STATE BANK OF INDIA

PROPOSED CONSTRUCTION OF THE ADDITIONAL FLOOR OVER EXISTING BRANCH BUILDING INCLUDING REPAIRING WORK OF COMPOUND WALL AND INSTALLATION OF PAVER BLOCKS AT STATE BANK OF INDIA'S MAIN BRANCH PREMISES, BETUL, MADHYA PRADESH

PART – A : TECHNICAL BID

TENDER FOR :

CIVIL, SANITARY AND ELECTRICAL WORK

TENDER SUBMITTED BY :

NAME : _____

ADDRESS : _____

_____

_____

DATE : _____

ARCHITECT :

PARELKAR OVALEKAR PARPIA,
139, SEKSARIA CHAMBERS,
NAGINDAS MASTER ROAD,
FORT, MUMBAI 400 001.
TEL. NO. 2267 3725 / 2267 5840
FAX NO. 2267 5840E-mail : parelkarovalekarparpia@gmail.com

NOTICE INVITING TENDERS

We on behalf of State Bank of India, Premises & Estate Department, Local Head Office, Hoshangabad Road, Bhopal invite sealed tenders from Empaneled Contractors (Category-'CC') of State Bank of India, Local Head Office, Bhopal and who receive N.I.T. from the Architect shall be eligible to quote for the "Proposed Construction of the Additional Floor over Existing Branch Building including Repairing Work of Compound Wall and installation of Paver Blocks at State Bank of India's Main Branch Premises, Betul, Madhya Pradesh."

Details of tenders are as under:

1. Name of work	:"Proposed Construction of the Additional Floor over Existing Branch Building including Repairing Work of Compound Wall and installation of Paver Blocks at State Bank of India's Main Branch Premises, Betul, Madhya Pradesh."
2. Nature of Work	: Civil, Sanitary and Electrical Work
3. Time allowed for completion	: 10 Months
4. Earnest Money Deposit	: ₹ 1,45,000.00 (Rupees One Lakh Forty Five Thousand only)
5. Initial Security Deposit	: 2% of contract amount including EMD.
6. Start date of collection/ downloading of tenders	: 23rd May' 2017 to 7th June' 2017
7. Last date and time of submission of tenders	: 7th June' 2017 upto 3.00 P.M.
8. Address at which the tenders are to be submitted	: Assistant General Manager (Premises & Estate), State Bank of India, Local Head office, Hoshangabad Road, Bhopal 462011.
9. Date and time of opening tenders	: 7th June' 2017 at 3.30 P.M.
10. Place of opening tenders	: Assistant General Manager (Premises & Estate), State Bank of India, Local Head office, Hoshangabad Road, Bhopal 462011.
11. Defects liability period	: 12 Months from the date of Virtual Completion
12. Validity of offer	: 90 days from the date of opening of Price-bid.
13. Liquidated Damages amount.	: 0.50% per weeks subject to max. 5% of contract

Signature of Contractor with Seal

14. Value of Interim Certificate : ₹ 20.00 Lakhs.

15. Tenders can be downloaded from **www.sbi.co.in** (link) <Procurement News>.**It shall be responsibility of the contractor to arrange and ensure that all pages of technical and financial bid are properly bound separately. Tenders in loose pages may be disqualified.**

16. The contractor shall sign and stamp each page of the tender document thereby ensuring the number and sequence of all pages.

17. No conditions other than mentioned in the tender will be considered, and if given they will have to be withdrawn before opening of the price-bid.

18. The bidding contractor for electrical works shall possess a valid license of having completed works of ₹1 Lakh in past 3 years.

19. The Bank reserve their rights to accept or reject any or all the tenders, either in whole or in part without assigning any reason(s) for doing so and no claim / correspondence shall be entertained in this regard.

The tender shall be submitted in two parts-

Part: A. **First Envelope** should contain, Technical Bid along with drawings given with the tender document correspondence entered till date along with Earnest Money Deposit, and

Part: B **Second Envelope** will contain Price Bid only.

In case the date of opening of tenders is declared as a holiday, the tenders will be opened on the next working day at the same time.

SBI has the right to accept / reject any / all tenders without assigning any reasons and no correspondence shall be entertained in this regard.

Thanking You,

Yours Faithfully,
For Parelkar-Ovalekar-Parpia

Mr. MandarOvalekar
Architect & Interior Designer

Signature of Contractor with Seal

ARTICLES OF AGREEMENT

(On non-judicial Stamp Paper of ₹ 200/-)

ARTICLES OF AGREEMENT made the _____ date of _____ between State Bank of India, having its office at Bhopal hereinafter called "the Bank" of the One Part and _____

_____

_____

WHEREAS the Bank is desirous of _____

_____ and has caused drawings and specifications describing the work to be done to be prepared by M/s. PARELKAR OVALEKAR PARPIA, its Architects.

AND WHEREAS the said Drawings numbered _____ to_____ inclusive, the Specifications and the Schedule of Quantities 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 set forth herein and to the Conditions set forth herein in the Special Conditions and in the Schedule of Quantities and Conditions of Contract (all of which are collectively 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 Schedule of Quantities at the respective rates therein set forth amounting to the sum as therein arrived at our such other sum as shall become payable there under (hereinafter referred to as "the said Contract Amount.)

NOW IT IS HEREBY AGREED AS FOLLOWS:

1) In consideration of the said Contract Amount to be paid at the times and in the manner set forth in the said Conditions, the Contractor shall upon and subject to the said Conditions execute and complete the work shown upon the said Drawings and described in the said Specifications and the priced Schedule of Quantities.

2) The Employer shall pay to the Contractor the said Contract Amount, or such other sum as shall become payable, at the times and in the manner specified in the said Conditions.

3) The term "the Architects" in the said Conditions shall mean the said M/s. PARELKAR OVALEKAR PARPIA, or in the event of their ceasing to be the Architects for the purpose of this Contract for whatever reason, such other person or persons as shall be nominated for that purpose by the Employer, not being a person to whom the Contractor shall object for reasons considered to be sufficient by the Employer, PROVIDED ALWAYS that no person or persons subsequently appointed to be Architects under this Contract shall be entitled to disregard or overrule any previous decisions or approval or direction given or expressed in writing by the outgoing Architects for the time being.

4) The said Conditions and Appendix thereto shall be read and construed as forming part of this Agreement, and the parties hereto shall respectively abide by submit themselves to the said Conditions and perform the Agreements on their part respectively in the said Conditions contained.

5) The term Structural Consultant refers to **Mr. Abhay Damle** of **M/s Damle&Thakurdesai, Andheri** and the term Electrical Consultant refers to **Mr. Ashish Bhilkar of M/s S.M. Engineers** Mumbai of their ceasing to be the Consultants for this Project, such other person or persons as may be appointed by the Architects with the approval of the Employer.

6) The Plans, Agreements and Documents mentioned herein shall form the basis of this Contract.

7) This Contract is neither a fixed lump-sum contract nor a piece work contract but a contract to carry out the work in respect of the entire building complex to be paid for according to actual measured quantities at the rates contained in the Schedule of Quantities and Rates or as provided in the said Conditions.

8) The Contractor shall afford every reasonable facility for the carrying out of all works relating to civil works, installation of lifts, Telephone, electrical installations, fittings air-conditioning and other ancillary works in the manner laid down in the said Conditions, and shall make good any damages done to walls, floors, etc. after the completion of his work.

9) The Employer reserves to itself the right of altering the drawings and nature of the work by adding to or omitting any items of work or having portions of the same carried out without prejudice to this Contract.

10) Time shall be considered as the essence of this Contract and the Contractor hereby agrees to commence the work soon after the Site is handed over to him or from 14th day after the date of issue of formal work order as provided for in the said Conditions whichever is later and to complete the entire work within 10 months subject to nevertheless the provisions for extension of time.

11) All payments by the Employer under this Contract will be made only at Bhopal.

12) All disputes arising out of or in any way connected with this Agreement shall be deemed to have arisen at Bhopal and only the Courts in Bhopal shall have jurisdiction to determine the same.

13) That the several parts of this Contract have been read by the Contractor and fully understood by the Contractor.

Signature of Contractor with Seal

IN WITNESS WHEREOF THE EMPLOYER and the Contractor have set their respective hands to these presents and two duplicates hereof the day and year first hereinabove written.

SIGNATURE CLAUSE

SIGNED AND DELIVERED by the

_____ By the
(Employer)

hand of Shri _____

_____ (Signature of Employer)
(Name and Designation)

In the presence of :

1) Shri / Smt. _____ (Signature of Witness)

Address _____

_____
(Witness)

SIGNED AND DELIVERED by the

_____ by the
(Contractor) (Signature of Contractors)

in the presence of :

Shri / Smt. _____ (Signature of Witness)

Address _____

_____
(Witness)

Signature of Contractor with Seal

SECTION – 1

INSTRUCTIONS TO THE TENDERERS

1.0 Scope of work

Sealed tenders are invited by M/s ParelkarOvalekarParpia for and behalf of State Bank of India for the construction of Proposed Construction of the additional floor over existing branch building including repairing work of compound wall and installation of paver blocks at Betul, Madhya Pradesh for State Bank of India, Bhopal.

1.1 Site and its location

The proposed work is to be carried out at S.B.I. MAIN BRANCH, BETUL, MADHYA PRADESH

2.0 Tender documents

2.1 The work has to be carried out strictly according to the conditions stipulated in the tender consisting of the following documents and the most workmen like manner.

Instructions to tenderers

General conditions of Contract

Special conditions of Contract

Additional specifications

Drawings

Priced bid A

2.2 The above documents shall be taken as complementary and mutually explanatory of one another but in case of ambiguities or discrepancies, shall take precedence in the order given below;

a) Price Bid

b) Additional Specifications

c) Technical specifications

d) Drawings

e) Special conditions of contract

f) General conditions of contract

g) Instructions to Tenderers

2.3 Complete set of tender documents including relative drawings can be downloaded from the website www.sbi.co.in or can also be collected from M/s. ParelkarOvalekarParpia, 139, Seksaria Chambers, 3rd Floor, Nagindas Master Road, Fort, Mumbai 400 023,Tel.No. 2267 3725 / Telefax : 2267 5840 from 23rd May' 2017 to 6th June' 2017**,** during office working hours (Monday to Friday), between 10.00 A.M. and 6.00 P.M. Saturday 10.00 A.M. TO 2.00 P.M

2.4 The tender documents are not transferable.

3.0 **Site Visit**

3.1 The tenderer must obtain himself on his own responsibility and his own expenses all information and data that may be required for the purpose of filling this tender document and enter into a contract for the satisfactory performance of the work. The tenderer is requested satisfy himself regarding the availability of water, power, transport and communication facilities, the character quality and quantity of the materials, labour, the law and order situation, climatic conditions local authorities requirement, traffic regulations etc;

The tenderer will be fully responsible for considering the financial effect of any or all the factors while submitting his tender.

4.0 **Earnest Money**

4.1 The tenderers are requested to submit the Earnest Money of ₹ 1,45,000.00(Rupees One Lakh Forty Five Thousand only)in the form of Demand Draft or Banker's Cheque in favour of A.G.M (P&E) State Bank of India, LHO, Bhopal drawn on any scheduled Bank in India, payable at Bhopal.

4.2 EMD in any other form other than as specified above will not be accepted. Tender not accompanied by the EMD in accordance with clause 4.1 above shall be rejected.

4.3 No interest will be paid on the EMD.

4.4 EMD of unsuccessful tenderers will be refunded within 30 days of award of Contract.

4.5 EMD of successful tenderer will be retained as a part of security deposit.

5.0 **Initial/ Security Deposit**

The successful tenderer will have to deposit a sum equivalent to 2% of contract value less EMD by means of DD/FDR drawn in favour of Asstt. General Manger (P & E), State Bank of India, Bhopal within a period of 15 days of acceptance of tender.

6.0 **Security Deposit**

6.1 Total security deposit shall be 5% of contract value. Out of this 2% of contract value is in the form of Initial Security Deposit (ISD) which includes the EMD. Balance 3% shall be deducted from the running account bill of the work at the rate of 10% of the respective running account bill i.e., deduction from each running bill account will be @10% till Total Security Deposit (TSD) including ISD reaches to 5% of contract value. The 50% of the Total Security Deposit shall be paid to the contract on the basis of architect's certifying the virtual completion. The balance 50% would be paid to the contractors after the defects liability period as specified in the contract.

6.2 No interest shall be paid to the amount retained by the Bank as Security Deposit.

7.0 **Signing of contract Documents**

The successful tenderer shall be bound to implement the contract by signing an agreement and conditions of contract attached herewith within 30 days from the receipt of intimation of acceptance of the tender by the Bank. However, the written acceptance of the tenders by the Bank will constitute a binding agreement between the Bank and successful tenderer whether such formal agreement is subsequently entered into or not.

8.0 **Completion Period**

Time is essence of the contract. The work should be completed in all respect accordance with the terms of contract within a period of 10 monthsfrom the date of award of work.

9.0 **Validity of tender**

Tenders shall remain valid and open for acceptance for a period of 90 days from the date of opening price bid. If the tenderer withdraws his/her offer during the value period or makes modifications in his/her original offer which are not acceptable to Bank without prejudice to any other right or remedy the Bank shall be at liberty forfeit the EMD.

10.0 **Liquidated Damages**

The liquidated damages shall be 0.50% per week subject to a maximum of 5% of contract value.

11.0 **Rate and prices:**

11.1 **In case of item rate tender**

11.1.1 The tenderers shall quote their rates for individual items both in words and figure. In case of discrepancy between the rate quoted in words and figures, the unit rate quantity in words will prevail. If no rate is quoted for a particular item the contractor shall not be paid for that item when it is executed.

The amount of each item shall be calculated and the requisite total is given. In case of discrepancy between the unit rate and the total amount calculated from multiplication of unit rate and the quantity the unit rate quoted will govern and the amount will be corrected.

11.1.2 The tenderers need not quote their rates for which no quantities have been given. In case the tenderers quote their rates for such items those rates will be ignored and will not be considered during execution.

11.1.3 The tenderers should not change the units as specified in the tender. If any unit is changed the tenders would be evaluated as per the original unit and the contractor would be paid accordingly.

The tenderer should not change or modify or delete the description of the item. If any discrepancy is observed he should immediately bring to the knowledge of the Architect/ Bank.

11.1.4 Each page of the BOQ shall be signed by the authorized person and cutting or overwriting shall be duly attested by him.

11.1.5 Each page shall be totaled and the grand total shall be given.

11.1.6 The rate quoted shall be firm and shall include all costs, allowances,taxes, levies.

11.1.7 The Bank reserve their rights to accept any tenders, either in whole or in part or may entrust the work in phases or may drop the part scope of work at any stage of the project within its sole discretion without assigning any reason(s) for doing so and no claim / correspondence shall be entertained in this regard.

11.1.8 In case it is decided by the Bank to drop one or more items from the scope of work at any stage of the project, the contractor shall not be entitled to raise any claim / compensation for such deleted scope of work. Also, the Bank may consider issuing work order for various buildings in phases but within a reasonable time interval and the contractor shall be bound to execute the same within the stipulated time period and as per rates quoted by them in this tender without any claim for price escalation.

SIGNATURE OF THE CONTRACTOR
WITH SEAL

GENERAL CONDITIONS OF CONTRACT

1.0 **Definitions**: -

"Contract means the documents forming the tender and the acceptance there of and the formal agreement executed between State Bank of India (client) and the contractor, together with the documents referred there in including these conditions, the specifications, designs, drawings and instructions issued from time to time by the architects/ Bank and all these documents taken together shall be deemed to form one contract and shall be complementary to one another.

1.1 In the contract the following expressions shall, unless the context otherwise requires, have the meaning hereby respectively assigned to them.

1.1.1 'SBI' shall mean State Bank of India (client) having its Corporate Centre at State Bank of India, Premises & Estate Department, Local Head Office, Hoshangabad Road, Bhopal and includes the client's representatives, successors and assigns.

1.1.2 'Architects/ Consultants' shall mean M/s Parelkar –Ovalekar-Parpia, Architects &Interior Designers, Mumbai.

1.1.3 'Site Engineer' shall mean an Engineer appointed by the Bank at site as their representative for day-to-day supervision of work and to give instructions to the contractors.

1.1.4 'The Contractor' shall mean the individual or firm or company whether incorporate not, undertaking the works and shall include legal personal representative of individual or the composing the firm or company and the permitted assignees of individual or firms of company.

The expression 'works' or 'work' shall mean the permanent or temporary work description in the "Scope of work" and / or to be executed in accordance with the contract includes materials, apparatus, equipment, temporary supports, fittings and things of kinds to be provided, the obligations of the contractor hereunder and work to be done by the contractor under the contract.

1.1.5 'Engineer' shall mean the representative of the Architect/consultant.

1.1.6 'Drawings' shall mean the drawings prepared by the Architects and issued by the Engineer and referred to in the specifications and any modifications of such drawings as may be issued by the Engineer from time to time 'Contract value shall mean value of the entire work as stipulated in the letter of acceptance of tender subject such additions there to or deductions there from as may be made under the provide herein after contained.

1.1.7 Specifications' shall mean the specifications referred to in the tender and modifications thereof as may time to time be furnished or approved by the Architect/ Consultant.

1.1.8 "Month" means calendar month.

1.1.9 "Week" means seven consecutive days.

1 .1.10"Day" means a calendar day beginning and ending at 00 Hrs and 24 Hrs respectively.

1.1.11 "Bank's Engineer" shall mean The Civil / Electrical Engineer in - charge of the Project, as nominated by the AGM (P&E).

1.1.12 The following shall constitute the Joint Project Committee (herein under referred to as JPC) for assessing and reviewing the progress of the work on the project and to issue instructions or directions from time to time for being observed and followed by the Architects site Engineer /PMC and other consultants / contractors engaged in the execution of the project.

i) Assistant General Manager, Premises & Estate Deptt., SBI, who shall be the Chairman of the Committee.
ii) Bank's Engineer (civil and Electrical) in-charge of the Project, as may be nominated by the AGM (P&E) …..Members
iii) Concerned partner of the Architects or their Resident Architect….Member.
iv) Project Manager OR Resident Engineer–in-charge of project of the PMC…Member and Secretary respectively.

CLAUSE

1.0 Total Security Deposit

Total Security deposit comprise of

Earnest Money Deposit

Initial security deposit

Retention Money

a) **Earnest Money Deposit -**

The tenderer shall furnish EMD of ₹1,45,000.00 in the form of Demand drawn in favour of Asstt. General Manager (Premises & Estate) SBI, LHO Bhopal, payable at Bhopal on any Scheduled Bank. No tender shall be considered unless the EMD is so deposited in the required form. No interest shall be paid on this EMD. The EMD of the unsuccessful tenderer shall be refunded soon after the decision to award the contract is taken without interest. The EMD shall stand absolutely forfeited if the tenderer revokes his tender at any time the period when he is required to keep his tender open acceptance by the SBI or after it is accepted by the SBI the contractor fails to enter into a formal agreement or fails to pay the initial security deposit as stipulated or fails to commence the commence the work within the stipulated time.

b) **Initial Security Deposit (lSD)**

The amount of ISD shall be 2% of accepted value of tender including the EMD in the form of DD/FDR drawn on any scheduled Bank and shall be deposited within 15 days from the date of acceptance of tender.

c) **Retention Money: -**

Besides the SD as deposited by the contractor in the above said manner, the Retention money shall be deducted from the running account bill at the rate of 10% of the gross value of work done by the contractor and claimed in each bill provided the total security deposit i.e. ISD plus EMD plus Retention Money shall both together not exceed 5% of the contract value.The50% of the total security deposit shall be refunded to the contractor without any interest on issue of Virtual Completion certificate by the Architect/consultant. The balance 50% of the total security deposit shall be refunded to the contractors without interest within fifteen days after the end of defects liability period provided the contractor has satisfactorily attended to all defects in accordance with the conditions of contract including site clearance.

