end of the cap, when screwed home, nor the sleeve shall produce beyond the inner surface of the trap. A washer to render the cap water-tight shall be supplied with every cap.



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16.9 GATE VALVE :

The Valves used for cold water services shall be of gunmetal and conform to Class - 1 type of IS 778. For hot water installations Class - II valves shall be used. The gate valves shall be the full way opening type with a metallic hand wheel fixed on the head of the spindle. The valves shall have screwed or flanged ends as approved by the Executive Engineer.

16.10 Globe valves (screw down stop valves) : These shall be of gunmetal Class - I type for cold water services conforming to I.S. 778 unless otherwise specified. The valves shall have screwed or flanged ends as directed. The valves shall be provided with metallic hand wheel fixed on the head of the spindle.

16.11 Check (non return) valves : These shall be of gun metal Class I type for cold water services conforming to I.S. : 778, unless otherwise specified. The valves shall have screwed or flanged ends as directed. They shall be suitable for horizontal or vertical use as directed.

16.12 FOOT VALVES :

Foot valves shall be of swing or lift type and provided with brass strainer and conform to the requirements of I.S. : 4038. The ends shall be screwed or flanged as directed.

16.13 FLOOR TRAPS :

The traps shall be of Cast Iron and self cleaning design. The traps shall be of specified size and fitted with a hinged C.P. or Cast iron grating as specified.

16.13.1 The grating shall be fixed flush with the floor while the trap shall rest on a 1:6 cement mortar bed.

16.13.2 When one pipe or single stack system of plumbing is employed it shall be essential to provide deep seal Cast iron floor traps of effective water seal 50mm complying with the requirements of Indian Standard specification.



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17. WATER TANKS :

17.1 Water Tanks : Hoisting of ready made mild steel galvanised iron, RCC or Asbestos Cement water tanks into position shall be carried out with proper tackle, care being taken that no part of the tank or of the structure is damaged with operation. The tanks shall be installed truly level. Steel tanks of capacity up to 1800 litres (Mild steel or Galvanised iron or specified) shall be of 3.2 mm thick sheet reverted to 32mm x 32mm x 6mm angle iron frame complete with MS cover and frame weighing 15 kg. with locking arrangement including providing pads of size as required for inlet and outlet pipes G.I. overflow pipe piece with mosquito proof couplings and scour pipe with backing nut of required size shall be also provided. Supports for tanks shall be provides as specified shall be measured and paid for separately.

17.1.1 Moulded P.V.C. Water Tanks : Polyethylene water storage tanks shall be one piece moulded in single wall construction without any seams, welds or joints from F.D.A approved grades of High Density polyethylene (HDPE) and of approved manufacture . The tank should satisfy the tests of safe storage of drinking water (Portability) and necessary test certificates from approved test laboratory should be produced for test of potability of water stored in tanks. The water tanks shall be of specified capacity and cylindrical vertical /Horizontal type with closed tops as specified in schedule of quantities The tanks should be provided with double seal mosquito proof light duty manhole cover with locking arrangements of diameter not less than 400 mm and shall be provided with G.I. fittings like inlet outlet for water connections wash out overflow with mosquito proof P.V.C. coupling brass ball cock with P.V.C coupling brass ball cock with PV.C. floats all of specified sizes . The tanks shall be hoisted and installed in position as per manufactures instructions manual and shall comply with the local municipal regulations . No leaks whatsoever shall be around the insert of water connection like inlet/ outlet pipe wash out etc. or any part of the body of the tank after the tank is filled with water to its full capacity.

The rates quoted shall include for :

- (1) Hoisting and installation in position
- (2) providing and fixing all fixture and fittings like G.I. inlet ,outlet overflow with mosquito proof P.V.C. coupling, wash out brass ball cock with polyethylene float, all of specified sizes.

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- (3) Manhole cover double seal mosquito proof of specified sizes.
- (4) Leakage test for the tank by filling water to full capacity after installation and completing all water supply connections.

17.2 PIPE INSERTS :

GI pipe inserts to be kept in position for outlets, washouts and inter connection of tanks while casting RCC water tanks shall be of the specified size and diameter and shall be threaded throughout its length. A 150mm x 150mm MS plate 6mm thick shall be welded centrally on to the threaded body of pipe as directed. Rates quoted shall include for the same.

17.3 OVERFLOW PIPES :

Overflow pipe inserts for tanks shall be of the specified size and diameter with an approved mosquito proof coupling and rates quoted shall include for the same.



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IV DRAINAGE

18. SALT GLAZED STONEWARE PIPE DRAINAGE

18.1 PIPES :

All pipes and fitting must be new and perfectly sound, free from fire cracks and imperfections of glazing, cylindrical and of standard nominal diameter, length and depth of socket. They shall be made of hard burnt stoneware of dark grey colour and thoroughly salt glazed inside and outside. These pipes and fittings shall conform to grade 'A' of the relevant latest IS. specifications for these pipes and fittings, unless otherwise specified.

18.2 EXCAVATION OF TRENCHES FOR SALT GLAZED STONEWARE PIPES :

Excavation of trenches connected works such as road crossing, protection of existing service lighting and water etc., shall generally be carried out in accordance with the procedure describe earlier in respect of Cast iron pressure pipes and fittings. Trenches for drainage work shall be carried out to the required levels. Use of sight rail and boning rods shall be adopted during the whole process of excavation and laying of pipes. Any excavation more than required shall be made good in 1:3:6 PCC at contractor's cost.

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18.3(a) CONCRETE SUPPORT OR PROTECTION :

Where it is desired to support or surround pipe sewers or drain, it shall be done in concrete 1:4:8 by adapting one of the following methods as specified.

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18.3.1 BEDDING :

Bedding shall be rectangular in section and shall extend laterally at least 15 cm. beyond on both sides of the projection of the barrel of the pipe. The thickness of the concrete, below the barrel of the pipe shall not be less than 10 cm. for the pipes under 15 cm. and over in diameter. Where bedding is used alone, the concrete shall be brought up at least to the invert level of the pipe to form a cradle and to avoid the line contact between the pipe and the bed.

18.3.2 HAUNCHING :

Concrete hunching shall consist of a concrete bed as described for bedding with the full width of the bed carried up to the level of the horizontal diameter of the pipe and splays from this level carried upon both sides of the pipe from the full width of the bed to meet the pipe barrel tangentially.

18.3.3 SURROUNDING OR ENCASING :

The surrounding or encasing shall be similar to hunching up to the horizontal diameter of the pipe and the top portion over this shall be finished in a semi-circular form to give a uniform encasing for the top half of the pipe. Encasement may be provided when the maximum subsoil water-table levels is likely to rise above the top of barrel or where there is insufficient earth cover over the top of the barrel.

18.4 LAYING OF PIPES :

Pipes shall be carefully laid to the levels and gradients shown on the plans. Great care shall be taken to prevent sand etc., from entering the pipes. The pipes between the man-holes shall be laid truly in straight line without vertical or horizontal undulations. The pipes shall be laid with the socket leading up hill. The body for the pipe shall for its entire length rest on an even bed of concrete and places shall be excavated in the concrete to receive the socket of the pipe.



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18.5 JOINTING :

In each joint, tarred gaskin or spun yarn soaked in neat cement slurry shall be passed round the joint and inserted in it by means of a caulking tool. More skeins of yarn shall be added and well rammed home.

18.5.1 The object of the yarn is to centre the spigot of one pipe within the socket of the other and to prevent the cement mortar of the joint penetrating into the pipes.

18.5.2 Cement Mortar 1:1 shall be slightly moistened and must on no account be soft or sloppy and shall be carefully inserted by hand into the joint. The mortar shall then be punched and caulked into the joint and more cement mortar added until the space of the joint has been filled completely with tightly caulked mortar. The joint shall then be finished off neatly outside the socket at an angle of 45 degree.

18.5.3 Any surplus mortar projecting inside the joint shall be removed and to guard against any such projections, sack or gunny bag shall be drawn past each after completion.

18.6 CURING :

The cement mortar joint shall be cured at least for seven days, before testing.

18.7 Quantity of Cement and Span yarn : The approximate quantity of cement and span yarn required for each joint for certain common sizes of pipes are given below for guidance :

Nominal Dia of pipe mm	Cement Kg.	Span yarn Kg.
100	1	0.25
150	1.5	0.35
200	2	0.70
250	2.5	0.80
300	3.25	1.10
350	4.5	1.25
400	5.5	1.50

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18.8 Jointing S.W. pipes with C.I. pipes : Where any C.I. soil, waste or ventilating pipe or trap is connected with stoneware pipe communicating with a sewer, the bedded spigot end of such C.I. pipe or trap shall be inserted into a socket of such S.W. pipe drain and the joint made with cement mortar 1:1.

18.9 Testing : All joint shall be tested to a head of 60 cms of water above top of the highest pipe between two man-holes.