2.0 **Language**

The language in which the contract documents shall be drawn shall be in English.

3.0 **Errors, omissions and discrepancies**

In case of errors, omissions and/ or disagreement between written and scaled dimensions on the drawings or between the drawings and specifications etc., the following order shall apply.

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

ii) Between the written or shown description or dimensions in the drawings and the corresponding one in the specification the former shall be taken as correct.

iii) Between written description of the item in the specifications and descriptions in bills of quantities of the same item, the former shall be adopted:

a) In case of difference between rates written in figures and words, the rate in words shall prevail.

b) Between the duplicate / subsequent copies of the tender, the original tender shall be taken as correct.

4.0 **Scope of Work:**

The contractor shall carryout complete and maintain the said work in every respectstrictly accordance with this contract and with the directions of and to the satisfaction Bank to be communicated through the architect/consultant. The

architect/consultant at the directions of the Bank from time to time issue further drawings and / or write instructions, details directions and explanations which are here after collectively references to as Architect's /consultant's instructions in regard to the variation or modification of the design, quality or quantity of any work or the addition or omission or substitution work. Any discrepancy in the drawings or between BOQ and / or drawings and / or specifications. The removal from the site of any material brought thereon by the Contractor and any substitution of any other materials therefore the removal and / or re-executed of any work executed by him. The dismissal from the work of any person engaged thereupon.

5.0 i) **Letter of Acceptance:**

Within the validity period of the tender the Bank shall issue a letter of acceptance directly or through the architect by registered post or otherwise depositing at the of the contractor as given in the tender to enter into a Contract for the execution of the work as per the terms of the tender. The letter of acceptance shall constitute a bind contract between the SBI and the contractor.

ii) **Contract Agreement:**

On receipt of intimation of the acceptance of tender from the SBI / Architect the successful tenderer shall be bound to implement the contract and within fifteen days there of shall sign an agreement in a non-judicial stamp paper of appropriate value.

6.0 **Ownership of drawings**:

All drawings, specifications and copies thereof furnished by the SBI through its Architect / consultants are the properties of the SBI. They are not to be used on other work.

7.0 **Detailed drawings and instructions:**

The SBI through its architects / consultants shall furnish with reasonable proper additional instructions by means of drawings or otherwise necessary for the execution of the work. All such drawings and instructions shall be consistent with contract documents, true developments thereof and reasonably inferable there.

The work shall be executed in conformity therewith and the contractor prepare a detailed programme schedule indicating therein the date of start and completion of various activities on receipt of the work order and submit the same to the SBI through the architect/consultant

7.0 **Copies of agreement**

Two copies of agreement duly signed by both the parties with the drawings shall be handed over to the contractors.

8.0 **Liquidated damages:**

If the contractor fails to maintain the required progress in terms of clause 6. 0 of G.C.C. or to complete the work and clear the site including vacating their office on or before the contracted or extended date or completion, without justification in support of the cause of delay, he may be called upon without prejudice to any other right of remedy available under the law to the SBI on account of such breach to pay a liquidated damages at the rate of 0.50% of the contract value which subject to a maximum of 5% of the contract value.

9.0 **Materials, Appliances and Employees**

Unless or otherwise specified the contractor shall provide and pay for all materials, labour, water, power, tools, equipment transportation and any other facilities that are required for the satisfactory execution and completion of the work. Unless or otherwise specified all materials shall be new and both workmanship and materials shall be best quality. The contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him. Workman whose work or behavior is found to be unsatisfactory by the SBI /architect/ consultant he shall be removed from the site immediately.

10.0 **Permits, Laws and Regulations:**

Permits and licenses required for the execution of the work shall be obtained by the contractor at his own expenses. The contractor shall give notices and comply with the regulations, laws, and ordinances rules, applicable to the contract. If the contractor observes any discrepancy between the drawings and specifications, he shall promptly notify the SBI in writing under intimation of the Architect/ Consultant. If the contractor performs any act, which is against the law, rules and regulations he shall meet all the costs arising there from and shall indemnify the SBI any legal actions arising there from.

11.0 **Setting out Work:**

The contractor shall set out the work and shall be responsible for the true and perfect setting out of the same and for the correctness of the positions, levels, dimensions, andalignment of all parts thereof and get it approved by the architect / consultant before proceeding with the work. If at any time any error in this respect shall appear during the progress of the works, irrespective of the fact that the layout had been approved by, the architect / consultant the contractor shall be responsible for the same ad shall his own expenses rectify such error, if so, required to satisfaction of the SBI.

12.0 **Protection of works and property:**

The contractor shall continuously maintain adequate protection. Of all his work from damage and shall protect the SBI’s properties from injury or loss arising in connection

with contract. He shall make good any such damage, injury, loss, except due to causes beyond his control and due to his fault or negligence.

He shall take adequate care and steps for protection of the adjacent properties. The contractor shall take all precautions for safety and protections of his employees on the works and shall comply with all applicable provisions of Govt. and local bodies' safety laws and building codes to prevent accidents, or injuries to persons or property on about or adjacent to his place of work. The contractor shall take insurance covers as per clause 24.0 at his own cost. The policy may be taken in joint names of the contractor and the SBI and the original policy may be lodged with the SBI.

13.0 **Inspection of work:**

The SBI / Architect / Consultant or their representatives shall at all reasonable times have free access to the work site and / or to the workshop, factories, or other places where materials are lying or from where they are obtained and the contractor shall giveevery facility to the SBI/Architect/consultant and their representatives necessary for inspection and examination and test of the materials and workmanship. No person unless authorized by the SBI/ Architect /Consultant except the representative of Public authorities shall be allowed on the work at any time. The proposed work either during its construction stage or its completion can also be inspected by the Chief Technical Examiner's Organization a wing of Central Vigilance commission.

14.0 **Assignment and subletting**

The whole of work included in the contract shall be executed the contractor and he shall not directly entrust and engage or indirectly transfer, assign or underlet the contract or any part or share there of or interest therein without the written consent of the SBI through the architect and no undertaking shall relieve the contractor from the responsibility of the contractor from active & superintendence of the work during its progress.

15.0 **Quality of materials, workmanship & Test**

All materials and workmanship shall be best of the respective kinds described in the contract and in accordance with Architect/consultant instructions and shall be subject from time to time to such tests as the architect/consultant may direct at the place of manufacture or fabrication or on the site or an approved testing laboratory. The contractor shall provide such assistance, instruments, machinery, labor, and materials as are normally required for examining measuring sampling and testing any material or part of work before incorporation in the work for testing as may be selected and required by the architect/consultant.

ii) **Samples**

All samples of adequate numbers, size, shades & pattern as per specifications shall be supplied by the contractor without any extra charges. If certain items proposed to be used are of such nature that samples cannot be presented or prepared at the site detailed

literature / test certificate of the same shall be provided to the satisfaction of the Architect/consultant. Before submitting the sample / literature the contractor shall satisfy himself that the material / equipment for which he is submitting the sample / literature meet with the requirement of tender specification. Only when the samples are approved in writing by the architect / consultant the contractor shall proceed with the procurement and installation of the particular material / equipment. The approved samples shall by the signed by the Architect / Consultant for identification and shall be kept on record at site office until the completion of the work for inspection / comparison at any time. The Architect/Consultant shall take reasonable time to approve the sample. Any delay that might occur in approving the samples for reasons of its not meeting the specifications or other discrepancies inadequacy in furnishing samples of best qualities from various manufacturers and such other aspects causing delay on the approval of the materials / equipment etc. shall be to the account of the contractor.

iii) **Cost of tests**

The cost of making any test shall be borne by the contractor if such test is intended by or provided for in the specification or BOQ.

iv) **Costs of tests not provided for**

If any test is ordered by the Architect/ Consultant which is either

a) If so intended by or provided for or (in the cases above mentioned) is not so particularized, or though so intended or provided for but ordered by the Architect / Consultant to be carried out by an independent person at any place other than the site or the place of manufacture or fabrication of the materials tested or any Government / approved laboratory, then the cost of such test shall be borne by the contractor.

16.0 **Obtaining information related to execution of work**

No claim by the contractor for additional payment shall be entertained which is consequent upon failure on his part to obtain correct information as to any matter affecting the execution of the work nor any misunderstanding or the obtaining incorrect information or the failure to obtain correct information relieve him from any risks or from the entire responsibility for the fulfillment of contract.

17.0 **Contractor's superintendence**

The contractor shall give necessary personal superintendence during the execution the works and as long, thereafter, as the Architect / Consultant may consider necessary until the expiry of the defects liability period, stated here to.

18.0 **Quantities**

i) The bill of quantities (BOQ) unless or otherwise stated shall be deemed to have been prepared in accordance with the Indian Standard Method of Measurements and

quantities. The rate quoted shall remain valid for variation of quantity against individual item to any extent. The entire amount paid under Clause 19, 20 hereof as well as amounts of prime cost and provision sums, if any, shall be excluded.

19.0 **Works to be measured**

The Architect/Consultant may from time to time intimate to the contractor that he require the work to be measured and the contractor shall forthwith attend or send a quantity representative to assist the Architect in taking such measurements and calculation and to furnish all particulars or to give all assistance required by any of them. Such measurements shall be taken in accordance with the Mode of measurements detail in the specifications. The representative of the Architect / Consultant shall take measurements with the contractor's representative and the measurements shall be entered in the measurement book. The contractor or his authorised representative shall sign all the pages of the measurement book in which the measurements have been recorded in token of his acceptance. All the corrections shall be duly attested by both representatives. No over writings shall be made in the M book should the contractor not attend or neglect or omit to depute his representative to take measurements the measurements recorded by the representative of the Architect / consultant shall be final. All authorized extra work, omissions and all variations made shall be included such measurement.

20.0 **Variations**

No alteration, omission or variation ordered in writing by the Architect / consultant vitiates the contract. In case the SBl / Architect / Consultant thinks proper at any during the progress of works to make any alteration in, or additions to or omission from the works or any. alteration in the kind or quality of the materials to be used therein, the Architect / Consultant shall give notice thereof in writing to the contractor shall confirm in writing within seven days of giving such oral instructions the contract shall alter to, add to, or omit from as the case may be in accordance with such but the contractor shall not do any work extra to or make any alterations or additions to or omissions from the works or any deviation from any of the provisions of the contract, stipulations, specifications or contract drawings without previous consent in writing of the Architect/ Consultant and the value of such extras, alterations, additions or omissions shall in all cases be determined by the Architect / Consultant and the same shall be added to or deducted from the contract value, as the case may be.

21.0 **Valuation of Variations**

No claim for an extra shall be allowed unless it shall have been executed under the authority of the Architect / Consultant with the concurrence of the SBI as herein mentioned. Any such extra is herein referred to as authorized extra and shall be made in accordance with the following provisions.

a) (i) The net rates or prices in the contract shall determine the valuation of the extra work where such extra work is of similar character and executed under similarconditions as the work priced herein.

(ii) Rates for all items, wherever possible should be derived out of the rates given in the priced BOQ.

b) The net prices of the original tender shall determine the value of the items omitted, provided if omissions do not vary the conditions under which any remaining items of Works are carried out, otherwise the prices for the same shall be valued under sub-Clause 'c' hereunder.

c) Where the extra works are not of similar character and/or executed under similar conditions as aforesaid or where the omissions vary the conditions under which any remaining items or works are carried out, then the contractor shall within 7 days of the receipt of the letter of acceptance inform the Architect/ consultant of the rate which he intends to charge for such items of work, duly supported by analysis of the rate or rates claimed and the Architect/ consultant shall fix such rate or prices as in the circumstances in his opinion are reasonable and proper, based on the market rate.

d) 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, of the BOQ 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 daily time (and if required by the Architect/Consultant) the workman's name and materials employed be delivered for verifications to the Architect /consultant at or before the end of the week following that in which the work has been executed.

e) It is further clarified that for all such authorized extra items where rates cannot be derived from the tender, the Contractor shall submit rates duly supported by rate analysis worked on the 'market rate basis for material, labour hire / running charges of equipment and wastages etc. plus 15% towards establishment charges, contractor's overheads and profit. Such items shall, not be eligible for escalation.

22.0 **Final measurement**

The measurement and valuation in respect of the contract shall be completed within two months of the virtual completion of the work.

23.0 **Virtual Completion Certificate (VCC)**

On successful completion of entire works covered by the contract to the full satisfaction of the SBI, the contractor shall ensure that the following works have been completed the satisfaction of the SBI:

a) Clear the site of all scaffolding, wiring, pipes, surplus materials, contractor's labour equipment and machinery.

b) Demolish, dismantle and remove the contractor's site office, temporary works, structure including labour sheds/camps and constructions and other items and things whatsoever brought upon or erected at the site or any land allotted to the contractor by the SBI not incorporated in the permanent works.

c) Remove all rubbish, debris etc. from the site and the land allotted to the contractor the SBI and shall clear, level and dress, compact the site as required by the SBI.

d) Shall put the SBI in undisputed custody and possession of the site and all land allot by the SBI.

e) Shall hand over the work in a peaceful manner to the SBI.

f) All defects / imperfections have been attended and rectified as pointed out by the Architects to the full satisfaction of SBI.

Upon the satisfactory fulfillment by the contractor as stated above, the contractor is entitled to apply to the Architect / consultant is satisfied of the completion of work. Relative to which the completion certificate has been sought, the Architect/ consultant shall within fourteen (14) days of the receipt of the application for completion certificate, issue a VCC in respect of the work for which the VCC has applied.

This issuance of a VCC shall not be without prejudice to the SBI's rights and contractor liabilities under the contract including the contractor's liability for defects liability nor shall the issuance of VCC in respect of the works or work at any site be construction as a waiver of any right or claim of the SBl against the contractor in respect of or work at the site and in respect of which the VCC has been issued.

24.0 **Work by other agencies**

The SBI / Architect / consultant reserves the rights to use premises and any portion the site for execution of any work not included in the scope of this contract with may desire to have carried out by other persons simultaneously and the contractor shall not only allow but also extend reasonable facilities for the execution of such work. The contractor however shall not be required to provide any plant or material for the execution of such work except by special arrangement with the SBI. Such work shall be carried out in such manner as not to impede the progress of the works included in the contract.

25.0 **Insurance of works**

25.1 Without limiting his obligations and responsibilities under the contract the contractor shall insure in the joint names of the SBI and the contractor against all loss of damages from whatever cause arising other than the excepted risks, for which he is responsible under the terms of contract and in such a manner that the SBI and contractor are covered for the period stipulated I clause of GCC and are also covered during the period of maintenance for loss or damage arising from a cause, occurring prior to the commencement of the period of maintenance and for any loss or damage occasioned by

the contractor in the course of any operations carried out by him for the purpose of complying with his obligations under clause.

a) The Works for the time being executed to the estimated current Contract value thereof, or such additional sum as may be specified together with the materials for incorporation in the works at their replacement value.

b) The constructional plant and other things brought on to the site by the contractor to the replacement value of such constructional plant and other things.

c) Such insurance shall be effected with an insurer and in terms approved by the SBI which approval shall not be unreasonably withheld and the contractor shall whenever required produce to the Architect / consultant the policy if insurance and the receipts for payment of the current premiums.

25.2 **Damage to persons and property**

The contractor shall, except if and so far as the contract provides otherwise indemnify the SBI against all losses and claims in respect of injuries or damages to any person or material or physical damage to any property whatsoever which may arise out of or in consequence of the execution and maintenance of the works and against all claims proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto except any compensation of damages for or with respect to:

a) The permanent use or occupation of land by or any part thereof.

b) The right of SBI to execute the works or any part thereof on, over, under, in or through any lands.

c) Injuries or damages to persons or properties which are unavoidable result of the execution or maintenance of the works in accordance with the contract

d) Injuries or damage to persons or property resulting from any act or neglect of the SBI their agents, employees or other contractors not being employed by the contractor or for or in respect of any claims, proceedings, damages, costs, charges and expenses in respect thereof or in relation thereto or where the injury or damage was contributed to by the contractor, his servants or agents such part of the compensation as may be just and equitable having regard to the extent of the responsibility of the SBI, their employees, or agents or other employees, or agents or other contractors for the damage or injury.

25.3 **Contractor to indemnify SBI**

The contractor shall indemnify the SBI against all claims, proceedings, damages, costs, charges and expenses in respect of the matters referred to in the provision sub-clause 25.2 of this clause.

25.4 **Contractor's superintendence**

The contractor shall fully indemnify and keep indemnified the SBI against any action, claim, or proceeding relating to infringement or use of any patent or design or any alleged patent r design rights and shall pay any royalties which may be payable in respect of any article or part thereof included in the contract. In the event of any claim made under or action brought against SBI in respect of such matters as aforesaid the contractor shall be immediately notified thereof and the contractor shall be at liberty, at his own expenses to settle any dispute or to conduct any litigation that may arise there from, provided that the contractor shall not be liable to indemnify the SBI if the infringement of the patent or design or any alleged patent or design right is the direct result of an order passed by the Architect / consultant in this behalf.

25.5 **Third Party Insurance**

25.5.1 Before commencing the execution of the work the contractor but without limiting his obligations and responsibilities under clause 24.0 of GCC shall insure against his liability for any material or physical damage, loss, or injury which may occur to any property including that of SBI, or to any person, including any employee of the SBI, by or arising out of the execution of the works or in the carrying out of the contract, otherwise than due to the matters referred to in the provision to clause 24.0 thereof.

25.5.2 **Minimum amount of Third Party Insurance**

Such insurance shall be affected with an insurer and in terms approved by the SBI which approval shall not be reasonably withheld and for at least the amount stated below. The contractor shall, whenever required, produce to the. Architect / consultant the policy or policies of insurance cover and receipts for payment of the current premiums.

25.6 The minimum insurance cover for physical property, injury, and death is Rs.5 Lakh per occurrence with the number of occurrences limited to four. After each occurrence contractor will pay additional premium necessary to make insurance valid for four occurrences always.

25.7 **Accident or Injury to workman:**

25.7.1 The SBI shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workmen or other person in the employment of the contractor or any sub-contractor, save and except an accident or injury resulting from any act or default of the SBI or their agents, or employees. The contractor shall indemnify and keep indemnified SBI against all such damages and compensation, save and except as aforesaid, and against all claims, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

25.7.2 **Insurance against accidents etc. to workmen**

The contractor shall insure against such liability with an insurer approved by the SBI during the whole of the time that any persons are employed by him on the works and shall, when required, produce to the architect / consultant such policy of insurance and receipt for payment of the current premium. Provided always that, in respect of any persons employed by any sub-contractor the contractor's obligation to insured as aforesaid under this sub-clause shall be satisfied if the sub-contractor shall have insured against the liability in respect of such persons in such manner that SBI is indemnified under the policy but the contractor shall require such sub-contractor to produce to the Architect /consultant when such policy of insurance and the receipt for the payment of the current premium.

25.7.3 **Remedy on contractor's failure to insure**

If the contractor fails to effect and keep in force the insurance referred to above or any other insurance which he may be required to effect under the terms of contract, then and in any such case the SBI may effect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose and from time to time deduct the amount so paid by the SBI as aforesaid from any amount due or whichmay become due to the contractor, or recover the same as debt from the contractor.

25.7.4 Without prejudice to the others rights of the SBI against contractors. In respect of such default, the employer shall be entitled to deduct from any sums payable to the contractor the amount of any damages costs, charges, and other expenses paid by the SBI and which are payable by the contractors under this clause. The contractor shall upon settlement by the Insurer of any claim made against the insurer pursuant to a policy taken under this clause, proceed with due diligence to rebuild or repair the works destroyed or damaged. In this event all the monies received from the Insurer in respect of such damage shall be paid to the contractor and the Contractor shall not be entitled to any further payment in respect of the expenditure incurred for rebuilding or repairing of the materials or goods destroyed or damaged.

26.0 **Commencement of Works:**

The date of commencement of the work will be reckoned as the date of fifteen days from the date of award of letter by the SBI.

27.0 **Time for completion**

Time is essence of the contract and shall be strictly observed by the contractor. The entire work shall be completed within a period of **10 calendar months** from the date of commencement. If required in the contract or as directed by the Architect / consultant. The contractor shall complete certain portions of work before completion of the entire work. However the completion date shall be reckoned as the date by which the whole work is completed as per the terms of the contract.

28.0 **Extension of time**

If, in the opinion of the Architect/consultant, the work be delayed for reasons beyond the control of the contractor, the Architect/consultant may submit a recommendation to the SBI to grant a fair and reasonable extension of time for completion of work as per the terms of contract. If the contractor needs an extension of time for the completion of work or if the completion of work is likely to be delayed for any reasons beyond the due date of completion as stipulated in the contract, the contractor shall apply to theSBI through the Architect' Consultant in writing at least 30 Days before the expiry of the scheduled time and while applying for extension of time he shall furnish the reason in detail and his justification if an', for the delays. The architect/consultant shall submit their recommendations to the SBI in the prescribed format for granting extension of time. While granting extension of time the contractor shall be informed the period extended time which will qualify for levy of liquidated damages. For the balance period in excess of original stipulated period and duly sanctioned extension of time by the provision of liquidated damages as stated under clause 10.0 shall become applicable. Further the contract shall remain in force even for the period beyond the due date of completion irrespective whether the extension is granted or not.

29.0 **Rate of progress**

Whole of the materials, plant and labour to be provided by the contractor and the mode, manner and speed of execution and maintenance of the works are to be of a kind and conducted in a manner to the satisfaction of the Architect / consultant should the rate of progress of the work or any part thereof be at any time be in the opinion the. Architect / consultant too Slow to ensure the completion of the whole of the work the prescribed time or extended time for completion the Architect / consultant shall thereupon take such steps as considered necessary by the Architect / consultant to expedite progress so as to complete the works by the prescribed time or extended time. Such communications from the Architect / consultant neither shall relieve. The contractor from fulfilling obligations under the contract nor he will be entitled to raise any claims arising out of such directions.

30.0 **Work during nights and holidays**

Subject to any provision to the contrary contained in the contract no permanent work shall be carried on during the night or on holidays without the permission in writing of the Bank Authority/Architect / Consultant, except when the work is unavoidable or absolutely necessary for the saving of life or property or for the safety of the work in which case the contractor shall immediately advise the Architect / consultant. However the provisions of the clause shall not be applicable in the case of any work which becomes essential to carry by rotary or double shifts in order to achieve the progress and quality of the part of the works being technically required / continued with the prior approval of the Architect / consultant at no extra cost to the SBI.

All work at night after obtaining approval from competent authorities shall be carried out without unreasonable noise and disturbance.

31.0 **No compensation or restrictions of work**

If at any time after acceptance of the tender SBI shall decide to abandon or reduce the scope of work for any reason whatsoever and hence not required the whole or any part of the work to be carried out. The Architect / consultant shall give notice in writing o that effect to the contractor and the contractor shall act accordingly in the matter. The contractor shall have no claim to any payment of compensation or otherwise what so ever on account of any profit or advantage which he might have derived from the execution of the Work fully but which he did not derive in consequence of the foreclosure of the whole or part of the work.

Provided that the contractor shall be paid the charges on the cartage only of materials actually and bonafide brought to the site of the work by the contractor and rendered surplus as a result of the abandonment, curtailment of the work or any portion thereof and then taken back by the contractor, provided however that the Architect / Consultant shall have in such cases the option of taking over all or any such materials at their purchase price or a local current rate whichever is less.

"In case of such stores having been issued from SBI stores and returned by the contractor to stores, credit shall be given to him at the rates not exceeding those at which were originally issued to the contractor after taking into consideration and deduction for claims on account of any deterioration or damage while in the custody of the contractor and in this respect the decision of Architect / consultant shall be final.

32.0 **Suspension of work**

i) The contractor shall, on receipt of the order in writing of the Architect / consultant (whose decision shall be final and binding on the contractor) suspend the progress ofworks or any part thereof for such time and in such manner as Architect /consultant may consider necessary so as not to cause any damage or injury to the work already done or endanger the safety thereof for any of following reasons:

a) On account any default on the part of the contractor, or

b) For proper execution of the works or part thereof for reasons other than the default the contractor, or

c) For safety of the works or part thereof.
The contractor shall, during such suspension, properly protect and secure the works the extent necessary and carry out the instructions given in that behalf by the Architect / consultant.

i) If the suspension is ordered for reasons (b) and (c) in sub-para (i) above:
The contractor shall be entitled to an extension of time equal to the period of every such suspension. No compensation whatsoever shall be paid on this account.

33 **Action when the whole security deposit is forfeited**

In any case in which under any clause or clauses of this contract, the Contractor shall have rendered himself liable to pay compensation amounting to the whole of his

security deposit the Architect / consultant shall have the power to adopt any of the following course as they may deem best suited to the interest of the SBI:

a) To rescind the contract (of which rescission notice in writing to the contractor by - Architect / consultant shall be conclusive evidence) and in which case the security, deposit of the contractor shall be forfeited and be absolutely at the disposal of SBI.

b) To employ labour paid by the SBl and to supply materials to carry out the work, or part of the work, debiting the contractor with the cost of the labour and materials cost of such labour and materials as worked out by the Architect/consultant shall final and conclusive against the contractor) and crediting him with the value of the work done, in all respects in the same manner and at the same manner and at the same rates as if it had been carried out by the contractor under the terms of this contract certificate of architect /consultant as to the value of work done shall be final conclusive against the contractor.

c) To measure up the work of the contractor, and to take such part thereof as shall unexecuted, out of his hands, and to give it to another contractor to complete in which case any expenses which may be incurred in excess of the sum which would have been paid to the original contractor, if the whole work had been executed by him (The amount of which excess the certificates in writing of the Architects / consultant shall final and conclusive) shall be borne by original contractor and may be deducted f any money due to him by SBI under the contract or otherwise, or from his security deposit or the proceeds of sale thereof, or sufficient part thereof.

In the event of any of above courses being adopted by the SBI the contractor shall have no claim to compensation for any loss sustained by him by reasons of his having purchased or procured any material or entered into any engagements or make any advances on account of, or with a view to the execution of the work or the performance of the contract and in case the contract shall be rescind under the provision aforesaid, the contractor shall not be entitled to recover or to be paid any sum or any work thereto for actually performed under this contract, unless, and until the Architect / consultant will have certified in writing the performance of such work and the value payable in respect thereof, and he shall only be entitled to be paid the value so certified.

34.0 **Owner's right to terminate the contract**

If the contractor being an individual or a firm commit any 'Act of insolvency' or shall be adjusted an insolvent or being an incorporated company shall have an order for compulsory winding up voluntarily or subject to the supervision of Govt. and of the Official Assignee of the liquidator in such acts of insolvency or winding up shall be unable within seven days after notice to him to do so, to show to the reasonable satisfaction of the Architect / Consultant that he is able to carry out and fulfill the contract, and to dye security therefore if so required by the Architect / Consultant.

Or if the contractor (whether an individual firm or incorporated Company) shall suffer execution to be issued or shall suffer any payment under this contract to be attached by or on behalf of any of the creditors of the contractor.

Or shall assign or sublet this contract without the consent in writing of the SBI through the Architect/Consultant or shall charge or encumber this contract or any payment dueto which may become due to the contractor there under:

a) has abandoned the contract; or

b) has failed to commence the works, or has without any lawful excuse under these conditions suspended the progress of the works for 14 days after receiving from the SBI through the Architect / consultant written notice to proceed, or

c) has failed to proceed with the works with such diligence and failed to make such due progress as would enable the works to be completed within the time agreed upon, or has failed to remove the materials from the site or to pull down and replace work within seven days after written notice from the SBI through the Architect / Consultant that the said materials were condemned and rejected by the Architect/consultant under these conditions; or 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 contactor for seven days after written notice shall have been given to the contractor to observe or perform the same or has to the detriment of good workmanship or in defiance of the SBI or Architect's / consultant's instructions to the contrary subject any part of the contract. Then and in any of said cases the SBI and or the Architect / consultant, may not withstanding any previous waiver, after giving seven days' notice in writing to the contractor, determine the contract, but without thereby affecting the powers of the SBI or the Architect / consultant or the obligation and liabilities of the contractor the whole of which shall continue in force as fully as if the contract had not been determined and as if the works subsequently had been executed by or on behalf of the contractor. And, further the SBI through the Architect / consultant their agents or employees may enter upon and take possession of the work and all plants, took scaffoldings, materials, sheds, machineries lying upon the premises or on the adjoining lands or roads use the same by means of their own employees or workmen in carrying on and completing the work or by engaging any other contractors or persons to the work and the contractor shall not in any was interrupt or do any act, matter or thing to prevent or hinder such other contractor or other persons employed for complement and finishing or using the materials and plant for the works.

When the works shall be completed or as soon thereafter as convenient the SBI or architect / consultant shall give a notice in writing to the contractor to remove his surplus materials and plants and should the contractor fail to do so within 14 days after receive thereof by him the SBI sell the same by publication, and after due publication, and shall, adjust the amount realized by such auction. The contractor shall have no right to question any of the act of the SBI incidental to the sale of the materials etc.

35.0 **Certificate of payment**

The contractor shall be entitled under the certificates to be issued by the Architect / consultant to the contractor within 15 working days from the date of certificate to payment from SBI from time to time. The SBI shall recover the statutory recovering other dues including the retention amount from the certificate of payment.

Provided always that the issue of any certificate by the Architect / consultant during progress of works or completion shall not have effect as certificate of satisfaction relieve the contractor from his liability under clause.

The Architect / consultant shall have power to withhold the certificate if the work orin part thereof is not carried out to their satisfaction.

The Architect / consultant may by any certificate make any corrections required previous certificate.

The SBI shall modify the certificate of payment as issued by the architect / consultant from time to time while making the payment

The contractor shall submit interim bills only after taking actual measurements and properly recorded in the M books

The Contractor shall not submit interim bills when the approximate value of work done by him is less than ₹ 20.0 lakh .

The final bill may be submitted by contractor within a period of one month from the date of virtual completion and Architect / consultant shall issue the certificate of payment within a period of two months. The SBI shall pay the amount within a period of three months from the date of issue of certificate provided there is no dispute in respect of rates and quantities.

The contractor shall submit the interim bills in the prescribed format with all details.

36.0 **A. Settlement of Disputes and Arbitration**

Except where otherwise provided in the contract all questions and disputes to the meaning of the specifications, design, drawings and instructions herein before mentioned and as to the quality of workmanship or materials used on the work or as to any other question , claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings specifications, estimates, instructions orders or these conditions or otherwise concerning the work or the execution or failure to execute the same whether arising during the progress of the work or after the cancellation, termination, completion or abandonment thereof shall be dealt with as mentioned hereinafter:

If the contractor considers that he is entitled to any extra payment or compensation in respect of the works over and above the amounts admitted as payable by the Architect or in case the contractor wants to dispute the validity of any deductions or recoveries made or proposed to be made from the contract or raise any dispute, the contractor shall forthwith give notice in writing of his claim, or dispute to the Assistant General Manager (Premises & Estate) S.B.I., L.H.O. Bhopal. And endorse a copy of the same to the Architect, within 30 days from the date of disallowance thereof or the date of deduction or recovery. The said notice shall give full particulars of the claim, grounds on which it is based and detailed calculations of the amount claimed and the contractor

shall not be entitled to raise any claim nor shall the Bank be in any way liable in respect of any claim by the contractor unless notice of such claim shall have been given by the contractor to the Asst. General Manager (Premises& Estate) in the manner and within the time as aforesaid. The Contractor shall be deemed to have waived and extinguished all his rights in respect of any claim not notified to the Asst. General Manager (Premises & Estate) in writing in the manner and within the time aforesaid.

B. Settlement of Disputes and Arbitration

The Asst. General Manager (Premises & Estate) shall give his decision in writing on the claims notified by the receipt of the contractor may within 30 days of the receipt of the decision of the Asst. General Manager (Premises & Estate) / Submit his claims to the conciliating authoritynamely the Circle Development Officer, S.B.I. L.H.O. Bhopal. For conciliation along with all details and copies of correspondence exchanged between him and the Asst. General Manager (Premises & Estate).

iii) If the conciliation proceedings are terminated without settlement of the disputes, the contractor shall, within a period of 30 days of termination thereof shall give a notice to the concerned Chief General Manager of the Bank for appointment of an arbitrator to adjudicate the notified claims falling which the claims of the contractor shall be deemed to have been considered absolutely barred and waived.

iv) Except where the decision has become final, binding and conclusive in terms of the contract, all disputes or differences arising out of the notified claims of the contractor as aforesaid and all claims of the Bank shall be referred for adjudication through arbitration by the Sole Arbitrator appointed by the Chief General Manager. It will also be no objection to any such appointment that the Arbitrator so appointed is a Bank Officer and that he had to deal with the matters to which the Contract relates in the course of his duties as Bank Officer. If the arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacates his office due to any reason whatsoever another sole arbitrator shall be appointed in the manner aforesaid by the said Chief General Manager Such person shall be entitled to proceed with the reference from the stage at which it was let by his predecessor.

It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed in respect of each dispute along with the notice for appointment of arbitrator.

It is also a term of this contract that no person other than a person appointed by such Chief General Manager as aforesaid should act as arbitrator.

The conciliation and arbitration shall be conducted in accordance with the provisions of the Arbitration & Conciliation Act 1996 or any or any accordance modification or reenactment thereof and the rules made there under.

It is also a term of the contract that if any fees are payable to the Arbitrator these shall be paid equally by both the parties. However, no fees will be payable to the arbitrator if he is a Bank Officer.

It is also a term of the contract that the Arbitrator shall be deemed to have entered on the reference on the date he issues notice to both the parties calling them to submit their statement of claims and counter statement of claims. The venue of the arbitration shall be such place as may be fixed by the arbitrator in his sole discretion. The fees, if any of the arbitrators shall, if required to be paid before the award is made and published, be paid half and half by each of the parties. The Cost of the reference and of the award (including the fees, if any of the arbitrator) shall be in the discretion of the arbitrator who may direct to any by whom and din what manner, such costs or any part thereof, shall be paid and fix or settle the amount of costs to be so paid.

37.0 **Water supply**

The contractor shall make his own arrangements for water required for the work and nothing extra will be paid for the same. This will be subject to the following condition.

i) That the water used by the contractor shall be fit for construction purposes to the satisfaction of the Architect / consultant's.

ii) The contractor shall make alternative arrangements for the supply of water if the arrangement made by the contractor for procurement of water in the opinion of the Architect / consultant is unsatisfactory.

iii) In case contractor is permitted to use Bank's source of water i.e. Municipal connection, Bore well (existing or new) etc., the Bank may consider recovering @1% of contract amount form the final bill of contractor.

37.1 The contractor shall construct temporary well / tube well in SBI land for taking water for construction purposes only after obtaining permission in writing from the SBI. The contractor has to make his own arrangements for drawing and distributing the water at his own cost. He has to make necessary arrangements. To avoid any accidents or damages caused due to construction and subsequent maintenance of the wells. He has to obtain necessary approvals from local authorities, if required, at his own cost. He shall restore the ground to its original condition after wells are dismantled on completion of work or hand over the well to the SBI without any compensation as directed by the architect / consultant.

38.0 **Power supply**

The contractor shall make his own arrangements for power and supply / distribution system for driving plant or machinery for the work and for lighting purpose at his own cost, The cost of running and maintenance of the plants are to be included in his tender prices, He shall pay all fees and charges required, by the power supply and include the same in his tendered rates and hold the owner free from all such costs. He has to obtain necessary approval from the appropriate authorities, if required.

39.0 **Treasure trove etc.**

Any treasure trove, coin or object antique which may be found on the site shall be the property of SBI and shall be handed over to the bank immediately.

40.0 **Method of measurement**

Unless otherwise mentioned in the schedule of quantities or in mode of measurement, the measurement will be on the net quantities or work produced in accordance with up to date rules laid down by the Bureau of Indian Standards. In the event any dispute / disagreement the decision of the Architect / consultant shall be final and binding on the corrector.

41.0 **Maintenance of registers**

The contractor shall maintain the following registers as per the enclosed perform at site of work and should produce the same for inspection of SBI architect / consultant whenever desired by them. The contractor shall also maintain the records / registers as required by the local authorities / Govt. from time to time.

i) Register for secured advance
ii) Register for hindrance to work
iii) Register of daily cement & steel consumption
iv) Register for running account bill
v) Register for labour

42.0 **Force Majeure**

42.1 Neither contractor nor SBI shall be considered in default in performance of the obligations if such performance is prevented or delayed by events such as but not war, hostilities revolution, riots, civil commotion, strikes, lockout, conflagrations, epidemics, accidents, fire, storms, floods, droughts, earthquakes or ordinances or any act of or for any other cause beyond the reasonable control of the party affected or prevents or delayed. However a notice is required to be given within 30 days from the happening of the event with complete details, to the other party to the contract, if it is not possible to serve a notice, within the shortest possible period without delay.

42.2 As soon as the cause of force majeure has been removed the party whose ability perform its obligations has been affected, shall notify the other of such cessation and the actual delay incurred in such affected activity adducing necessary evidence in support thereof.

42.3 From the date of occurrence of a case of force majeure obligations of the party affected shall be suspended during the continuance of any inability so caused. With the caused itself and inability resulting there from having been removed, the agreed time

completion of the respective obligations under this agreement shall stand extended a period equal to the period of delay occasioned by such events.

42.4 Should one or both parties be prevented from fulfilling the contractual obligations by state of force majeure lasting to a period of 6 months or wore the two parties, shall each other to decide regarding the future execution of this agreement.

43.0 **Local laws, Acts Regulations:**

The contractor shall strictly adhere to all prevailing labour laws inclusive at contract labour (regulation and abolition act of 1970) and other safety regulations. The contractors should comply with the provision of all labour legislation including the latest requirements of the Acts, laws, any other regulations that are applicable to the execution of the project.

i) Minimum wages Act 1948 (Amended)
ii) Payment of wages Act 1936 (Amended)
iii) Workmen's compensation Act 1923 (Amended)
iv) Contractlabour regulation and abolition act 1970 and central rules 1971 (Amended)
v) Apprentice act 1961 (amended)
vi) Industrial employment (standing order) Act 1946 (Amended)
vii) Personal injuries (Compensation insurance) act 1 963 and any other modifications
viii) Employees' provident fund and miscellaneous provisions Act 1952 and amendment thereof
ix) Shop and establishment act
x) Any other act or enactment relating thereto and rules framed there under from time to time.
xi) Prevailing Indian Electricity rules & act.

44.0 **Accidents**

The contractor shall immediately on occurrence of any accident at or about the site or in connection with the execution of the work report such accident to the architect / consultant. The contractor shall also such report immediately to the competent authority whenever such report is required to be lodged by the law and take appropriate actions thereof.

SPECIAL CONDITION OF CONTRACT

Scope of work

1.0 The scope of work is to carry out for the construction of General Electrical work for "Proposed Construction of the additional floor over existing branch building including repairing work of compound wall and installation of paver blocks at Betul, Madhya Pradesh for State Bank ofIndia, Bhopal".