18.9.1 The lowest end of the pipe shall be plugged watertight. Water shall then be filled in manhole at the upper end of the line. The depth of water in the manhole shall be 60 cm plus the diameter of the pipe. The joints shall then be examined. Any joint found leaking or sweating shall be remade or embedded into 15 cm layer of cement concrete 1:2:4. 30 cms. in length and the section re-tested, at the Contractor's expense until satisfactory results are obtained.

18.10 REFILLING :

Refilling in trenches for pipes shall be commenced as soon as the joint and concrete have been passed. The refilling on the top and around the drain shall be done with great care and in a manner as will obtain the greatest amount of compactness and solidity possible. For this purpose the earth shall be laid in regular layers of 15 cm. watered and rammed at earth layer. All surplus earth shall be disposed of as directed by the Executive Engineer.

19. STONEWARE STORM WATER DRAINS :

19.1 Storm Water Drains : When S.W. pipes are used for Storm water drainage, no concreting will be necessary. The cement mortar for jointing will be 1:3 or as specified. To avoid clogging of drains, both ends shall be kept plugged until the construction of manholes is completed in every respect. On compaction care shall be taken that each plug is removed and the face of the drain made smooth.



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20 STONEWARE GULLY TRAPS :

20.1 Gully Trap : This must be new, perfectly sound free from fire cracks and other imperfections of glazing, of standard nominal diameter and other dimensions. It shall be made of hard burnt stoneware of dark grey colour and thoroughly salt glazed inside and outside.

20.1.1 Each gully rap shall have one C.I. grating 15 cm x 15 cm and one watertight C.I. cover with frame 30cm x 30cm (Inside dimensions) with machined seating faces.

20.2 EXCAVATION :

The excavation for gully traps shall be done true to dimensions and levels as indicated on plans or as directed by the Executive Engineer.

20.3 FIXING :

The gully trap shall be fixed on cement concrete foundation 70 cms squared and not less than 10 cm. thick. The mix for the concrete will be 1 : 4 : 8 (1 cement : 4 sand and 8 stone ballast 40mm). The jointing of gully outlet to the branch drain shall be done similar to jointing of S.W. pipes.

20.4 MASONRY CHAMBER :

After fixing and testing the gully and branch drain, a brick masonry chamber 30 x 30 cm (Inside as specified in first class brick in cement mortar 1:4 shall be built with 11 cm thick wall round the gully trap from the top of the bed concrete up to ground level, the space between the chamber walls and the trap being filled in with cement concrete of the specifications of bed concrete. The chamber shall be plastered internally and externally with cement mortar 1:3 (1 cement : 3 sand) finished with a floating coat of neat cement. The corners and bottom of the chamber shall be rounded off so as to slope towards the grating.

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20.5 C.I. COVER :

C.I. cover with frame 30x30 cm (Finished) or as specified with machined seating faces shall then be fixed on the top of the brick masonry with cement concrete 1:2:4 and rendered smooth. The finished top of covers shall be left 5 cm. above the adjoining ground level so as to exclude the surface water from entering the gully trap.

21. REINFORCED CEMENT CONCRETE PIPE DRAINAGE :

21.1 R.C.C. PIPES :

All pipes and fittings must be new and perfectly sound, free from cracks, cylindrically straight and of standard nominal diameter and length. They shall be made of reinforced cement concrete, manufactured by centrifugal or spun process and shall have an even texture. Each pipe shall have one collar with it. The pipes shall conform to latest Indian Standard Specifications and shall be of 'NP2' class, unless otherwise specified.

21.2 EXCAVATION OF TRENCHES :

Excavation of trenches and connected works such as road crossings, protection of existing services, lighting and watch etc., shall generally be carried out in accordance with procedure described earlier of Cast Iron Pressure pipes and Stoneware pipes.

21.3 CONCRETE SUPPORT :

Chairs made of cement concrete shall be used unless otherwise specified for supporting pipes. These shall be provided at suitable intervals which shall not exceed the length of pipe. In cases where the soil is made up or is very soft, other form of concrete supports may be resorted to form the bed of the trench below the pipe as directed by the Executive Engineer.

21.4 LAYING :

The pipes shall be carefully laid to levels and gradients shown in the plans and sections. Great care shall be taken to prevent sand etc., from entering the pipes. The pipes between two manholes shall be laid truly in straight lines without vertical or horizontal undulations.

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21.4.1 The body of the pipe shall for its entire length rest on an even bed in the trench and places shall be excavated to receive the collar for the purpose of jointing.

21.5 **JOINTING** : A few skeins of span yarn soaked in neat cement wash shall be inserted in the groove at the end of the pipe and the two adjoining pipes butted against each other. The collar shall then be slipped over the joint covering equally both the pipes. Spun yarn soaked in neat cement wash shall be passed round the pipes and inserted in the joint by means of caulking tools from both ends of the collar. More skeins of yarn shall be added and well rammed home.

21.5.1 The object of the yarn is to centre the two ends of the pipes within the collar, and to prevent the cement mortar of the joint penetrating into the pipes.

21.5.2 Cement mortar 1:1 (1 cement : 1 sand) shall be slightly moistened, and must on no account be soft or sloppy and shall be carefully inserted by hand into the joint. The mortar shall then be punched and chaulked into the joint and more cement mortar added until the space of the joint has been filled completely with tightly caulked mortar. The joint shall be finished off neatly outside the collar on both sides at an angle 45 degree.

21.5.3 Any surplus mortar projecting inside the joint is to be removed and to guard against any such projection sack or gunny bag shall be drawn past each joint after completion.

21.6 **CURING** : The cement mortar joints shall be cured at least for ten days.

21.7 **TESTING AND REFILLING** : This shall be the same as described for S.W. pipe drains except that in the case of testing, the head of water for testing shall be 2 Meters above the top of the highest pipe between two manholes.

22. **STORM WATER DRAINS** : When concrete pipes are used for storm water drainage, the cement for the jointing shall be 1:3 (1 cement : 3 sand), or as specified. To avoid clogging of drains, both ends shall be kept plugged until the construction of manholes



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is completed in every respect. On completion care shall be taken that each plug is removed and the face of the drain made smooth.

23. CAST IRON PIPE DRAINAGE :

23.1 APPLICATION : C.I. pipe drainage may be adopted in the cases mentioned below where specified.

- a. In bad or unstable ground where soil movement is expected.
- b. In made-up or tripped ground.
- c. To provide for increased strength where a sewer is laid at insignificant depth, where it is exposed or where it has to be carried on piers or above ground, and
- d. Under buildings and where pipes are suspended in basements and like situations.

23.2 PIPE : The pipes used shall conform to the latest Indian Standard specifications IS : 6163 for C.I. spigot and socket pipes unless otherwise specified.

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

23.2.2 The nominal weights of the pipe shall be as per details below

Nominal dia of pipe	Nominal weight of pipes including socket length for pipes of over- all length 3.66 M.
MM	Kg.
80	44
100	52
150	85
200	

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23.3 EXCAVATION IN TRENCHES : LAYING AND JOINTING, REFILLING ETC. :

Specifications for trenches and connected works for laying and jointing, refilling cast iron pressure pipes & stoneware pipes shall apply in this case.

23.4 CONCRETE SUPPORTS : In normal ground no concrete support or protection to C.I. pipes need be provided. Where supporting pipes are specified, these shall not be less than 30 cm in length (parallel to the axis of pipe) and at least equal in section to that described for hunching under concrete supports for S.W. pipes. Piers shall be built just behind the pipe sockets intermediate piers being provided where necessary.

24. BRICK MASONRY OPEN SURFACE DRAINS.

24.1 SURFACE DRAINS : The top of the drain shall always be kept 50 to 75mm above adjoining ground level so as not to admit water form surrounding area into it.

The overall depths of various sizes of drains shall be as follows:

Drain size	Depth
10cm	15cm
15cm	23cm
23cm	30cm

24.1.1 The earth excavation shall be done true to levels and lines. The drains shall be build in 1st class brick in cement mortar 1:5 over a 10cm bed of cement concrete 1:5:10. The inside bottom concerns of the drain shall be rounded of by means of fine cement concrete 1:2:4. Inside of the drain, top and sides of the brick work shall be plastered with 12 mm cement mortar 1:3 finished with a floating coat of neat cement. The drain may be given as far as possible a uniform slope from the starting point to the discharging point.



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24.2 BRICK MASONRY DRAINS WITH STONEWARE GLAZED CHANNELS :

The work shall be carried out as per specifications of open surface of drains except that the cement plaster of the inside of the drain shall be omitted and stoneware glazed channel of proper size shall be fixed in drain with cement mortar 1:1.

25. MANHOLES AND INSPECTION CHAMBERS :

25.1 Chambers : At every change of alignment, gradient or diameter of a drain there shall be a manhole or inspection chamber. The maximum distance between manholes shall not exceed 30 meters.