2.0 **Address of site**

The site is located at State Bank of India's Main Branch, BETUL, MADHYA PRADESH

3.0 **Dimensions and levels**

All dimensions and levels shown on the drawings shall be verified by the contractor and the site and he will be held responsible for the accuracy and maintenance of. All the dimensions and the levels. Figured dimensions are in all cases to be accepted and dimension shall be scaled. Large scale details shall take precedence over small scale drawings. In case of discrepancy the contractor shall ask for clarification from the Architect / consultant before proceeding with the work.

04 **Notice of operation**

The contractor shall not carry out any important operation without the Consent in with from the Architect / consultant:

5.0 **Construction records**

The contractor shall keep and provide to the Architect / consultant full and accurate records of the dimensions and positions of all new work and any other information necessary to prepare complete drawings recording details of the work as construction.

6.0 **Safety of adjacent structures and trees**

The contractor shall provide and erect to the approval of the Architect / consultant supports as may be required to protect effectively all structures and protective give to trees, which may be endangered by the execution of the works or otherwise such permanent measures as may be required by the Architect to protect the tree structures. .

7.0 **Temporary works.**

Before any temporary works are commenced the contractor shall submit at least in advance to the architect / consultant for approval complete drawings of all temporary works he may require for the execution of the works. The contractor shall carry out the modifications relating to strength, if required by the architect / consultant may require in accordance with the conditions of contract at his own cost The contractor shall be solely responsible for the stability and safety of all temporary works and unfinished works and for the quality of the permanent works resulting from the arrangement eventually adopted for their execution.

8.0 **Water power and other facilities**

a) The rate quoted by the contractor shall include all expenses that are required for providing all the water required for the work and the contractor shall make his own arrangements for the supply of good quality water suitable for the construction and good quality drinking water for their workers If necessary the contractor has to sink a tube well / open well and bring water by means of tankers at his own cost for the purpose The SBI will not be liable to pay any charges in connection with the above

b) The rate quoted in the tender shall include the expenses for obtaining and maintaining power connections and shall pay for the consumption charges

c) The contractors for other trades directly appointed by the SBI shall be entitled to take power and water connections from the temporary water and power supply obtained by the contractor However, the concerned contractor shall make their own arrangements to draw the supply and pay directly the actual consumption charges at mutually agreed rates between them. All municipal charges for drainage and water connection for Construction purposes shall be borne by the contactor and charges payable for permanent connections, if any, shall be initially paid by the contactor and the SBI will reimburse the amount on production of receipts

d) The SBI as well as the Architect / consultant shall give all possible assistance to the Contractor's to obtain the requisitePermission from the various authorities, but the responsibility for obtaining the same in time shall be of the contractor

9.0 **Facilities for contractor's employees**

The contractor shall make his own arrangement for the housing and welfare of his staff and workmen including adequate drinking water facilities. The contractor shall also make the arrangements at his own cost for transport where necessary for his staff and workmen to and from site of work at his own cost.

10.0 **Lighting of works**

The contractor shall at all times provide adequate and approved lighting as required for the proper execution and supervision and inspection of work.

11.0 **Firefighting arrangements**

i) The contractor shall provide suitable arrangement for firefighting at his own cost. This purpose he shall provide requisite number of fire extinguishers and adequate number of buckets, some of which are to be always kept filled with sand and some with water these equipments shall be provided at suitable prominent and easily accessible place and shall be properly maintained.

ii) Any deficiency in the fire safety or unsafe conditions shall be correctedby the contractor at his own cost and, to the approval of the relevant authorities. The contractor make the following arrangements at his own cost but not limited the following:

a) Proper handling, storage and disposal of combustible materials and waste.
b) Work operations which can create fire hazards.
c) Access for fire-fighting equipments.
d) Type, number and location of containers for the removal of surplus materials and rubbish.
e) Type, size, number and location of fire extinguishers or other tire fighting equipment.
f) General house keeping

12.0 **Site order book**

A site order book shall be maintained at site for the purpose of quick communication between the Architect / Consultant. Any communication relating to the work may be conveyed through records in the site order book. Such a communication from one party to the other shall be deemed to have been adequately served in terms of contract Each site order book shall have machine numbered pages in triplicate and shall carefully maintained and preserved by the contractor and shall be made available to the architect / consultant as and when demanded- Any instruction which the architect /consultant may like to issue to the contractor or the contractor may like to bring to the architect / consultant two copies of such instructions shall be taken from the site order book and one copy will be handed over to the party against proper acknowledgment and the second copy will be retained for their record.

13.0 **Temporary fencing/ barricading**

The contractor shall provide and maintain a suitable temporary fencing / barricading and gates at his cost to adequately enclose all boundaries of the site for the protection of the public and for the proper execution and security of the work and in accordance with the requirement of the architect I consultant and regulations of local authorities. These shall be altered, relocated and adopted from time to time as necessary and removed on completion of the work.

14.0 **Site meetings**

Site meetings will be held to review the progress and quality evaluation. The contractor shall depute a senior representative along with the site representative and other staff of approved sub-contractors and suppliers as required to the site meetings and ensure all follow up actions. Any additional review meetings shall he held if required by the architect/ consultant. -

15.0 **Disposal of refuse**

The contractor shall cart away all debris, refuse etc. arising from the work from the site and deposit the same as directed by the architect / consultant at his own cost. It is the responsibility of the contractor to obtain from the local authorities concerned to the effect that all rubbish arising out of contractor's activities at the construction site or any other off-site activities borrow pits has been properly disposed off.

16.0 **Contractor to verify site measurement**

The contractor shall check and verify all site measurements whenever requested other specialists contractors or other sub-contractors to enable them to prepare the own shop drawing and pass on the information with sufficient promptness as will in any way delay the works.

17.0 **Displaying the name of the work**

The contractor shall put up a name board of suitable size as directed by the architect/ consultant indicating therein the name of the project and other details as given by the architect/consultant at his own cost and remove the same on completion of work.

18.0 **As built drawings**

i) For the drawings issued to the contractor by the Architect / Consultant. The architect Consultant will issue two sets of drawings to the Contractor for the items for some changes have been made. From the approved drawings as instructed by the SBI/ architect / consultant. The contractor will make the changes made on these copies and return these copies to the architect / Consultant for their approval. In cases revision is required or the corrections are not properly marked the architect / Consultant will point out the discrepancies to the contractor. The contractor will have to incorporated these corrections and / or attend to discrepancies either on copies as directed by the architect / consultant and resubmit to him for approval. The architect / consultant will return one copy duly approved by him.

ii) For the drawings prepared by the contractor

The contractor will modify the drawing prepared by him wherever the changes made by the SBI / architect / consultant. And submit two copies of such modified drawings to the architect/ consultant for approval. The architect / consultant will return one copy of the approved drawing to the contractor.

19.0 Approved make

The contractor shall provide all materials from the list of approved makes at his own cost and also appoint the specialized agency for the waterproofing anti-termite, aluminum doors and windows and any other item as specified in the tender. The

architect/consultant may approve any make / agency within the approved list as given in the tender after inspection of the sample/mock up.

20.0 **Procurement of materials**

The contractor shall make his own arrangements to procure all the required materials for the work .All wastages and losses in weight shall be to the contractors account

21.0 **Excise duty, taxes, levies etc;**

The contractor shall pay and be responsible for payment of all taxes, duties, levies, royalties, fees, cess or charges in respect of the works including but not limited to sales tax, tax on works contract excise duty, and octroi, payable in respect of materials, equipment plant and other things required for the contact. All of the aforesaid taxes, duties, levies, fees and charges shall be to the contractor's account and the SBI shall not be required to pay any additional or extra amount on this account. Variation of taxes, duties, fees, levies etc if any, till completion of work shall be deemed to be included in the quoted rates and no extra amount on this account. Variation of taxes, duties, fees, levies etc if any, till completion of work shall be deemed to be included in the quoted rates and no extra claim on this account will in any case be entertained. If a new tax or duty or levy or cess or royalty or octroi is imposed under as statutory law during the currency of contract the same shall be borne by the contractor.

22.0 **Acceptance of tender**

The SBI shall have the right to reject any or all tenders without assigning any reason. They are not to bind to accept the lowest or any tender and the tenderer or tenderers shall have no right to question the acts of the SBI. However adequate transparency would be maintained by the SBI.

23.0**Photographs:**

- The Contractor shall at his own expense supply to the Architects with duplicate hard copies of large photographs not less than 25 cm. x 20 cm. (10" x 8") of the works, taken from two approved portions of each building, at intervals of not more than one months during the progress of the work or at every important stage of construction.

- In addition to above, the contractor shall be bound to submit adequate no. of site photographs along with their each Running Bill for the project clearing showing major progress of work measured and claimed therein failing which the Architect/Bank may consider returning the Bill to the contractor and no claim for delay on this account will be entertained.

SAFETY CODE

1. First aid appliances including adequate supply of sterilized dressing and cotton wool shall be kept in a readily accessible place.

2. An injured person shall be taken to a public hospital without loss of time, in cases when the injury necessitates hospitalization.

3. Suitable and strong scaffolds should be provided for workmen for all works that cannot safely be done from the ground.

4. No portable single ladder shall be over 8 meters in length. The width between the side rails shall not be less than 30 cm. (clear) and the distance between two adjacent runnings shall not be more than 30 cm. When a ladder is used an extra mazdoor shall be engaged for holding ladder.

5. The excavated material shall not be placed within 1.5 meters of the edge of the trench half of the depth of trench whichever is more. All trenches and excavations shall be provided with necessary fencing and lighting.

6. Every opening in the floor of a building or in a working platform be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be one meter.

7. No floor, roof or other part of the structure shall be so overloaded with debris or material as to render it unsafe.

8. Workers employed on mixing and handling material such as asphalt, cement,mortar, concrete and lime shall be provided with protective footwear and rubber hand gloves.

9 Those engaged in welding works shall be provided with welders' protective eye shield and gloves.

10. (i) No paint containing lead or lead products shall be used except in the form of paste readymade paint.
(ii) Suitable facemasks should be supplied for use by the workers when the paint applied in the form of spray or surface having lead paint dry rubbed and scrapped.

11. Overalls shall be supplied by the contractor to the painters and adequate facilities shall be provided to enable the working painters to wash during cessation of work.

12 Hoisting machines and tackle used in the works including their attachments anchor and supports shall be in perfect condition.

Signature of Contractor with Seal

13. The ropes used in hoisting or lowering material or as a means of suspension shall be durable quality and adequate strength and free form defects.

APPENDIX HEREINBEFORE REFERRED TO

1)	Name of the Client Offering Contract	:	The Assistant General Manager, Premises & Estate Department State Bank of India Local Head Office, Bhopal.
2)	Consultants	:	M/s ParelkarOvalekarParpia Architects & Interior Designers, 139, SeksariaChambers Nagindas Master Road Mumbai-400001.
3)	Site Address	:	STATE BANK OF INDIA'S MAIN BRANCH @ BETUL, M.P.
4)	Scope of Work	:	Proposed Construction of the Additional Floor over Existing Branch Building including Repairing Work of Compound Wall and installation of Paver Blocks at State Bank of India's, Main Branch @ Betul, M.P.
5)	Name of the Contractor	:	---------- ---------- ----------
6)	Address of the Contractor	:	---------- ---------- ----------
7)	Period of Completion	:	10 months from the dated of Commencement
8)	Earnest Money Deposit (Rupees One Lakh Forty Five Thousand only)ByBank Draft/Pay Order/Banker's Cheque only	:	₹1,45,000/- only
9)	Retention Money	:	As per clause no. 11(a) of general Conditions
10)	Defects Liability Period	:	Twelve Months from the date of Virtual Completion.
11)	Insurance to be undertaken by the Contractor at his cost	:	125% of Contract Value (Contractor's all risk policy)

Signature of Contractor with Seal

12)	Liquidated damages	:	0.5% of the estimated amount shown in the tender per week max. 5% of the contract value.
13)	Value of Interim Bill (Min.)	:	Not less than Rs. 20.00 lacs.
14)	Date of Commencement	:	14 days from the date of acceptance letter is issued to the Contractor/ or the day on which the Contractor is instructed to take possession of the site whichever is earlier.
15)	Period of Final Measurement	:	4 Months from the date of Virtual Completion.
16)	Initial Security Deposit	:	2% of the Accepted Value of the Tender. (Clause No. 22)
17)	Total Security Deposit	:	As per clause No. 11 a
18)	Refund of initial Security Deposit Comprising of EMD and ISD.	:	50% of the Security Deposit shall be refunded to the Contractor on completion of the work and balance refunded only after the Defect Liability Period is over.
19)	Period for Honoring Certificate	:	1. 15 days for R.A. Bills 2. The final bill will be submitted by the Contractor within one monthof the date fixed for completionwork and the Bill shall be Certified within four months from the date of receipt of final billprovided the bills are submitted with all pre-requisite documents/test reports etc. prescribed in the tender.

.

_____

Signature of Tenderer.

Date:

Signature of Contractor with Seal

LETTER OF DECLARATION

The Asstt. General Manager (Prem& Estate),
State Bank of India,
Premises & Estate Department,
Local Head Office,
Bhopal

Dear Sir,

PROPOSED CONSTRUCTION OF ADDITIONAL FLOOR OVER EXISTING BRANCH INCLUDING REPAIRING WORK OF COMPOUND WALL AND INSTALLATION OF PAVER BLOCKS AT BETUL, M.P.

Having examined the terms & conditions, drawings, specifications, design relating to the works specified in the memorandum hereinafter set out and having visited and examined the site of the works specified in the said memorandum and having acquired the requisite information relating thereto and affecting the quotation, I/We hereby offer to execute the works specified in the said memorandum within the time specified in the said memorandum on the item rate basis mentioned in the attached schedule and in accordance in all respect with the specifications, design, drawings and instructions in writing referred to in conditions of Tender, the articles of agreement, conditions of contract and with such conditions so far as they may be applicable.

MEMORANDUM

(a)	Description of work	"Proposed Construction of the additional floor over existing branch building including repairing work of compound wall and installation of paver blocks at Betul, Madhya Pradesh for State Bank of India, Bhopal".
(b)	Earnest Money	₹ 1,45,000/- (Rupees One Lakh Forty Five Thousand only)
(c)	Time allowed for completion of work from the date of issue of work order.	10 months from the date of commencement as per tender.

Should this tender be accepted, I/we hereby agree to abide by and fulfill the terms and provisions of the said conditions of Contract annexed hereto so far as they may be applicable or in default thereof to forfeit and pay to STATE BANK OF INDIA, the amount mentioned in the said conditions.

I/we have deposited Demand Draft / Banker's Cheque / FDR for a sum of ₹1,45,000/- as Earnest money deposit with State Bank of India. Should I/we do fail to execute the contract when called upon to do so, I/we hereby agree that this sum shall be forfeited by me/us to State Bank of India.

We understand that as per terms of this tender, the Bank may consider accepting our tender in part or whole or may entrust the work of various buildings in phases. We, therefore, undertake that we shall not raise any claim / compensation in the eventuality of Bank deciding to drop any of the building / buildings from the scope of work of this tender at any stage during the contract period. Further, we also undertake to execute the work entrusted to us in phases on our approved rates and within the stipulated

time limit without any extra claim for price escalation as provided for in Clause 11.1.7 and 11.1.8 “Instructions to Tenderers” of this tender.

We, hereby, also undertake that, we will not raise any claim for any escalation in the prices of any of the material during the currency of contract/execution/completion period.

Yours faithfully,

Signature of contractor
With Seal

INDEX

PROFORMAS OF VARIOUS TESTS

TABLE NO.	DESCRIPTION	PAGE NO.
1.	Record of Cement/Received/Used/Balance.	
2.	Proforma of Paint/Lead/CICO Register.	
3.	Bank for Reinforcement Bars Received.	
4.	Proforma for Register of Material of Site Account.	
5.	Proforma for Account of Secured Advance Register.	
6.	Proforma for Bulkage Test of Sand Register.	
7.	Proforma for Silt Test Register.	
8.	Proforma for Sieve Analysis of Fine Aggregate Register.	
9.	Proforma for Sieve Analysis of Coarse Aggregate Register.	
10.	Proforma for Slump Test Register.	
11.	Proforma of Cube Test Register.	
12.	Proforma for Hindrance to Work.	
13.	Proforma for Running A/c. Bill.	
14.	Account of Secured Advance if Admissible on Materials Held at Site by the Contractors	
15.	Memorandum for Payment.	

Signature of Contractor with Seal

RECORD OF CEMENT RECEIVED / USED / BALANCE

S. No.	Cement in stock Bags	Cement received (Bags)	Total Cement received (Bags)	Source4 from which received	Description of work where cement is used	Number of cement bags consumed	Balance in stock	Signature of Contractors Bank / Engineer
1	2	3	4	5	6	7	8	9

Signature of Contractor with Seal

TABLE-II

RECORD OF PAINT / LEAD / CICO REGISTER

Name of work :

Name of the Contractor :

Agreement No. :

Date of Receipt	Source Receipt with Ref. To S.O./Indent	Qty. Received	Progressive Total	Item of work for which issued with approx qty. work done in case of paint only	Date of issued	Quantity issued	Qty. returned at the end of the day	Total issued	Delay Balance at hand	Contractors initials	Site Engineers initials	Signature of Banks/ Architect
1	2	3	4	5	6	7	8	9	10	11	12	13

Register for bitumen should be maintained. The format will be similar to that for cement.

Signature of Contractor with Seal

TABLE-III

BANK FOR REINFORCEMENT BARSRECEIVED

Truck No.	Challan No.	Name of Supplier	Binding Wire	6mm dia	8mm dia	12mm dia	16mm dia	20mm dia	25mm dia	Total Received
1	2	3	4	5	6	7	8	9	10	11

Number of diameters given is only illustrative. Open more columns for other diameters wherever needed.