25.2 SIZE : The size of the manhole or inspection Chamber specified shall be the internal size of the manhole (between brick faces). The work shall be done strictly as per drawings and specifications.

25.3 EXCAVATION : The manhole shall be excavated true to dimensions and levels, shown on the plan or as directed by the Executive Engineer.

25.4 BRICK WORK : The bricks shall be of first quality, best locally available and from approved surface. The brick work shall be laid in cement mortar 1:3. The joints shall be made thoroughly leak proof.

25.5. PLASTER : The walls shall be plastered both inside and outside with 20mm thick cement plaster 1:3. Where subsoil water condition exists, the outside surface of the walls shall be plastered with the addition of approved water proofing compound.

25.6 FOUNDATION CONCRETE : The manhole/inspection chambers shall be built on a base of cement concrete of mix 1:4:8 of thickness of atleast 15cm for chambers upto 1m. depth, at least 20cm for chambers from 1m. to 1.5m depth and atleast 30cm for inspection chamber of greater depth.

25.7 POINTING : Pointing shall be done with cement mortar 1:2 whenever required.

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- 25.8. CHANNELS AND BENCHING** : The channels and benching shall be done in cement concrete 1:2:4 and rendered smooth to the grade with cement mortar 1:2. The channel shall be semicircular in the bottom half and of diameter equal to the sewer. Above the horizontal diameter, the sides shall be extended vertically to the same level as the crown of the outgoing pipe and the top edge shall be suitably rounded off.
- 25.9 R.C.C. COVER SLAB** : Cover slab shall be of RCC 1:2:4 of 100mm thickness or other specified with steel reinforcement as per details.
- 25.10 FOOT RESTS** : Foot rests shall be provided in all inspection chambers and manholes over 0.8m in depth and shall be of C.I. square flats 25mm weighing at least 4.50 kg or as specified and shall be painted with coal tar. These shall be embedded in masonry in cement mortar at least 25cm, while the brickworks is in progress. They shall be set staggered into two vertical runs which maybe 38 cms apart horizontally and 30.5 cms apart vertically. The top foot rest shall be 45 cms below the manhole cover and the lowest not more than 30 cms above the benching.
- 25.11 LEVELS OF INVERT** : Sewers of unequal sectional area should not join with level inverts in a manhole, but the crown of the sewers shall be kept at the same level and necessary slope given in the invert of the manhole chamber. The branch sewer should deliver sewage in the manhole in the direction of main flow and the junction must be made with care so that flow in the main is not impeded.
- 25.12 HOUSE CONNECTIONS** : No drain from house fittings e.g. gully trap or soil pipe, etc. to manhole shall exceed a length of 6m unless it is unavoidable.
- 25.13 MEASUREMENTS** : The depth of manhole shall be reckoned from the invert level of the channel to the top of the C.I. cover. The depth shall be measured correct to the nearest cm.

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- 25.14 MANHOLE UPTO 1 METER** : This shall be of 0.80 x 0.80 M unless otherwise specified and is generally constructed within compounds for house drainage only, The thickness of brick walls shall not be less than 23 cms.
- 25.15 MANHOLES OF DEPTHS BETWEEN 1.00 M AND 1.50 M** : This shall be of 1.2 M x 0.9M unless otherwise specified. The thickness of brick walls shall not be less than 23 cms.
- 25.16 MANHOLE OF DEPTHS MORE THAN 1.5 METERS** : Circular chambers with a minimum diameter of 1.4 meters or rectangular chambers with minimum internal dimensions of 1.2 M x 0.9 Meter shall normally be provided unless otherwise specified. The brick work for the portion exceeding 1.5 Meters and upto 2.20 Meters shall normally be of 34.5 cms thickness, unless otherwise specified.
- 25.17 DROP MANHOLES** : Where it is impractical to arrange the connection of the branch pipe sewer within 60 cm of the invert of the outgoing sewer in the manhole, a drop connection shall be provided, if the difference in level between the in-coming drain and the sewer dose not exceed 60cm the connecting pipe may be directly brought through the chamber wall and the fall accommodated by constructing a ramp in the benching of chamber.
- 25.17.1** The connection shall be made by constructing a vertical shaft outside the manhole chamber as shown in drawings or directed by the Executive Engineer. The rates quoted shall include for providing the requisite length of SW or RCC pipe embedded in the masonry or PCC at the upper and lower ends of the drop arrangement, providing and fixing SW or RCC right angled bend and double tee junction of the requisite size including cutting ends if required and jointing, providing 11cm thick brick masonry in 1:2 cement mortar or PCC encasement around including finishing with cement plaster 1:1, 20 mm thick and excavation and plugging the open mouths of the double tee junctions and house connection pipes wherever directed.