Signature of Contractor with Seal

TABLE-IV

PROFORMA FOR REGISTER OF MATERIAL AT SITE ACCOUNT

Name of Work :

Name of Contractor :

Agreement No. :

Name of Article :

Estimated Requirement :

Issue Rate :

Date of Receipt	Received from/Issued to (with Ret. to So/Indent)	Receipt	Issue	Balance	Initials of Contractor	Initial of Bank's/Architect's representative	Remark
1	2	3	4	5	6	7	8

Signature of Contractor with Seal

TABLE-V

PROFORMA FOR REGISTER OF MATERIAL AT SITE ACCOUNT

Name of Work :

Name of Contractor :

Agreement No. :

Discription of Material	Qty.outstanding from previous Bill	Deduct Qty.utilised in works measured since previous bill	Qty.outstanding & Qty.brought to site since previous bill	Signature of Site Engineer	Signature of Contractor	Initial of Bank's/ Architect's representative	Remark
1	2	3	4	5	6	7	8

Signature of Contractor with Seal

TABLE-VI

PROFORMA FOR BULKAGE TEST OF SAND REGISTER

S.No.	Date of Test	Volume of dust sand in Cylinder inundated & stirred	Volume inundated Sand in Cylinder	Percentage of Bulkage	Signature of Site Engineer	Signature of Contractor	Initial of Bank's Architect's representative (Periodical)
1	2	3	4	5	6	7	8

Signature of Contractor with Seal

TABLE-VII

PROFORMA OF SILT TEST REGISTER

S. No.	Date of Test	Height of Sand in Cylinder innundated& stirred	Height of Silt	Max percentage of silt as specified	Percentage of silt obtained	Signature of Site Engineer	Signature of Contractor	Initial ofBank's / Representative (Periodical)
1	2	3	4	5	6	7	8	9

Signature of Contractor with Seal

TABLE-VIII

PROFORMA SIEVE ANALYSIS OF FINE AGGREGATE REGISTER

S. No.	Date of Test	Wt. of Material to be tested	Sieve as per I.S. designation	Wt. of Sand retained in sieve	%a retained in each sieve successively	Cumul-ative % retained in each sieve	F. M.	Signature of Site Engineer	Signature of Contractor	Signature of Banks/ Architect's representative & Remarks (Periodical)
1	2	3	4	5				7	8	9

Signature of Contractor with Seal

TABLE-IX

PROFORMA OF SIEVE ANALYSIS OF COARSE AGGREGATE REGISTER

S. No.	Date of Testing	Wt. of Material to be tested	Nominal size of Aggregate	I.S. Sieve designa- tion	Standard passing for graded aggre. of nominal size	Test Result	Obtained passing	Signature of Site Engineer	Signature of Contractor	Signature of Banks/ Architect's represen-tative& Remarks (Periodical)
1	2	3	4	5	6	7	8	9	10	11

Signature of Contractor with Seal

TABLE-X

PROFORMA FOR SLUMP TEST REGISTER

S. No.	Date of Testing	Type of work fore which slump taken	Specified slump		Slump Obtained		Signature of Site Engineer	Signature of Contractor	Signature of Banks/ Architect's represen-tative& Remarks (Periodical)
			When Vibrators are u`sed	When Vibrators are not used	When Vibrators are used	When Vibrators are not used			
1	2	3	4	5	6	7	8	9	10

Signature of Contractor with Seal

TABLE-XI

PROFORMA OF CUBE TEST REGISTER

Date of taking Cube + Lime	Sample No.	No. of Cubes taken	Specific marking of Cubes	Proportion of mixture	Description of work carried out	Signature of Engineer taking sample	Signature of Contractor	7/28 Days Testing				Permissible Compressive strength of Concrete / 28 Days / 7 days		Remarks on Test Report and No.	Remarks of Banks/ Architectsrepresentativeperiodicals
								Date of Test	Test Result Kg/ Sq.cm	Av. Strength Kg. / Sq. cm.	Standard strength Kg / Sq. cm.	7 Days	28 Days		
1	2	3	4	5	6	7	8	9	10	11	12	13		14	15

Signature of Contractor with Seal

TABLE-XII

PROFORMA FOR HINDRANCE TO WORK

Name of Work : Date of Start of work :

Name of Contractor : Period of Completion :

Agreement No. : Dt. of Completion of work :

S.No.	Nature of Hindrance	Date of Occurrence of Hindrance	Date of which Hindrance was removed	Period of which Hindrance existed	Signature of Site Engineer	Signature of Bank / Architects Representative
1	2	3	4	5	6	7

Signature of Contractor with Seal

TABLE - XIII

PROFORMA FOR RUNNING A/C BILL

i. Name of Contractor / Agency :

ii. Name of Work :

iii. Sl.No. of this Bill :

iv. No. & Date of previous Bill :

v. Reference to Agreement No. :

vi. Date of Written order to commence :

vii. Date of Completion as per Agreement :

S.No.	Item Description	Unit	Rate (Rs.)	As per Tender	
				Quantity	Amount (Rs.)
1	2	3	4	5	

Upto Previous R.A. Bill		Up Date (Gross		Present Bill		Remarks
Quantity	Amount (Rs.)	Quantity	Amount (Rs.)	Quantity	Amount (Rs.)	
6		7		8		9

Note: 1. If part rate is allowed forany items, it should be indicated with reasons for allowing such a rate.
2. If ad-hoc payment is made, it should be mentioned specifically.

_____
_____
Net Value since previous bill

Signature of Contractor with Seal

CERTIFICATE

The measurements on the basis of which the above entries for the Running Bill No. ---------- were made have been taken jointly on ---------- and are recorded at pages ---------- to ---------- of measurement book No. ----------.

---	---	---
Signature and date of Contractor	Signature and date of Architects Representative (Seal)	Signature and date of Site Engineer

The work recorded in the above mentioned measurements has been done at the site satisfactorily as per tender drawings, conditions and specifications.

---	---
Architect	Signature and date of Site Engineer

Signature of Contractor with Seal

TABLE - XIV

ACCOUNT OF SECURED ADVANCE, IF ADMISSIBLE ON MATERIALS HELD AT SITE BY THE CONTRACTOR

S.No.	Item	Quantity	Unit	Amount	Remarks
1	2	3	4	5	6

Total value of materials at Site.

Secured Advance @ ---------- of above value - B

CERTIFIED:

(i) That the materials mentioned above have actually been brought by the Contractor to the site of the work and on advance on any quantity of any of this item is outstanding on their security.

(ii) That the materials (are of imperishable nature) and are all required by the Contractor for use in the work in connection with the items for which rates of finished work have been agreed upon.

Dated Signature of
Site Engineer
Preparing the bill
Rank ----------

Date signature of
Banks Architects----------
(Name of the Architects)

Dated Signature of
the Contractor

Signature of Contractor with Seal

TABLE - XV

MEMORANDUM FOR PAYMENT

R/A BILL NO.

1.	Total value of work done since previous bill (A)	Rs. ----------
2.	Total amount of secured advance due since Previous Bill (B)	Rs. ----------
3.	Total amount due since Previous Bill (C) (A+B)	Rs. ----------
4.	PVA on account of declaration in price of Steel, Cement and other materials and labour as detailed in separate statements enclosed.	Rs. ----------
5.	Total amount due to the Contractor	Rs. ----------

OBJECTIONS:

i)	Secured Advance paid in the previous R/A	Rs. ----------
ii)	Retention money on value of works as per accepted tenders upto date amount Rs.	Rs. ----------
	Less already recovered	Rs. ----------
	Balance to be recovered	Rs. ----------
iii)	Mobilization Advance, if any	
(a)	Outstanding amount (principal + interest) as on date	Rs. ----------
(b)	To be recovered in this bill	Rs. ----------
iii.	Any other Departmental materials cost to be recovered as per contract, if any	Rs. ----------
iv.	Any other Departmental service charges to be recovered if any, as per contract (water, power etc.) enclose statement.	Rs. ----------

Signature of Contractor with Seal

Total Deduction as per contract (F)		Rs. ----------
Adjustments, if any ---------- Amount less received by Contractor in ---------- R/A Bill (as per statement of Contractor)	Rs. ----------	
P.V.A.	Rs. ----------	
Total amount payable as per contract (E+F+G)		Rs. ----------

(Rupees ---------- in words)

The bill amount to Rs. ---------- (both figures and words) has been scrutinized by us after due checking of the measurements of work as required and is recommended for payment.

Date: ----------

Signature of Architect
with Seal

The bill amount to Rs. ---------- certified by Consultants has been scrutinized by me after due test checking of measurements of works as required and is recommended for payment for an amount of Rs.....

Date : ----------

Signature of Owners
Engineer

STATUTORY DEDUCTION:

i)	Total Amount due (E)	Rs. ----------
ii)	Less I.T. Payable	Rs. ----------
iii)	Less S.T. Payable	Rs. ----------
	Net Payable	Rs. ----------

This figures given in the Memorandum for payable has been verified and bill passed for payment ---------- (in words and figures)

Date: ----------

Signature of the AGM
(Premises)

Signature of Contractor with Seal

LIST OF APPROVED MATERIAL AND MAKES OF ITEMS

(THE MAKE LISTED BELOW SHOULD BE FIRST APPROVED BY THE BANK BEFORE USE IN CONSTRUCTION)

1.	CEMENT (53 Grade)	:	ULTRATECH, LAFARGE, JAYPEE, DIAMOND, ACC, MODI OR EQUIVALENT
	WHITE CEMENT	:	BIRLA WHITE, JK WHITE
2.	STEEL FOR REINFORCEMENT	:	TESTED STEEL OF RATHI, TATA OR SAIL (TMT STEEL)
3.	BRICKS	:	BRICKS OF METRIC SYSTEM
4.	WOOD	:	FIRST CLASS C.P. TEAK UNLESS OTHER WISE SPECIFIED.
	SOFT WOOD	:	KAIL WOOD, HOLLOCK
5.	BITUMIN	:	STP OR ANY OTHER I.S.I. MARKED BRAND
6.	ALUMINUM SECTION	:	HINDALCO, INDAL OR JINDAL
7.	EXTERNAL PUTTY	:	BIRLA WALL CARE
8.	EXTERNAL PAINTS	:	ASIAN, BERGER, NEROLAC, SHALIMARICI OR EQUIVALENT
9.	STEEL PRIMER	:	ASIAN, BERGER, SHALIMAR, ICI
10.	SYNTHETIC ENAMEL PAINT	:	APCOLITE, NAROLAC, DULUX, ICI
11.	CEMENT PAINTS FOR EXTERIOR FINISH	:	SNOWCEM PLUS, SUPER INDOCEM, ICI,CEMPLUS
12	WATER PROOFING COMPOUND	:	CICO, CHOK SEY'S, PIDILITE , ROFF, SUNANDA, CHEMISTIK
13.	BUTT HINGES	:	I.S.I. MARKED HINGES
14.	FACTORY MADE SHUTTERS (FLUSH DOORS)	:	ARCHID, DURO, SWASTIK, RAMA
15.	PVC DOOR SHUTTERS	:	SINTEX, SPLENDOOR, GODREJ OR EQUIVALENT
16.	GALVANISED STEEL SHEETS	:	TATA, JINDAL, HINDALCO OR EQUIVALENT
17.	GALVALUMN SHEETS	:	TRAC, KIRBY, CRIL
18.	C.I. PIPES AND FITTINGS	:	B.I.C., HEPCO, NECO OR

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			EQUIVALENT.
19.	G.I. PIPES	:	G.S.I. AMBICA, ZENITH, TATA OR EQUIVALENT
20.	BRASS C.P. FITTINGS	:	PLUMBER, L&K, K.B., TECHNO, JAQUAR OR EQUIVALENT
21.	GUN METAL VALVES	:	LEADER, SANT OR EQUIVALENT
22.	E.W.C., O.W.C., PANS WASH BASINS, URINALS	:	HINDUSTAN, PARRYWARE, CERA,PARRYWARE
23.	E.W.C. SEATS	:	COMMANDER, PATEL OR EQUIVALENT
24.	FLUSHING SYSTEM	:	<u>OVERHEAD C.I. FLUSHING RANK-A-1</u>, JAMCO OR EQUIVALENT <u>LOW DOWN FLUSHING SYSTEM</u> PARRY,HINDUSTAN SANITARYWARE, CERA
25.	WATER METER	:	ANAND, ASAHI, KAYCEL, KAPSTAN OR EQUIVALENT
26.	ASBESTOS CEMENT PIPES AND	:	LOCALY AVAILABLE APPROVED MAKE FITTINGS
27.	PIGMENTS	:	TATA, SHALIMAR
28.	PVC PIPES	:	SUPREME, ASTRAL, PRINCE OR EQUIVALENT
29.	CPVC PIPES	:	NOVEON, ASTRAL OR EQUIVALENT
30.	FIRE FITTING SLUICE & NRV	:	KIRLOSKAR / KALPANA
31.	CEMENT BOARDS /PARTICAL BOARDS	:	BISON BOARDS. NUWUD
32.	MORTICE LOCK, HANDLE	:	GODREJ, EBCO
33.	DOOR CLOSERS, FLOOR SPRINGS	:	EVERITE, DOORKING, HARDWYN
34.	FLOORING TILES	:	KAJARIA, BELL, NAVEEN, SOMANY, JOHNSON, RAK
35.	M.S / BRASS SCREWS	:	NATTLE FOLD
36.	MILD STEEL FOR FABRICATION	:	TATA, SAIL OR EQUIVALENT

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37.	FLUSH DOOR SHUTTERS	:	ISI MARK AS PER SAMPLE APPROVED

NB. 1) The contractor should obtain prior approval from Employer / Consultants before placing order for any specific materials. Employer may / delete any of the makes or brands out of the above list.

2). All materials should conform to relevant standards and codes of BIS.

3) Materials with I.S.I. mark shall be used duly approved by the Banks Engineer / Architect.

4) Equivalent shall be applicable only if it is proved that the makes specified are not available.

Note: - If any material is found to be not up to the mark, the contractor will have to produce original bills/certificate from the manufacturer or his authorized Distributor for authenticity and genuineness of the material for consideration and as per make approved by the Bank. The same will not be considered for payment.

MODE OF MEASUREMENT

1. Unless otherwise stated, all pipes shall be measured net, length as laid and measured overall fittings, such as bends, junctions, etc., and given in running meters. The length shall be taken along the center line of the pipes and fittings.

2. Length of fittings viz, taps, valves, traps etc., which are paid under appropriate items shall not be re-measured under linear measurements as enumerated above.

3. Soil waste and vent pipes shall be measured along the center line of the stack including the connecting bends/tees to W.C. Pan, Nahani trap, etc. and shall be paid as enumerated above.

4. W.C. Pans, Lavatory basins, Sinks, Drain boards, Urinals, Mirrors, Glass shelf Toilet paper Holder, shall be measured by number and shall include all accessories as enumerated in detail specification under each item.

5. Unless otherwise specified, all types of taps, valves, etc., shall be measured by number and paid separately.

6. Manholes, inspection Chambers, Gully traps, etc. shall be constructed according to detail specification and measured by number and paid separately. The depth of Manhole shall mean the vertical distance from the top of the Manhole cover to the outgoing invert of the main drain channel.

7. Water meter shall include Y strainer and other appurtenances required by the local bodies and shall include brick masonry chamber, etc., as per detailed specifications and item shall be measured by number and paid for accordingly or as per schedule of quantity.

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PREAMBLE TO SCHEDULE OF QUANTITIES

Note: While quoting rates for each item of work, the contractor shall include for the following irrespective whether it has been mentioned or not in the description of the item without any extra claim / payment.

1. All unexposed surfaces of timber (any variety) used shall be treated with necessary coats of wood preservative.
2. All exposed surfaces of timber (any variety) shall also have necessary coat of wood primer / putty and paint / polish as per description in the item.
3. Before making bulk quantities , the contractor shall make each of the item as sample and get it approved in writing from the consultants minor modification if and as suggested by the consultant the same shall have to be incorporated without any extra cost.
4. All exposed edges of ply board shall be fixed with cedar / teak wood lipping.
5. All fabrics / leatherite to be used shall cost ₹ 300/ - per meter unless otherwise specified in the item.

   Difference in cost for approved sample shall be adjusted accordingly.
6. For furniture item where required whether mentioned or not shall be include providing an fixing of Brass / Power coated handles /knobs multipurpose locks, mini tower bolts ,ball catchers, hinges, screws and sliding rails etc.
7. Back of all storage, cabinets, and consoles shall be in 6mm commercial ply only.
8. Thickness of laminates to be used shall be 1 mm except where specified.
9. Ant termite treatment is to provide for all wood / board /ply used in the storage.

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SECTION – A: MATERIALS

1) Material shall be of best approved quality obtaining and they shall comply with the respective Indian Standard Specification.
2) Samples of all materials shall be got approved before placing order and the approved sample shall be deposited with the Architect.
3) In case of non-availability of materials in metric sizes the nearest size in FPS units shall be provided with prior approval of the Architects for which neither extra will be paid nor shall any rebates be recovered.
4) If directed, materials shall be tested in any approved Testing Laboratory and the test certificates in original shall be testing including charges for repeated tests, if ordered, shall be borne by the Contractor.
5) It shall be obligatory for the Contractor to furnish certificate, if deemed by the Architects, from manufacturer or the material supplier that the work has been carried out by using their material and as per their recommendations.
6) All materials supplied by the Employer / any other Specialist Firms shall be properly stored and the Contractor shall be responsible for its safe custody until they are required on the works and till the completion of the work.
7) Unless otherwise shown on the Drawings or mentioned in the "Schedule of Quantities" or special specification, the quality of materials, workmanship, dimensions, etc., shall be as specified as hereunder.
8) All equipment and facilities for carrying out field tests on materials shall be provided by the Contractor without any extra cost.

a) **Cement :**

Cement shall comply in every respect with the requirements of the latest publications of IS: 269 and unless otherwise specified ordinary Portland Cement shall be used.

The weight of ordinary Portland Cement shall be taken as 1440 kg. per cu.m. (90 lbs. per C.Ft.). Cement shall be measured by weight and in whole bags, and each undisturbed and sealed 50 kg. bag being considered equivalent to 35 liters (1.2 c.ft.) in volume care should be taken to see that each bag contains full quantity of cement. When part bag is required cement shall be taken by weight or measured in measuring boxes.

No other make of cement but that approved by the Architects will be allowed on works and the source of supply will not be changed without approval of Architect in writing. Test certificates to show that cement is fully complying the specifications shall be submitted to the Architects and
notwithstanding this, the Architect may at his discretion, order that the cement brought on site and which he may consider damaged or of doubtful quality for any reason whatsoever, shall be re-tested in an approved testing laboratory and fresh certificates of its soundness shall be produced.

Cement ordered for re-testing shall not be used for any work pending results of re-test.

Cement shall be stored in weather-proof shed with raised wooden plank flooring to prevent deterioration by dampness or intrusion of foreign matter. It shall be stored in such a way as to allow the removal and use of cement in chronological order of receipt i.e., first received being used first used. Cement deteriorated and or clotted shall not be used on the work but shall be removed at once from the site. However, allowing use of warehouse set cement shall be determined by the Architects.

b) **Lime :**

Lime shall comply in every respect with the requirements of IS: 712 and shall be made from approved line stone or Kankar and properly burnt. It shall be free from excess of unburnt Kankars or lime stone ashes or other extraneous materials and shall be stored in weather-proof sheds. Lime which has damaged by rain, moisture, or air slacking shall not be used but shall be removed from the site of work forthwith. Lime shall be slacked with fresh water and screened through appropriate screens and stored and used within 14 days provided it is protected from drying out.

Field tests according to IS: 1624 shall be carried out from time to time to determine the quality of lime.

c) **River Sand :**

River sand shall confirm to IS: 383 and relevant portion of IS: 515. It shall pass through pass through a I.S. sieve 4.75 mm. (3/16 B.S.) test sieve, leaving a residue not more than 5%. It shall be from natural source i.e. only river or crushed stone screenings, if allowed, chemically intert clean, sharp, hard durable, well graded and free from dust, pebbles, clay, shale, salt, organic matter, loam , mica or other deleterious matter. The sum percentages of all deleterious substances to acceptable limits. River sand shall not contain any trace of salt and it shall be tested and river sand containing any trace of salt shall be rejected.

The fine aggregate i.e. river sand for concrete shall be graded within limits as specified in IS: 383 and the fineness Modules may range between 2.60 to 3.20.

The fine aggregate shall be stacked carefully on a clean hard dry surface so that it will not get mixed up with deleterious foreign materials. If such a surface is not available a platform of planks or corrugated iron sheets or brick floor or a thin layer of lean concrete shall be prepared.

d) **Fine & Coarse Aggregate :**

Shall consist of crushed or broken stone 95% of which shall be retained on 4.75 mm. IS tests sieve. It shall be obtained on crushing Granite, Quartzite, Trap, Basalt, or similar approved stones from approved quarry and shall confirm to

IS:383 and IS 515. Fine & Coarse aggregate shall be chemically inert when mixed with cement and shall be cubical in shape and be free soft, friable, thin, porous, laminated or flaky pieces. It shall be free from dust and any other foreign matter.

Gravel / Shingle of desired grading may be permitted as a substitute in part or full in plain cement concrete if the Architect is otherwise satisfied about the quality of aggregate. For all the R.C.C. works the size of coarse aggregate shall be 20 to 25 mm. and fine aggregate shall be 10 to 15 mm.

e) **Reinforcement :**

Reinforcement shall be of mild steel tested quality confirming to I.S. : 432-1966 and any other I.S. applicable or deformed bar confirming to IS:1786 and Is:1139 or hard drawn Fe 415 (Tor Steel) steel wire fabric confirming to IS:1566;1967.

All finished bars shall be free from cracks, surface flaws, laminations, jagged and imperfect edges.

f) **Bricks :**

Bricks shall generally comply with IS:1077 except in size which shall be classified as 1st and 2nd class.