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26. C.I. MANHOLE COVERS :

26.1. COVERS : The C.I. manhole covers and frame shall be cleanly cast and shall be free from air and sand holes, cold shuts and warping which are likely to impair utility of castings. They shall be of tough homogeneous cast iron, or heavy, medium or light duty type as specified. The sizes specified are the clear internal dimensions.

The minimum weights of the various types of manhole covers with frames and their internal sizes will be as given below.

SL.	Description No.	Clear opening mm	Minimum weight of cover kg.	Minimum weight of frame. kg.	Total weight weight kg.
1.	Heavy Duty Circular	500 dia.	118	111	229
2.	Medium Duty Rectangular	455x610	80	64	144
3.	Medium Duty Circular	500 dia.	58	58	116
4.	Light Duty Rectangular Double seal	455x610	29	23	52

26.2 Manhole covers with double seal shall be used near buildings and within compounds. When the inspection Chamber is built in domestic premises where they are not subjected to wheeled traffic head light duty. C.I. covers may be used. When it is build within the metalled width of the road under heavy vehicular traffic, it shall be provided with heavy duty C.I. cover. Medium duty covers shall be used in light traffic conditions such as internal approach roads and cycle tracks.

26.2.1 The covers used in manholes on sewer lines shall invariably bear the work "SEWER" on the top, and those used for storm water drains shall bear work S.W.D. These makings shall be done during casting of the covers.

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26.2.2 The frame of manholes cover shall be embedded firmly in the RCC slab or plain concrete as the case may be on the top of the masonry.

26.2.3 After the completion of the work manhole covers shall be seated by means of thick motor grease. All exposed surfaces of the frames and cover shall be painted with coat tar. The cost of such work should be included in the Contractor's rates.



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**WATER SUPPLY, INTERNAL SANITARY INSTALLATIONS
AND DRAINAGE WORK-SCHEDULE OF QUANTITIES**

P R E A M B L E S

1. **GENERAL** : These preambles apply to all the sections of the "Schedule of Quantities" although they may not be repeated later.
2. In case any variation or discrepancy is found between the description in the schedule of quantities will take precedence over the specifications for Sanitary work.
3. **RATES TO COVER** :
 - a. Whether specifically mentioned or not, the contractor should cover in the rates quoted by him in the schedule of quantities , for all the conditions, materials and labour (up to incorporation in acceptable work) covered in this preambles. The contractor should also cover in his rates for the method of work, cost of materials, labour etc., to comply with the "General specifications" "General instructions to contractors", "Conditions of Contract", "Special Conditions (if any)" and all documents of this contract.
 - b. The Contractor's rates shall cover for all materials, tools and plants, scaffolding and everything necessary, for the proper execution of the work to the satisfaction of the Chief Engineer . All materials and workmanship used in the execution of the work shall be the best or first quality and description unless otherwise stated. All materials or procedure or specifications for work, unless otherwise stated, shall conform to the current Indian standard whether or not specific mention is made thereof. The contractor shall be responsible for and shall replace or make good at his own expense, any materials lost or damaged, or of quality not approved.
4. **SUPPLY AND FIX** : All rates shall include for "supplying and fixing" although the same may not have been mentioned in the items of the schedule of quantities. Words "providing and fixing" where used shall have the same meaning as "supplying and fixing".

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5. **DESCRIPTION OF ITEMS CLARIFICATION** : Description of item shall mean its description in all relevant parts of the tender including that described in these preambles, General specifications, General instructions, etc. Every care is taken to describe an item as clearly as possible. If meaning of any of the items is not clear, the contractor is advised to have the clarification in writing from the office of the Chief Engineer, Life insurance corporation of India, East Central Zonal office, ĩveevandeep Bldg. 4th Floor, Engineering department, Exhibition Road, Patna ĩ 800001.
6. **PRICE FLUCTUATION/VARIATION** :

Rate Quoted by the Contractors shall be firm throughout the currency of the contract (including extension of time, if any, granted). Price fluctuation due to variation in cost of materials or labour in water supply, internal installations and drainage work shall be considered as stated in clause 18 (Reimbursement/recovery on variation in prices) of General preambles to schedule of Quantities.
7. The Executive Director (Building) reserves the right to increase or decrease and/or revise the scope of contract if required at his own discretion and the decision of the Chief Engineer in this respect shall be final and binding to the Contractor. No claim whatsoever from Contractors on this account will be entertained.
8. **WORK TO BE COMPLETED WITH BUILDERS' WORK** :

The work involved in this contract shall be completed along with builders' work. If any extensions to the builders' work is granted or if builders work gets extended beyond its expected date of completion for any reason whatsoever, and for any period of time a corresponding extension of time will be granted to the Sanitary Contractor on account of any delays in the completion of the Builders' work will be entertained by the Chief Engineer .
9. **CO-OPERATION** : Contractor shall be required to extend the maximum co-operation to the other contractors like those involved in the work of Builder's work, electrical work, road work etc.

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10. **QUALITY** : The work involved calls for a high standard of workmanship combined with speed.
11. **ANNULARY WORKS** : The contractor shall have to carry out all ancillary and connected works within the boundary of the plot of the proposed work and inside the building if ordered to do so by the Chief Engineer at the rates quoted in the Schedule of Quantities, at any time during the currency of this contract including extension of time, if any granted.
12. **SAMPLES** : The contractors shall furnish at the earliest possible opportunity before work commences at his own cost, any samples of materials or workmanship that may be called for by the Executive Engineer 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. Rates quoted shall cover for such preliminary work, which shall not be paid for.
13. **SEQUENCE OF WORKS** : The Executive Engineer reserves the right to fix the order in which the various items of work involved in this contract are to be executed and contractor shall comply with the same. There shall be no extra claims on account of this.
14. **RATES** : Contractor shall ensure that each and every quoted rates is workable and self supporting. If called upon by the Chief Engineer detailed analysis of any or of all the rates shall be submitted. The Executive Director is not bound to recognise Contractor's analysis and reserve the right to reject abnormal rates quoted by the contractor. In case there are inconsistencies in the rates for items of same description quoted in the different parts of the Schedule of Quantities, the lowest of such rates will be considered as the rate for all such items, unless Executive Director finds that there is justification for such inconsistent rates.

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15. **MUNICIPAL CLEARANCE** : All work shall conform to the description given for each of the items, in addition to the Bye-laws of the Municipality/Public Health Authority within whose jurisdiction the items are to be executed. Contractor shall obtain approval to drainage and water supply work and work shall be considered as completed only when the Contractor produces "No Objection and completed certificate" from the Municipal/Public Health Authorities. Rates quoted shall include for the same.

16. **LICENSED PLUMBERS** : All sanitary and plumbing work shall be carried out through licensed plumbers, as per the bye-laws and regulations of the concerned Municipal Authorities. The Contractor shall complete all the formalities of Local Municipal Authorities in respect of the work covered under this tender including getting the water supply and drainage plans approved. After completion of work the Contractors shall obtain the drainage and water supply completion certificate including water sufficiency certificate from the Municipal Authorities. No charges whatsoever, either professional or Municipal, including any deposits or any other charges required to be paid for getting the materials tested and approved from the Municipal Authorities etc., obtaining permissions, certificates etc., will be paid to the Contractor and the rates be based accordingly.

17. **JOINTS**: All joints in piping shall be made properly so as to be mechanically sound and leak proof and shall satisfy water and smoke tests. Leaking or sweating joints shall be remade to Executive Engineer's satisfactions, at Contractor's expense.

18. **QUOTED RATES**: Rates quoted shall allow for the following :-
 - a. Excavation in all types of soil except in hard rock, refilling and carting away surplus materials to Contractor's own dump or as directed, for manholes, inspection chambers, gully traps water supply and drainage line of appurtenances.
 - b. All subsidiary fastenings, fittings and fixtures required even though they may not have been specially described under particular item.
 - c. All fittings fixed to walls will have approved clamps fixed to wooden plugs.
 - d. Two coats of approved ready mixed paint over red oxide primer to all exposed iron or wood work including C.I. brackets, G.I. pipe and C.I. pipes. All G.I. pipes

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whether laid in ground or concealed in walls or floors shall be coated with bitumen, wrapped with hessian and again coated with bitumen. All C.I. pipes fixed in chase or concealed in floors shall be given three coats of bitumastic paint. The inside of flushing cistern and fitting shall be painted with approved bitumastic paint and outside of the cistern, brackets, overflow and flush pipes etc., shall be painted with two or more coats of white zinc or any other colour over a red oxide primer. Lead pipe shall be painted in similar manner as C.I. or G.I. pipes. A.C. pipes shall be painted to match the surrounding finish.