1st class bricks shall be the best quality locally available table moduled, well burnt but not over burnt, have plain rectangular faces with parallel sides and sharp right angled edges, have a find compact and uniform texture. The bricks shall be free from cracks, chips, flaws, stones or subsequent to soaking in water. It shall emit a clear ringing sound on being struck and shall not absorb water more than 20% by weight. Common building bricks shall have a compressive strength of 35 kg. / sqmunless otherwise specified for first class bricks.

g) **Neeru :**

Shall be made of Class “C” Lime (i.e. pre fat lime) as mentioned in IS: 712. It shall be slaked with fresh water then sifted and reduced to a thick paste by grinding in a mill. Neeru thus prepared shall be kept moist until used and no more than that can be consumed in 15 days shall be prepared at time.

h) **Surkhi :**

Shall be made by grinding well burnt bricks, brick bats, burnt clay balls, etc., the brick etc., to be used shall be prepared from selected clay. The quality shall confirm to IS:1344.

Bricks bats, etc., shall be ground in mechanical disintegrator to a find powder passing through IS Sieve No. 9 (2.36 mm.) with a residue not exceeding 10% by weight.

Surkhi for lime surkhi plaster shall be ground to fine powder in a mortar mill to pass through IS Sieve 150 micron (No. 100)

Surkhi shall be stored in a weather-proof shed on a brick pave platform.

i) **Water :**

Water for mixing cement / lime / surkhi mortar or concrete shall not be salty or brackish and shall be clean, reasonably clear and free from objectionable quantities of silt and traces of oil, acid and injurious alkali, salts, organic matter and other deleterious materials which will either weaken the mortar or concrete or cause affluence or attack the steel in reinforced cement concrete. Water shall be obtained from sources
approved by the Architect. Potable water is generally considered satisfactory for mixing and curing concrete, mortar masonry, etc., where water other than main source is used this shall be tested in an approved testing laboratory to establish its suitability. All charges connected therewith shall be borne by the Contractor.

j) **Timber :**

Timber shall be well seasoned and of the best quality Indian Teak of specified species viz., Dandeli, Balarshah, Melabar, C.P.

Timber shall be considered as well seasoned, if its moistures content does not exceed the following limits.

a) Timber for frames	14%
b) Timber for planking, shutters, etc.	12%

The moisture content of timber shall be determined according to method described in paragraphs 4 of IS:287 for Maximum permissible moisture content of timber used for different purpose in different climatic zones.

In measuring cross-sectional dimensions of the frame pieces tolerance upto 1.5 mm. shall be allowed for each planed surface.

k) **Superior quality Indian Teak Wood :**

Superior quality Indian Teakwood means Dandeli, Balarshah, and Malabar Teak. It shall be of good quality and well seasoned. It shall have uniform colour, reasonably straight grains, and shall be free from large. Loose, dead knots, cracks, shakes, warp, twists, bends, borer holes, sap-wood or defects of any kind. No individual hard and should knot shall be more than 1 cm. in diameter and aggregate areas of all knots shall not exceed ½% of area of the piece. There shall not be less than 6 growth rings per 2.5 cm. width.

l) **Ist Class Indian Teakwood :**

1st Class Indian Teakwood means C.P. and Bulsar teak of good quality and well seasoned. It shall have uniform colour, reasonably straight grains and shall be free from large. Loose dead knots, cracks, shakes, warp, twists, bends, sap-wood or defects of any kind. No individual hard and should knot shall be more than 2.5 cm. in diameter and aggregate areas of all the
knots exceed 1% areas of the piece. There shall not be less than 5 growth tings per 2.5 cm. width.

m) **IInd Class Indian Teakwood :**

Shall be similar to first class Indian teak wood except that knot upto 4 cm. diameter and aggregate area of all knots upto 1 ½% of the area of the piece shall be allowed. There shall not be sapwood upto 15% is allowed.

n) **Flush Doors :**

All flush doors shall be solid core exterior grade unless otherwise specified and it shall generally confirm to IS:2202 and shall be fabricated as described under specification.

o) **Steel Windows and Doors :**

Steel windows and doors shall be fabricated of steel sections conforming to IS:226. They shall conform to IS 1038. Unless otherwise specified the details of construction etc., shall be as described under specification.

p) **Floor Tiles :**

Designer pre-cast concrete tiles and interlocking paver block, plain cement tiles, chequred tiles, mosaic tiles terrazzo tile shall conform to IS:1237. For neutral shade tiles grey cement shall be used. Tiles shall be compacted by mechanical vibration and hydraulically pressed. It shall be of choice shade and shall have desired pattern of chip distribution. The sizes of chips to cement in terrazzo or mosaic floor shall be as specified in IS:1237. The size and thickness of tiles shall be as approved by the Architect.

q) **Ceramic / Vitrified Tiles :**

White or coloured glazed tiles shall comply with IS:777 or relevant or latest I.S. code. It shall be from an approved manufacturer and shall be flat and true to shape. They shall be free cracks, crazing, spots, chipped edges and corners. The glazing and colour shall be uniform shade and unless otherwise specified the tiles shall be 6 mm. thick.

r) **Marbles :**

Marble slabs for flooring, dado veneering etc., shall be of kind specified in the item such as white or pink, Makrana, Chittor black, Bhanslana black, Jaisalmer yellow, Baroda green, Patiala (Pepsu) grey, etc., Marble from which slabs are made shall be selected quality, hard, sound dense and homogenous in texture and free from cracks, weathering, decay and flaws. Before starting the work the contractor shall get the sample of Marble slabs approved by the Architect.

The slabs shall be machine cut and machine polished.

s) **Kotah / Shahbad / Cudappa / Granite :**

Shall be of selected quality, hard, sound, dense, and of homogenous texture, free from cracks decay, weathering and flaws. Stone slabs shall be of uniform colour as approved by the Architect. They shall be machine cut and machine polished where specified and shall confirm to the required size. Thickness shall be specified in the respective items.

t) **Glazing :**

Glass used for glazing shall be float glass of best quality, free from flaws, specks bubbles and shall be 2.9 mm. thick upto 0.60 x 0.60 mm. size and for larger size it shall be 4 mm. thick unless otherwise specified in the Schedule of Quantities.

The following type of glasses shall be used:-

1) For OfficeBuilding ..		Clear glass or as specified in the Schedule of Quantities.
2) Office (toilets)	..	Clear or frosted
3) Partitions	..	Frosted

u) **Asbestos Roofing & rain Water Pipes :**

All Asbestos pipes and fittings shall comply with IS:459 and shall be free from cracks, chipped edges of corners and other damages.

v) **MPI. Sheets :**

MPI. Sheets shall be of a gauge specified in the description of the item and shall conform to the IS:277. The sheets shall be free from cracks, spilt edges, twists, surface flaws, etc. They shall be clean bright and smooth. Galvanising shall be uninjured and the perfect condition. The sheet shall show no sign of rust or white powdery deposits on the surface. The corrugations shall be uniform in depth and pitch and parallel.

w) **Paints :**

Lime for lime wash, dry distemper, oil bound distemper cement primer, oil paint, enamel paint, flat oil paint, plastic emulsion paint, anti-corrosive primer, red lead, water-proof cement paint and exterior grade Acrylic Emulsion paint, cement paint, sand-tex matt shall be from an approved manufacturer and shall conform to the latest Indian Standard for various paints. Ready mixed pains as received from the manufacturer without any admisture shall be used, except for addition of thinner, if recommended by the manufacturer.

x) **Mortar :**

Lime Surkhi Mortar :

Lime and surkhi shall confirm to the specifications. It shall be composed of approved lime and surkhi in proportion of 1 lime to 2 surkhi mixed thoroughly. The ingredients shall be accurately gauged by measure and shall be well and evenly mixed together on a platform and water added to make it homogenous. When large quantities are required the mortar shall be mixed in a mechanical grinder.

Cement Mortar :

Cement mortar shall be of proportions specified for each type of work in the schedule. It shall be composed of Portland Cement and sand. The ingredients shall be accurately gauged by measure and shall well and evenly mixed together in a mechanical pan mixer, care being taken not to add more water than is required. No mortar that has begun to set shall be used. River sand shall be used unless otherwise specified.

If hand mixing is allowed, then it shall be done on pucca water-proof platform. The gauged materials shall be put on the platform and mixed dry. Water will then be added and the whole mixed again until it is homogenous and of uniform colour. Not more than one bag of cement shall be mixed at one time and which can be consumed within half an hour of its mixing.

Composite lime, cement, sand mortar :

The mortar shall be of proportions specified for each type of work in the schedule of quantities. It shall comprise of Portland cement, lime and sand. Lime shall be measured in gauge boxes similar to one used for measuring cement and sand to the proportion specified and sufficient water then added to it to form a thick slurry thus obtained shall then be added to dry cement and sand mixture and thoroughly mixed to make a workable homogenous mortar of uniform colour by adding more water if necessary. Mechanical mixers shall generally be used for mixing such mortars. If hand mixing is allowed it shall be done on pucca platform.

Note :

In connections with the I.S. Code numbers indicated under Section, Specification, Section A – General
Refer to the following I.S. Code numbers and the year and or otherwise latest modified I.S.Code Number.

1)	Cement	:	I.S. 269 – 1976
2)	Lime	:	I.S. 712 – 1964
			I.S. 1624 – 1960
3)	Fine – Aggregate	:	I.S. 383 – 1970
4)	Coarse – Aggregate	:	I.S. 515 – 1970
5)	Reinforcement	:	I.S. 432 – 1966 Fe 415
			I.S. 1786 – 1966 (Tor Steel)
			I.S. 1139 – 1966
6)	Bricks	:	I.S. 1077 – 1970
7)	Neeru	:	I.S. 712 – 1964
8)	Surkhi	:	I.S. 1344 – 1968
9)	Timber	:	I.S. 287 – 1960
10)	Flush Doors	:	I.S. 2202 – 1966
11)	Floor Tiles	:	I.S. 1237 – 1980
12)	Ceramic / Vitrified Tiles	:	I.S. 777 – 1970
13)	Asbestos Roofing and Rainwater pipes	:	I.S. 459 – 1962
14)	R.C.C. design mix M-25	:	I.S. 456 – 2000

SECTION – B: MODE OF MEASUREMENTS

The method of measurement for various items in the tender shall be generally in accordance with the IS: 1200 subject to the items for which the mode of measurements are not given under or elsewhere in the tender.

1) **Excavation** :

a) **Footings**: Area of excavation for footing shall be measured equal to the area of the lowest concrete as shown on the drawing. Depth shall be measured vertically from ground level to bottom of concrete course or dry rubble packing as the case may be.
b) **Plinth Beams**: Depth of excavation for plinth beam shall be measured from ground level upto bottom of beam and width equal to width of the beam. If a leveling course is ordered, if shall be measured upto the bottom of the Leveling course.
c) Where excavation is made in trenches, measurements for cutting shall be taken by means of taps and staff and the width of concrete or rubble packing as shown on the Drawing shall be considered as the width of excavation.
d) Where excavation is made for leveling the site, levels shall be taken before start and after completion of work and total quantity of excavation computed from these levels in manner approved by the Architect.
e) Where soil including soft rock and hard rock are mixed, hard rock after excavation shall be stacked separately. Measurement of the entire excavation shall be taken as indicated above. Excavations of hard rocks shall be measured from stacks of excavated hard rock and reduced by 40% for bulkage and void. The quantity so arrived at shall be paid for under hard rock. The difference between the quantity of entire excavation and quantity payable under hard rock shall be paid as soil including soft rock.

2) **Earth Filling** :

In open spaces Fillings shall be measured from cross sections of embankments, levels of which are recorded by means of levels before start of work and after completion of work. When it is not possible to measure filling from cross sections, it may be measured from loose stacks or lorry measurements with previous written permission from the Architect and 20% deduction shall be made from the measured quantity to arrive at the net quantity payable.

3) **Cement Concrete (Plain & Reinforcement)**:

Cement concrete in R.C.C. and P.C.C. items shall be measured exclusive of reinforcement and plaster thickness but shall include necessary costs of shuttering, centering, hire charges of all equipment, curing, hacking and fair finish. Reinforcement and plaster shall be measured and paid separately.

Items line R.C.C. precast jalli, R.C.C. pipes and other such items which are normally manufactured in factories as well as those items which have been specifically mentioned in the Schedule of Quantities shall be measured inclusive of reinforcement.

No deductions will be made for openings upto 0.1 sq.m. and no extra labour for forming such openings or voids shall be paid.

Columns shall be measured from face to face of columns / beams and shall include haunches, if any. The depth of the beams (other than raft foundations beam) shall be measured from the top of the slab to the bottom of the beam.

In case of combined footings and raft foundations, the exposed, portion of the beam rib shall be measured as beam and remaining portion measured in footing / raft slab.

Slabs (other than in raft foundations) shall be measured in bays (clear of beams) with deductions for columns portions.

Chajja: only projected portion shall be measured in Square meter.

Staircase: Measurements shall be in Cu.m. Staircase comprising if steps, soffit slab, landing slab shall be measured and paid under this them. Side parapet walls, railings, finishing of raisers and treads, M.S. reinforcement and plastering etc., shall be paid separately under respective items.

4) **Reinforcement**:

Shall be measured in lengths of bars as actually placed in position on standard weight basis; no allowance being made in the weight for rolling margin, Wastage and binding wire shall not be measured, authorised overlaps and spacers shall only be measured.

Standard weight for steel reinforcement bars

Diameter of the steel bars in mm.	6	8	10	12	16	20	25	32
Weight of steel bars in kg per Rmt.	0.22	0.39	0.62	0.89	1.58	2.47	3.85	6.31

5) **Brick Work** :

Except walls of half-brick thickness or less, all brick work shall be measured in cubic meters.

Thickness of Wall:

Brick walls upto and including three bricks in thickness shall be measured in multiples of half-brick which shall be deemed to be inclusive of the mortar joints. Where fractions on half-bricks occur due to architectural or other reasons, the measurement shall be taken half-bricks.

For walling, which is more than three bricks in thickness, the actual thickness of the wall be measured to the nearest centimeter.

Honey-combed brick walling shall be given in square meters stating the thickness of wall and the pattern of honey-combing. Honey comb openings shall not be deducted.

Deductions:

No deductions or additions shall be made on any account for

a) Ends of dissimilar materials (i.e. joists, beams, lintels, lofts, grinders, rafters, purlins, trusses, corbels, steps, etc.) upto 500 square centimeters in section.
b) Opening upto o.1 sq. in section.
c) Wall plates, bed plates 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 width of the wall.

6) **Stone Masonry** :

Except where otherwise described, stone work and stone walling generally shall be given in cubic meters and facia work in square meters.

When measuring walls, the thickness shall be measured to the nearest one centimeter.

Deductions shall be made as described under brick work.

7) **Wood Work**:

All work shall be measured net as fixed. No extra measurement will be given for shape, joints, splayed meeting styles of doors and windows and shall be measured in unit of square meters.

Area over the face inclusive of exposed frame thickness (excluding width of cover mould) shall be measured in case of door, windows and ventilators when frames are included in the item. Portions embedded in masonry or flooring shall not be measured. Where frames are measured separately mode of measurement shall be as per C.P.W.D. practice or IS:1200.

8) **Steel doors, windows, ventilators, louvers**:

Clear area over one face inclusive of exposed frame shall be measured. Holdfasts or portions embedded in masonry or flooring shall be measured.

9) **Steel rolling shutters and rolling grilles**:

Clear width between side jambs and clear height between floor and bottom of lintel / beam shall be measured. Hood shall not be measured separately. The rate should be inclusive of the cost of hood.

10) **Flooring, Skirting, Dado**:

Flooring shall be measured from skirting to skirting and where the wall surface are plastered or provided with Dado, it shall be measured from plaster to plaster or dado to dado.

11) **Plastering and Pointing**:

All plastering and pointing shall be measured in square meters unless otherwise described.

Net are of surface plastered shall be measured. No deductions will be made for ends of joints, beams, posts, etc., and opening not exceeding 0.5 sq.m. each and no additions shall be made neither for reveals, jambs, soffits, sills, etc. of these openings nor for finishing the plaster around openings, ends, of joists, beam and posts, etc.

Full deductions will be made for door, window and ventilator from each side with adding jambs for door, window and ventilator.

12) **Painting, White washing, colour washing and distempering**:

All painting work shall be measured in square meters.

Net are of surface painted shall be measured. No deductions will be made for unpainted surfaces of ends of joists, beams, posts etc., and opening not exceeding 0.5 sq.m. each and no additions shall be made for reveals, jambs, soffits, sills, etc., of these openings.

Full deductions will be made for door, window and ventilator from each side with adding jambs for door, window and ventilator.

No coefficient will be considered for painting over sponge finished or sandfaced plaster.

The following multiplying factors for obtaining equivalent areas shall be adopted.

No.	Description of works	How measured	Multiplying Factor
a)	Wood paneled framed ledged, braces and battened.	Measured flat (not girthed) including frame, edges, chawkats, cleats, etc., shall be deemed to be included in the item.	1 1/8 (for each side).
b)	Wood flush part paneled and part.	-- do – glazed or gauzed.	1 (for each side).
c)	Fully glazed or gauzed or glazed louvered ventilators / window / door.	-- do --	¼ (for each side).
d)	Fully venetioned of louvered (not with glazing).	-- do --	1 ½ (for each side).
e)	Weather boarding.	Measured flat (not grithed supporting frame work shall not be measured	1 1/8 (for each side).

		separately).	
f)	Trellis (or Jaffri) work one way or two way.	Measured flat overall, no deduction shall be made for opening (supporting members shall not be measured separately)	1 (for each side).
g)	Guard bars, balustrades, gratings, grille railings, grille partitions, etc.	--- do ---	1 (for painting all over).
h)	M.S. gates & open palisades fencing, door including standards, braces, rails, stays, etc.	See not below	1 (for painting over all).
i)	Steel rolling / alligator type shutters.	Measured flat over jambs, guides, bottoms, rails and locking arrangement etc. shall be deemed to be included in the item.	1 ¼ (for each side).
j)	Carved or enriched work.	Measured flat.	2 (for each side).
k)	Fully glazed or gauzed steel windows or partitions.	Measured flat.	1 ¼ (for all over).

Note :

The height shall be taken from the bottom of the lowest rail, if the palisades do not go below it (or from the lower end of the palisades, if they project below the lowest rail) upto the top of the palisades, but not upto the top of the standards, if they are higher than the palisades. Similarly for the gates, depth of roller shall not be considered while measuring the height.

Area painted over sand cement plaster, sponge finished / sand faced plaster / rough cast plaster area painted without considering any coefficient for painting over sand faced plaster

SECTION – C : WORKMANSHIP

CLEARING OF SITE, EXCAVATION AND EARTH FILLING

Note: Workmanship for all items related to the construction work should be as per relevant I.S. Code.

General:

Trenches for wall foundations, column footings, raft foundations, pile caps, plinth beams, water tanks, cess pits, etc., shall be excavated to the exact length, width and depth shown in the figure on the drawing or as may be directed by the Architect. If taken out to greater length, width or depth than shown or required, the extra work occasioned thereby shall be done at the Contractors own expenses. Extra depth shall be brought up by plain cement concrete filling 1:4:8 proportion and extra length and width filled in by rammed earth or murum or if the Architect thinks it necessary for the stability of the work by 1:4:8 concrete, as may be directed by the Contractors costs.

Excavated material shall be used for filling in plinth, or each side of the foundation blocks or trenches or it shall be spread elsewhere on or near the site of work including watering, ramming and consolidating or carted away from site free of charge, as may be ordered.

The Contractor shall at his own expenses and without any extra charge, make provision for supporting all utility services, lighting the trenches, separating and stacking, serviceable materials neatly, shoring, timbering, stuttering, bailing out of water either sub-soil or rain water including pumping at any stage of the work. Trenches shall be kept free of water while masonry or any concrete works are in progress and until the Architects consider that concrete is sufficiently set.

Excavation excluding in Hard Rock:

Excavation shall be carried out in any type of soil, murum (soft or hard), soft rockm boulders, old foundation, concrete asphalt or stone paved surfaces, old masonry or concrete (plain or reinforced).

Excavation in Hard Rock:

Rock which is in solid beds, which can only removed either by blasting or by wedging or chiseling shall be treated as hard rock. A boulder or detached rock measuring one cubic meter or more, shall blasting, wedging or chiseling.

Where hard rock is met with the blasting operations is considered necessary, the Contractor shall intimate about the same to the Architect.

The Contractor shall obtain license from District / Public authorities for carrying our blasting work as well as for obtaining transporting and storing explosives as per Explosives, Rules 1940 or as amended. He shall purchase the explosives, fuses, detonators, etc., only from

a licenses dealer. He shall maintain the account of explosive etc., purchased and used by him. He shall be responsible for safe custody and proper accounting of explosives materials. The Architect shall have access to check store of explosive and accounts thereof.

Blasting shall normally be done with gun powder. Dynamite Gelatin or any other high explosive shall only be used in special cases with written permission of the Architect and District / Public authorities concerned under Explosives Rules.

Blasting operations shall be carried out under the supervision of a responsible representative of the Contractor during certain hours, preferably during lunch break as approve in writing by the Architect. The representative shall be conversant with the rules of blasting.

Proper precautions for the safety of persons shall be taken. Red flags shall be prominently displayed around the area to be blasted and all people on work expect those who actually light the fuses shall be withdrawn to a safe distance of not less than 100 meters from the blast. Blasting shall not be done within 100 meters of an existing masonry or any other kind of structure unless special precautions are taken by heavy blanketing etc.

Where Blasting is not practicable or prohibited, excavation shall be done by wedging or chiseling and it shall be restricted to the quantity required to enable the necessary foundation etc. to the put in. In case, the dimension of trenches exceed those shown in drawings or as directed by the Architect, the excess quantity shall not be paid for, the item also covers bailing out subsoil or rain water including pumping at any stage of work, shoring strutting, etc.

Earth Filling:

General: Filling shall be done with good earth, murum, stone chips, or disintegrated building debris. It shall be free from salts, organic matter, black cotton or slushy earth and combustible material. All clods shall be broken.

a) **Filling in Plinth** :

Filling shall be done in layers not exceeding 25 cm., amply watered and consolidated by ramming with iron or wooden rammers weighing 7 to 8 kgs. and having base 20 cm. square or 20 cm. diameter. When the filling reaches the finished level, surface shall be flooded with water for atleast 24 hours, allowed to dry and then rammed and consolidated, after making good any settlement in order to avoid settlement at a later stage. Special care shall be taken to pack earth under plinth beams and column corners. Finished level of filling shall be kept to a slope intended to be given to the floor.

b) **Filling in Outdoor portions and for Site Development**:

Shall be done in layer of 30 cm. Each layer shall be adequately watered. When filling reaches the required level the top most layer shall be dressed to proper section, grade and camber and rolled by 8 to 10 ton’s power roller and adequately watered to aid compaction.

DRY RUBBLE PACKING & LEVELING COURSE.

Dry Rubble Packing: Ground shall first be leveled up and thoroughly consolidated by means of heavy log hammer or frog rams. Rubbles of specified thickness shall then be laid and set with hand. It shall be consolidated by either hand roller or wooden log hammer, free use of water being made during consolidation. All hollows and interstices after consolidation shall be filled up with quarry spalls, stone chips etc., and the packing blinded with stone grit and watered and consolidated by log hammer.

Rubble packing in Road work shall be thoroughly consolidated by means of power rollers of 8 ton's capacity instead of log hammers and the surface shall be brought to proper grade and camber. After checking the level, grade and camber the surface will again be watered and rolled to receive road structure.

Leveling Course:

It shall be either plain cement concrete of leaner mix or lime concrete which shall be proportioned as stipulated in the relevant item and mixed and placed in position confirming to line and level show on the drawing and compacted by approved means and cured adequately.

Lime concrete shall be prepared by mixing sand and slaked lime in proportion of three parts of sand and one part of lime and ground in a suitable mill and the mortar so prepared shall be added to six parts of the brick bat passing through 50 mm. mesh, mixed well and placed in position and compacted by approved means. The concrete shall be cured adequately.

PLAIN & REINFORCED CEMENT CONCRETE

A) **VOLUMETRIC BASIS**:-

General : Except where they are varied by the requirements of this specification due provision of Indian Standard Specification IS-456-1964 for plain and reinforced concrete and IS-432 part I and II for Mild and Medium Tensile steel Bars and hard drawn steel wire for concrete reinforcement and any other relevant ISS applicable together with the latest amendments shall be held to be incorporated this specifications. It shall be intent of these specifications to ensure that all concrete placed at various location of the job should be durable, strong enough to carry design, loads, it should wear well and practically be impervious to water. It should be free from such defects as shrinkage, cracking and honey-combing.

Proportioning the Mix :

In ordinary concrete, excluding controlled concrete, proportions of cement to fine and coarse aggregate shall be as specified in the respective items and shall be accurately measured as in table "A" below. These proportions are based on assumption that the aggregates are dry. If aggregates are moist allowance shall be made for bulking in accordance with IS:2386/-. Allowance shall also be made for surface water present in aggregate when computing water contents. Surface water present shall be determined by one of the field methods described in

IS:2386/- (Part III). In the absence of exact data, the amount of surface water may estimated by the value given in table “B” below (Table “A” and “B” please see on page nos.124 & 125).

Mixing :

Concrete of 1:2:4 or richer mix shall be mixed in an approved mechanical mixer. The mixer and mixing platform shall be suitably protected from wind and rain. Aggregates shall be accurately measured out in boxes and mixed dry along with cement, water shall be then added in measured quantity and mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in colour and in consistency but in no case shall he mixing be done for less than 2 minutes.

When hand mixing is permitted with the approval of the Architect it shall be carried out on water-tight mixing platform and care shall be taken to ensure that mixing is continued until mass is uniform in colour and consistency.

Consistency :

Quantity of water for making reinforced concrete shall be sufficient so as to ensure that concrete shall surround and properly grip all the reinforcement. The best consistency shall be that, which will flow sluggishly without flattening out and without separation of

coarse aggregates from the mortar. The degree of plasticity shall depend on the nature of work and atmospheric temperature and whether the concrete is vibrated or hand compacted. The slumps shown in table “C” obtained by standard slump test carried out in accordance with the procedure laid down in IS:119-1959 shall be adopted for different types of work.

Admixtures :

The usage of admixtures are allowed only if approved by the structural consultant and his decision in this regard shall be final.

Transportation:

Concrete shall be conveyed from the place of mixing to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of any of the ingredients. If segregation does occur during transport, the concrete shall remixed before being placed. In no case, more than 30 minutes shall elaspe between mixing the consolidation in its position.

Placing and Compacting :

Concrete shall be placed in layers of suitable thickness or in strips and compacted before initial setting commences and should not be subsequently disturbed. Method of placing shall be such as to preclude segregation and as far as practicable the placing shall be continuous. Special care shall be taken in accordance with IS:456 while laying concrete under extreme weather.

Concrete shall be thoroughly compacted during the operation of placing and thoroughly working around the reinforcement, embedded fixtures and spaded against corners of the form work and by punning, rodding, mechanically vibrating or by any other approved means. In addition form work shall be tapped lightly by using wooden mallet at the pouring head. The number and type of vibrator to be used shall be subject to the approval of the Architects and in general immersion type vibrators shall be used. External vibrators shall also be used whenever directed.

The intensity and duration (of vibration shall be sufficient to cause complete settlement and compaction without any stratification of successive layers or separation of ingredients or formation of liatance. Vibrator shall be inserted vertically in the concrete at points not more than 45 cm. apart and withdrawn very slowly when air bubbles no longer come on the surface. Over vibration or vibration of very wet mixes is harmful and should be avoided. Care shall be taken to utilize the vibrator only to compact the concrete and not to spread it, sufficient number of reserve vibrator in good working condition shall be kept on hand at all times, so as to ensure that there is no slackening or interruption in compacting.

Construction Joints :

Concreting shall be carried out end to end continuously as far as possible and when construction joints are totally unavoidable, it shall be located in a predetermined position approved by the Architect. The joints shall be kept at places where the shear force is the minimum and these shall be straight and at right angles to the direction of main reinforcement. When the work has to be resumed, on a surface which has hardened, such surface shall be roughened. It shall be swept clean, thoroughly wetted and covered with a 13 mm. layer of mortar composed of cement and sand in the same ration as the cement concrete mix. This 13 mm. layer of mortar shall be freshly mixed and placed immediately before the placing of the concrete.

Where the concrete has not fully hardened, all liatence shall be removed by scrubbing the
Wet surface with wire or bristle brushes, care being taken to avoid dislodgment of particles of aggregate. The surface shall then be coated with neat cement grout. In horizontal joints the first layer of concrete to be placed on this surface shall not exceed 15 cm. thickness and shall be well rammed against old work, particular attention being paid to corners.

Expansion Joint:

Expansion joint shall be provided where required as shown on the drawings or as directed by the Architect / Consultant. The joints shall be filled by the approved quality filler.

Curing :

Concrete shall be carefully protected during first stage of hardening from harmful effects of excessive heat, drying winds, rain or running water. It shall be covered with a layer of sacking, sand canvas, hessian, or similar absorbent materials and kept constantly, wet for ten days from the date of placing of concrete. Alternatively, the concrete being thoroughly wetted and covered by layer of approved water-proof material which should be kept in contact with it for seven days.

Form Work :

The form work shall conform to the shape, lines and dimensions as shown on the plans and be so constructed as to remain sufficiently rigid during the placing and compacting of the concrete and shall be sufficiently watertight to prevent loss of cement slurry from the concrete. Form work or centering shall be constructed of steel or timber and adequately designed to support the full weight of wet concrete without deflection and retain its form during laying, ramming and setting of concrete. Timber used shall be properly seasoned so as to prevent deformation when wetted.

All props shall be straight and of full height and no joints shall be allowed. Props shall be braced with thin bamboos or wooden battens and where additional staging is necessary, extra care shall be taken to use bigger diameters props with bracing at 4 or 5 levels. All props shall be supported on sole plates and double wedges. At the time of removing props these wedges shall be gently eased and not knocked out.

All rubbish, chippings, shavings and saw dust shall be removed from the interior of the forms before the concrete is placed and the form work in contact with the concrete shall be cleaned and thoroughly wetter or treated with non-staining mineral oil or any other approved materials is kept out of contact with the reinforcement.

All form work shall be removed without shock or vibration and shall be eased off carefully in order to allow the structure to take up its load gradually. Forms shall not be disturbed until concrete has adequately hardened to take up superimposed load coming on it and in no circumstances shall forms be struck until the concrete may be subjected at the time of striking.

In the normal circumstances (generally where temperatures are above 21 degrees centigrade) and where ordinary cement is used, forms may be struck after expiry of following periods :

a)	Walls, Columns and Vertical sides of beams	}48 hours as may be directly }by the Architect.
b)	Bottom of slab upto 4.5 m. span.	}7 days.
c)	Bottom of slab upto 4.5 m. span. bottom of beam and arch rib upto 6 m. span.	}14 days. } }
d)	Bottom of beams and arch rib over 6 m. span.	}21 days. }

However this period may be increased or decreased at the discretion of Architects. Special care shall be taken while striking the centering of cantilevered slab canopies, portal frames, folded plate construction and period of striking centering shall be as determined by the Architect.

If directed, form shall be given an upward camber to ensure that the beams do not have any sag. Surface that becomes exposed on removal of forms shall be carefully examined and any

fins, burrs, projections etc., that are detected shall be removed. Any honeycombing of minor nature shall be finished neatly with cement mortar 1:2.

Any work showing signs of damage through premature or careless removal of centering or shuttering, shall be reconstructed by the contractor at his own cost.

Strength :

Concrete mixed in the proportion desired shall have compressive strength after placing, not less than the following :

No	Concrete Mix.	Minimum compressive strength @ 7 days	Minimum compressive strength @ 28 days
1	1:1:2	160 Kg. / Sq.m. (2250 Lbs. / Sq. inch).	250 Kg. / Sq.m. (3500 Lbs. / Sq. inch).
2	1:11/2:3	132 Kg. / Sq.m. (1875 Lbs. / Sq. inch).	200 Kg. / Sq.m. (2850 Lbs. / Sq. inch).
3	1:2:4	106 Kg. / Sq.m. (1500 Lbs. / Sq. inch).	150 Kg. / Sq.m. (2250 Lbs. / Sq. inch).

Tests : Tests on concrete shall be carried out in accordance with IS-456/- and any other is applicable. The frequency of work test shall be at such intervals as ordered by the Architect and subject to that every 150 cu.m. of concrete placed or part thereof and for a day's concrete exceeding 30 cu.m. a batch of 6 cubes shall be made for every sample and 3 of them tested after 7 days and the remaining 3 cubes shall be tested after 28 days. The criteria for acceptance of a concrete as confirming to a specified proportion / grade of concrete shall be in accordance with IS:456 and the Contractor shall entirely re-do the rejected work at his own cost. Strength of 28 days shall alone be considered for acceptance.

The Contractor shall arrange to carry out the tests in accordance with the relevant Indian Standards Specifications in an approved laboratory and the test reports in original be submitted to Architect. The entire cost of testing shall be borne by the Contractor.

Steel Reinforcement :

Reinforcement shall be accurately fabricated, placed and adequately maintained in position as shown on the drawings or as directed by the Architect. All finished bars shall be free from cracks, surface flaws, laminations, jagged and imperfect edges. Cement mortar blocks shall be used to give requisite cover as shown be firmly tied with binding wire of 16 to 18 gauge. Reinforcement shall be bent in accordance with the procedure stipulated in IS:2502-1963 and will not be straightened in a manner which will injure the material.

All reinforcement shall immediately before placing in concrete be thoroughly cleaned of loose mill scale, loose rust, oil and grease or other deleterious matter that would destroy or reduce bond.

Reinforcement in reinforced concrete members shall not be connected by welding or coupling except in accordance with relevant ISS and with the previous approval of the

Architect. Overlaps and joints shall be staggered and located at points, along the spans where neither shear nor bending moment is maximum.

Cover :

Reinforcement shall have cover as shown on the R.C.C. drawings and where not specified the thickness of cover shall be as follows. Cement mortar blocks in C.M. 1:1 shall be used for making cover blocks.

a) At each end of reinforcing bar not less than 25 mm. not less than twice the diameter of such rod or bar.
b) For a longitudinal reinforcing bar in a column not less than the diameter of such rod or bar. In the case of columns of minimum of 20 mm. or under whose reinforcing bars do not exceed 13 mm. the cover of 25 mm. may be used.
c) For longitudinal reinforcing bar in a column not less than 25 mm. not less than diameter of such rod or bar.
d) For tensile, compressive, shear or other reinforcement in a slab not less than 13 mm. nor less than diameter of such reinforcement, and
e) For ant other reinforcement not less than 13 mm. not less than the diameter of such reinforcement.

A) **WEIGH-BATCHING BASIS i.e. (DESIGN MIX CONCRETE)** :

Workmanship of Design Mix Concrete shall be carried out in accordance with I.S. : 456 – 2000 and any other I.S. Code is applicable.

TABLE – A

No	Nominal Mix.	Quantity of aggregates required per 50 kgs of cement.		Quantity of water required per 50 kgs of cement. (For dry aggregate)	
		Fine Cu.m.	Coarse Cu.m.	Vibrated	Unvibrated
1	1:1:2	0.035 (1.2 C.ft.)	0.070 (2.4 C.ft.)	22 lit. (4.8 Gal.)	27 lit. (6 Gal.)
2	1:11/2.3	0.052 (1.8 C.ft.)	0.106 (3.6 C.ft.)	23 lit. (5 Gal.)	30 lit. (6 Gal.)
3	1:2:4	0.070 (2.4 C.ft.)	0.138 (4.8 C.ft.)	27 lit. (6 Gal.)	32 lit. (7 Gal.)
4	1:3:6	0.105 (3.6 C.ft.)	0.210 (7.2 C.ft.)	28 lit. (6.25 Gal.)	34 lit. (7.5 Gal.)
5	1:4:8	0.150 (4.8 C.ft.)	0.280 (9.6 C.ft.)	-- --	45 lit. (10 Gal.)

TABLE – B

No	Aggregate	Approx. quantity of surface water in Lit / Cu.m.
1	Very wet sand.	120
2	Moderately wet sand.	80
3	Moist sand.	40
4	Moist gravel or crushed sock. Coaser the aggregate, lesser the water it will carry.	20 to 40

TABLE – C

No.	Type of Work	SLUMPS	
		When vibrated	When not vibrated
1.	Mass concrete in R.C.C. foundation footings.	2.5 cms. (1”)	5 cms. (2”)
2.	Beams, slabs, columns with simple reinforcement.	2.5 cms. to 5 cms. (1” to 2”)	5 cms. to 10 cms. (2” to 4”)
3.	Thin sections with congested reinforcement.	5 cms. to 10 cms. (2” to 4”)	10 cms. to 15 cms. (4” to 6”)

Note : Should conditions governing slump and workability changed pointing to advisability of an increased slump, this shall only be done by decreasing the amount of aggregate and not by increasing the amount of water.

B) **WEIGH-BATCHING BASIS i.e (DESIGN MIX CONCRETE)** :-

Workmanship for design mix concrete shall be carried out in accordance with I.S. 456-2000 and any other I.S. code is applicable.

BRICK AND STONE MASONRY

General :

All brick work should be carried out as shown on the drawings with setbacks, projections, cuttings, toothings, etc. Wherever the proportion of cement mortar has not been specifically mentioned, cement mortar in the proportion of 1:6 shall be used. Flat bricks arches shall be provided wherever required without any extra cost. Brick work shall be kept wet while in progress, till mortar has properly set. On holidays or when work is topped, top of all unfinished masonry shall be kept wet. Should the mortar become dry, white or powdery, for want of curing work shall be pulled down and rebuilt at the Contractor’s expenses.

Brick Work 1stClass :

Bricks shall be thoroughly cleaned, well wetted and soaked for atleast twelve hours in fresh water before being used on the work. Bricks shall be of locally, available best quality.

English bond shall be used throughout in walling. A good bond shall be maintained throughout the work, both laterally and transversely. In walling, the courses shall be kept perfectly horizontal and in plumb with the frogs facing upwards. Vertical joints shall not exceed 10 mm. thickness and shall be full of mortar. No broken bricks shall be used except as closers. After day's work all joints shall be raked to 12 mm. depth to provide for proper key to plastering.

Mortar used shall be as specified in respective items and every third course of brick work shall be flushed with mortar grout.

Whole of the masonry work shall be brought up at one uniform level throughout the structure; but where breaks are unavoidable, joints shall be made in good long steps. All junctions of walls and cross walls shall be carefully bounded into the main walls. The rate of laying masonry may be upto a height of 60 cm. per day if cement mortar is used and 45 cm. per day if lime mortar is used. Greater heights may be built only if permitted by the Architect.

During rains, the work shall be carefully covered to prevent mortar from being washed away. Should any mortar or cement be washed away, the works shall be removed and rebuilt at the Contractor's expenses.

Bricks Work 2ndClass :

Shall be similar to 1st class brick work except that 2nd class bricks shall be used and joints shall be 10 mm. t0 12 mm. thick.

Half Brick Masonry :

Shall be set in cement mortar as specified. Hoop iron bands of 2.5 cm. x 0.16 (1" x 1/16") shall be embedded in every fourth course with thick mortar band or 2 Nos. 6 mm. (1/4") dia. bars shall be used in every sixth course otherwise as specified under item.