- e. Making holes through concrete/masonry, making good the work and redoing and re-plastering the same to match the surroundings.
- f. For all pipes, rates shall be inclusive of all fittings and specials such as couplings, bends unions, cleaning eyes, tees, plugs, reducers, etc., and making joints and connections to valves, tanks, pumps and existing pipe lines etc., as required.
- g. Cutting chases for concealing pipes in walls and floors and making good with cement plaster.
- h. Fixing of drainage pipes and rainwater pipes 5 cm away from the wall by means of holder bats fixed to wooden plugs.
- i. Rates quoted shall include for hoisting to and work at all levels and lift of materials shall not form any criterion for any extra claims.
- j. Cutting into existing manhole/chambers above the invert level of the existing drain but without drop arrangements and not disturbing existing benching of manhole/chamber including making good the same.
- k. Disinfection and flushing of water supply mains as directed.
- l. Testing the installations by smoke and water test.

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19. **ADEQUACY** : The Contractor shall be responsible for the adequacy and efficiency of the entire plumbing system and if in his opinion he finds any serious objections to the system shown on the drawings he shall set forth his objections or his suggestions to ensure adequacy and efficiency of the said system and notify the Chief Engineer before proceeding with the work.
20. **SEQUENCING** : The work should be executed simultaneously with completion of the General Building work and the Contractor shall take care to see that no damage or breakage is done to work once it is constructed and finished. The sanitary work shall be so adjusted that it does not hold up the general construction or other Contractor's work.
21. **FITTINGS** : All sanitary ware and fittings shall be white glazed VITREOUS CHINA of approved make.
22. **CLASS OF PIPE** : Unless otherwise specified pipes for water supply shall be 'Medium' quality galvanised steel tubing ('B' Class) of approved make, welded and seamless, screwed and socked.
23. **QUALITY OF PIPE & FITTING** : All C.I. pipes and fittings shall be of heavy quality and approved make.
Plumbers brass work or gunmetal valves and fittings shall be of heavy quality and of approved make with tested ISI mark. All sanitary appliances, pipes and fittings shall be of approved make and brand as per list of approved makes/brand of materials mentioned elsewhere in the tender.
24. **RATE TO PROVIDE FOR** : Rates for items with excavation shall include for shorting, timbering, strutting etc., for protection of excavated sides, bailing out water due to rains or subsoil water if encountered and de-watering by pump wherever required until all work below water level is finished to the satisfaction of the Executive Engineer.

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25. **CONCRETE MIXE** : The proportion of mixes for concrete work is by volume. Cement shall not however be measured by volume, but shall be measured by weight. O One bag of cement containing 50 Kg. of cement shall be assumed to contain 35 litres (1.20 C. it.). Unless otherwise specified, ordinary portland cement shall be used complying with the requirements of latest I.S. Specification.
26. **BRICKS** : Bricks used for construction of manholes, gully trap chambers etc., shall be table moulded from approved source. Bricks shall be well burnt, first quality, having regular shape with sharp corners and edges. It shall not absorb water more than 20% of its own weight when dry.
27. **THICKNESS OF PLASTER** : The thickness of plaster where specified is the minimum thickness required over the proudest part of the wall and all dubbing out shall be included in the rates quoted. Sand for mortar and plaster shall be clean, free from salt, loam, clay, shells, vegetable matter and fit for use in the opinion of the Executive Engineer.
28. **WATERPROOFING** : Cement waterproofing compound wherever mentioned shall be of approved make and use as per manufacturer's specifications. The rates quoted for items where waterproofing compound is specified shall include for the same.
29. **COMPLETION CERTIFICATE**: The Contractor shall obtain all necessary permissions, fill up all the requisitions, test reports etc. He shall include all such costs incidental to the work.

The Contractor shall obtain drainage completion certificate and water sufficiency certificate from the authorities without any obligation.

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30. ABBREVIATION USED :

C.P.	shall mean Chromium plated.
R.C.C.	shall mean Reinforced Cement Concrete.
P.C.C.	shall mean Plain Cement Concrete.
C.I.	shall mean Cast Iron.
G.I.	shall mean Galvanised Iron.
A.C.	shall mean Asbestos Cement.
P.V.C.	shall mean (Unplasticated) Polyvinyl Chloride.
I.S.I.	shall mean Indian Standards Institution.
W.C.	shall mean Water Closet.