RUBBLE MASONRY

General :

Stones shall be of the kind specified in the item and shall be from an approved quarry. Stones shall be well wetted before laying in position. The mortar shall be as specified in the item. Face stone shall not be less than in breadth than in height, it shall also tail into the work more than its height. Jambs of doors, windows and openings shall be formed with quoins. In case of battered walls, the courses on battered surface shall be at right angle to the batter.

Through stones or headers shall be laid in every course at a distance not exceeding 2 meters part and shall be staggered. They shall be in one piece for walls upto 1.5 meter width and shall be lap jointed in case of wall having thickness more than half meter. The face are a of each header shall not be less than 0.50 sqm. 1:2:4 cement concrete may also be allowed where good

length headers are not available. Headers shall be marked with oil paint for ready identification.

Height of quoins shall be same as that of the course. Length of quoins shall be 0.50 m. and shall be laid header and stretcher alternatively. Faces of quoins shall be fair dressed. No quoins stones shall be less than 0.30 cum. In content. Joints of masonry shall be raked out and unless otherwise stated, shall be raised cement pointed by using cement mortar 1:1 to all exposed surfaces. All masonry work shall be well watered for a period of seven days.

a) **Coursed Rubble Masonry – First Sort** :

Height of course shall not be less than 15 cm. and all courses shall be of uniform height. All stones in the course shall be of same height. In no case height of course shall be more than any of the course below it. Bed and sides shall be hammer or chisel dressed back from the face 75 mm. and 35 mm. respectively.

Faces of stones shall be hammer dressed and bushing shall not be more than 35 mm. Thickness of joints shall not be more than 10 mm. Stones shall break joints at least half the height of the course. Work on interior face shall be precisely the same, as on exterior face.

Quoins shall be at least 0.5 m. long laid square on their beds and shall be fair dressed to a depth of at least 10 cm.

b) **Uncoursed Rubble Masonry** :

Stones shall be hammer dressed. Nearly fifty per cent of stones shall not be less than 0.30 cum. in content each, and twenty five per cent of stone shall tail back in masonry by 40 cm. or more. Stones shall be so arranged as to break joints as much as possible.

Long vertical joints shall be carefully avoided. Thickness of joints shall in no case exceed 12 mm.

Pillar offsets shall be properly dressed with hammer or chisel to form proper angle. Stones used for the backing shall be of fairly large size.

c) **Random Rubble Masonry – First Sort** :

Stones shall be roughly chisel dressed. They shall be solidly bedded in mortar. Height of stone shall not be more than width of face or length of tail. Stones shall be of equal size and so arranged as to break joints as much as possible, avoiding long lines of horizontal or vertical joints. Quoins shall be same as described in Coursed Rubble Masonry – 1st Sort. All stones shall be carefully fitted. Thickness of face joint shall be not exceed 25 mm. Edges of stones shall be chisel dressed for fitting in position properly.

WOOD WORK

Timber used shall conform to specifications described under Materials, Doors, Windows, Ventilators, walls, Paneling, False Ceiling, etc., shall be in accordance with Architect's

drawing in every detail and all joiner's work shall be accurately set out, framed and finished in a proper workman-like manner, frames of doors, windows and ventilators etc. and shutter styles and rails shall be best solid teak of quality specified in the schedule of quantities. The scantlings shall be accurately planed smooth, rebates, rounding and mouldings shall be made as shown on the drawings, patching or plugging of any kind shall not be allowed. Joints shall be simple, neat and strong. Framed joints shall be coated with suitable adhesive like glue or synthetic resin before the frames are put together. All mortice and tenon joints shall be fit and fully and accurately without wedging on filling. The joints shall be pinned with hard wood or bamboo pins of 10 mm. to 12 mm. dia. or rust resisting star shaped metal pins 8 mm. after the frames are put together and pressed in position by means of press. The frames are put together and pressed in progress of work by suitable boxing. All portions of timber abutting against or embedded in masonry or concrete shall be treated against termites by giving a coat of any approved wood preservative.

Unless otherwise specified all doors frames shall have six M.S. flat holdfasts and window frames shall have four holdfasts shall be provided to the ventilators, if directed. Size of holdfasts shall be 30 mm. x 40 mm. x 6 mm. M.S. flat bent to shape worth fish tail end and it shall be fixed to frame with sufficient number of screws as directed. When door / window frames are to be fixed to R.C.C. column or R.C.C. wall, holdfasts shall be substituted by suitable arrangements such as coach crews, rawl bolts etc., to secure frames to R.C.C. column or R.C.C. wall as directed by the Architect.

Frames and shutter shall not be painted or erected before being approved by Architect.

Paneled Shutter :

Panels shall be of pattern and size as shown on the drawings or as directed by Architect. Solid teak wood panels shall be in one piece wherever possible. Where two or more pieces are permitted, they shall be of equal width. Panels shall be framed into grooves made in styles and rails to the full depth of groove and faces shall be closely fitted to sides of groove.

Where panels specified are block board, it shall be solid core with teak internal lipping and of approved make.

Partly paneled and partly glazed shutter shall be similar to paneled shutters except that such parts as are directed shall be glazed with plain or ground glass as specified. Styles and rails shall be rebated 12 mm. to receive glass. Sash bars shall be moulded and rebated and mitered on sides to receive the glass which shall be fixed with putty and beads.

Hardware Fittings :

Unless otherwise specified all hardware fittings and fixtures shall be supplied by the employer free of charge. However, the cost of fixing fittings shall be included in the rate quoted. The fixing shall be done in the best workman-like manner in accordance with the manufactures specifications. The Contractor shall be held responsible for working of all moving parts dependent on proper fixing. He will also be responsible for any breakage due to negligence during fixing or lack of protection before the building is handed over. The Contractor shall also

take delivery of all hardware fittings etc., as and when supplied and arrange for safe storage etc.
Hardware required for fixing false ceiling, wall paneling etc., shall be arranged by the Contractor at his cost. Apart from the hardware fittings required for the joinery items, the Contractor shall have to fix all other items of hardware fittings to be supplied by the employer viz. coat / picture hooks, numercials, letters to denote buildings, hanging rods etc., as directed by the Architects.

Painting and polishing of wood work shall be as per specifications under respective heads.

Flush Doors :

All flush doors shall be solid core unless otherwise specified. It shall conform to the relevant specifications of I.S. 2202 and shall be obtained from approved manufactures. The finished thickness of the shutter shall be mentioned in the items. Face veneers shall be of the pattern and colour approved by the Architect and an approved sample shall be deposited with the Architect for reference.

The solid core shall be wood laminae prepared from battens of well seasoned and treated good quality wood having straight grains. The battens shall be of uniform size of about 2.5 cm. width. Theses shall be properly glued and machine pressed together, with grains of each piece reversed from that of adjoining one. The longitudinal joints of the battens shall be staggered and no piece shall be less than 50 cm. in length. Alternatively, the core shall be of solid teak particle board. Edges of the core shall be lipped internally with 1st Class teak wood battens of 4 cm. (1.5”) minimum depth, glued and machine pressed along with the core.

The core surface shall then have two or three veneers firmly glued on each face. The first veneer (called cross band) shall be laid with its grains at right angles to those of the core and the second and the third veneers with their grains parallel to those of the core. The under veneers shall be of good quality, durable and well seasoned wood. The face veneers shall be of minimum 1 mm. thickness and of well matched and seasoned 1st class teak, laid along with grains of the core battens. The combined thickness of all the veneers on each face shall not be less than 4 mm. Thermosetting synthetic resin conforming to I.S. 303 or moisture-proof plywood grade MPF.I. shall be used in manufacture.
In addition to internal lipping all doors shall have external lipping all round.

STEEL DOORS, WINDOWS, VENTILATORS ROLLING SHUTTER, M.S. GRILLES ETC.

Steel used in the manufacture of rolled steel sections shall not have more than 0.060 per cent of sulphul and 0.065 per cent of phosphorus. The carbon content shall not exceed 0.30 per cent and shall be of weldable quality. In all other respects, the rolled steel sections shall conform to I.S. 226-1955 and I.S. 1977-1962.

Frames shall be square and flat. Both the fixed and openable frames shall be constructed of sections which have been cut to length, mitred and electrically welded at corners. Sub-dividing bar units shall be tenoned and rivetted into the frames. All frames shall have the corners

welded to a true right angle and welds shall be neatly cleaned off. Couplings, moulding and weather bar shall be provided as directed by the Architects.

Outer frames shall be provided with fixing holes centrally in the web of the sections and fixing screws and lugs shall be used for fixing the frame to masonry. Mastic cement shall be used for making the joints watertight.

Hinges shall be strong projecting type. If directed friction type hinges shall be used in which case windows shall not be fitted with peg stays.

Projecting type hinged shutter shall be fitted with bronze or brass peg stays, 30 cm. long with peg and brackets welded / reivetted to the frame or as sated under item.

All windows shall be provided with handles of brass or bronze or otherwise as stated under them.

Top hung ventilators shall be fixed with plain hinges rivetted / welded to the fixed frame. A brass or bronze peg stay 30 cm. long as in windows shall be provided or as stated under item.

Center hung ventilators shall be hung on two pairs of brass or leaded tin bronze cup pivots rivetted to the inner and outer frames of the ventilators to permit the ventilators to swing through an angle of approximately 85. The opening position of the ventilator shall be so balanced to keep it open at any desired angle under normal weather conditions. A bronze spring catch shall be fitted in the center of the top bar of the ventilator for the operation of the ventilator. This spring catch shall be secured to the frame with brass screws and shall close into a mild steel malleable iron catch plate rivetted or welded to outside of the outer ventilator frame bar. A brass cord pulley wheel in mild steel or malleable iron brackets shall be provided along with card eye.

The windows and ventilators shall be painted. All the steel surfaces shall be thoroughly cleaned free of rust, scale or dirt and millscale by picking or phosphating and before erection painted with one coat of approved primer and after erection painted with two finishing coats of synthetic enamel paint of approved shade and quality.

Glazing of specified thickness shall be provided on the outside of frames and unless otherwise specified, metal beading of approved shape, and section shall be used for fixing glasses. Special metal sash putty of approved make shall be used, if directed.

Rolling Shutters :

Shall be of approved manufacture suitable for fixing in the position ordered i.e. outside, inside, on or below lintel or between jambs. Shutters upto 12 sqm.(130 Sq.ft.)in area shall be manually operated or Push Up type while bigger sizes shall be of reduction gear type mechanically operated chain or handles.

These shall be consist of 8 gauge or as specified with 75 mm. (3”) M.S. laths of best quality mild steel strips machine rolled and straightened with an effective bridge depth of 16 mm.

(5/8”) and shall have convex corrugation. These shall be interlocked together throughout their entire length with end locks. These shall be mounted on specially designed pipe shaft.

The spring shall be of approved make coiled type. These shall be manufacture from tested high tensile spring steel wire or strip of adequate strength to balance the shutters in positions. The spring pipe, shaft etc., shall be supported on strong M.S. or malleable cast iron brackets.

Both the side guides and bottom rail shall be jointless and of single piece of pressed steel.

Top cover of shaft, spring etc., shall be of the same material as that of lath.

For rolling shutter with wicket-gate, night latch shall be provided free of cost.

The shutter and cover etc., shall be painted with one coat of anti-corrosive paint and two coats of synthetic enamel paint of approved quality and shade.

Collapsible Steel Gate :

It shall consist of vertical double channels at 10 cm. centers. The sizes of channels T-Section for top and bottom shall be as approved by the Architects. The gate shall be provided with necessary bolts, nuts, locking arrangements, stoppers and brass handles on both sides. The gate shall be painted with one coat of anti-corrosive paint before erection and two coats of synthetic enamel paint of approved quality and shade.

Wrought Iron Grilles :

Grilles hall be manufactured as per drawings and the welded joints shall be smooth. The grilles shall be painted with one coat of anti-corrosive paint before fixing and two coats of synthetic enamel paint of approved quality and shade.

Aluminium Doors, Windows, Ventilators & Partitions etc. :

These shall be obtained from approved and established manufactures and shall be of Aluminium alloy conforming to I.S. 733 and sections shall generally conform to I.S. 1948. Theses shall be fabricated as per the details drawings,

Frames for windows, ventilators etc., shall be square and flat. Both fixed and openable frames shall be constructed of section which have been cut to length, mitred and welded at corners. Sub-dividing bars shall be tenoned and rivetted into the frames. All frames shall have corners welded to a true right angle. For side hung shutters, hinges shall normally be of projecting type made of Aluminium alloy and rivetted / welded to frames. Handles, peg stays etc., or approved quality Aluminium or its alloy conforming to IS Specifications.

All types of shutters shall be fabricated, supplied and fixed as specified in the IS:1948. The rate shall include supplying and fixing all fittings and fixtures required for proper and safe operation.

The doors shall be fabricated by using standard aluminium alloy extruded sections as specified in IS:1948. The rate shall include supplying and fixing all fittings and fixtures including approved locking arrangement as directed.

All aluminium fabricated work shall be anodised to the British Standard 1616:1961 to give an anodised film of 25 micorn.

The Contractor shall take to stack the fabricated frames etc., on site under cover. They shall be handled with care, stacked on edge on level bearers and supported evenly. Before erecting, the frames coming in contact with concrete, masonry, plaster of dissimilar metals shall be coated with a coat of Zinc Chromate conforming to IS:104-1950. The Contractor shall cover all anodised finish work with a thick layer of clear transparent lacquer based on methacrylates or cellulose butyrate to protect the surface from wet cement during installation. This coating shall removed on completion. Before handing over, the aluminium work shall be washed with mild solution of non-alkali soap and water.

Glazing :

Glazing shall be approved specially quality glass of specified thickness and unless otherwise directed it shall be provided the exterior with metal beading.

FLOORING, SKIRTING, DADO AND STONE VENEERING

All flooring, skirting, dado and stone veneering etc., shall be executed strictly as per relevant IS Specification and in workman-like manner.

Indian Patent Stone :

Selection of materials, method of mixing, placing and compacting shall generally conform to the specifications under plain and reinforced cement concrete described earlier. A stiff mix consistent with workability shall be used.

Preparation of Surface :

Before the operation for laying topping is started the surface of base concrete shall be thoroughly cleaned of all dirt, loose particles coked mortar droppings and laitance if any, by scrubbing with coir or steel wire brush. Where the concrete has hardened so much that roughening of surface by wire brush is nor possible, the surface shall roughened by chipping or hacking at close intervals. The surface shall then be cleaned with water and kept wet for 12 hours and surplus water shall be removed by mopping before the topping is laid.

Laying :

The screed strips shall be fixed over the base concrete dividing it into suitable panels. Before placing the concrete for topping, neat cement slurry shall be thoroughly brushed into the prepared surface of the base concrete just ahead of the finish. Concrete of specified proportion and thickness shall be laid in alternate panels to required level and slope and thoroughly tamped.

Finishing the Surface :

After the concrete has been fully compacted it shall be finished by troweling or floating with neat cement rendering. Finishing operations shall start shortly after the compaction of concrete and the surface shall be troweled three times at intervals so as to produce a uniform and hard surface. The satisfactory resistance of floor to wear depends largely upon the care with trowelling is carried out. The time intervals allowed between successive trowellings is very important. Immediately after placing cement rendering, only just sufficient troweling shall be done to give a level surface. Excessive troweling in the earlier stages shall be avoided as this tends to bring a layer rich in cement to the surface. Sometime, after the first troweling, the duration depending upon the temperature, atmospheric conditions and the rate of the set of cement used, the surface shall be retrowelled to close any pores in the surface and to bring to surface and to scrape off any
excess water in concrete or laitance. No dry cement shall be used directly on the surface to absorb moistures or to stiffen the mix. The final troweling shall be done well before
the concrete has become too hard but at such time that considerable pressure is required to make any impression on the surface.

If directed by the Architect, approved mineral pigment shall be added to the rendering to give desired colour and shade to the flooring at no extra cost.

When instead of 1:2:3 or 1:2.5:3.5 mix, 1:2:4 is specified the topping shall be rendered with 1:1 cement mortar with a suitable mineral pigment, if directed, instead of cement only. If specified in the Schedule of Quantities, the flooring shall be machine polished as per the Architect's instructions.

Wherever the patent stone flooring is used as finishing on roof the joints shall be filled with an approved bitumastic filler in workman like manner.

Ironite Topping :

Instead of finishing the top with rendering coat of 1:1 cement mortar, the top shall be finished with 12 mm. thick ironite topping. Unless otherwise specified, one part of ironite and four parts of ordinary cement by weight shall be mixed dry thoroughly. This dry mixture shall be mixed with stone grit 6 mm. (1/4") and down size or as otherwise directed in the ratio of 1:2 by volume and well turned over. Just enough water shall be added to this dry mix and mixed thoroughly well and laid to uniform thickness of 12 mm. and compacted. After initial set has started the surface shall be finished as directed.

Plain and Coloured Cement Tiles, Marble Mosaic and Terrazzo Tiles Flooring :

The tiles shall conform to IS : 1237 having the colour approved the Architect and the rate shall include provision of border tiles and tiles of different colours in pattern if directed. The mosaic topping of lighter shade tiles shall be made of White Cement with an approved shade pigment and neutral shade shall be of Grey cement with an approved shade pigment. The type of tiles shall be as specified in respective items.

The sub-grade shall be thoroughly wetted after cleaning of all dirt, laitance, and loose material. A bed of lime mortar consisting of one part of lime and two parts of sand shall be laid and properly leveled to an average thickness of 25 mm. and the surface shall be kept slightly rough to form a satisfactory key for tiles. Neat cement paste of honeylike consistency shall be spread over mortar bed, over such area at a time as would accommodate about 20 tiles. Tiles shall be soaked in water for 15 minutes and allowed to dry for the same duration. Tiles shall then be fixed with a thin coat of cement paste on back of each tile and then each tile being gently tapped with a wooden mallet till it is properly bedded and in level with adjoining tiles. Joints shall be fine and as imperceptible as possible.

After tiles have been laid in a room or a day's fixing work is completed, surplus cement grout that may have come put of the joints may be wiped off gently and joints cleaned. A

thin slurry of coloured cement matching to the colour of tiles shall be spread over it and rubbed so as to seal even a thinnest joint between the tiles and make it impervious and the flooring cured for 7 days. The tiles shall be polished and finished according to IS:1443.

Dado, Skirting and Risers:

Tiles shall conform to IS:1237 and shall be of approved design. The tiles shall be fixed near cement grout on a blacking coat consisting of 1:4 cement sand plaster of 15 mm. thick. The top and bottom junctions of tiles shall be rounded off neatly as directed. The joints shall be filled with matching shade coloured cement slurry. The surface shall be kept wet for 7 days and then polished with carborundum stone to obtain smooth surface and fine polish.

Shahabad / Tandur / Kotah / Cuddappa Stone Flooring :

The flooring shall be either with rough stone or machine cut and machine polished as specified in respective items and shall be of specified thickness and of approved quality and size, free from cracks and flakes and shall be uniform in colour with straight edges. The sides of machine

cut and machine polished stone shall have perfect right angles and surface smooth. The stone slabs shall be laid and finished as described under plain cement or colour cement tiles on a bedding of 1:2 lime mortar 25 mm. (Average) thickness. The finished stone surface thus laid shall then be polished to the required degree as approved by the Architect.

In Dado, Skirting, Risers etc. :

Stone slabs shall be laid on backing plaster of cement mortar 1:4 of 15 mm. to 20 mm. thick and finished as described under plain and coloured cement tile dado.

Marble mosaic / Terrazzo in situ work in flooring, dado, skirting etc. :

The terrazzo / mosaic finish shall be laid on an under layer of thickness as specified in the respective items. The topping shall consist of a layer of marble chips of selected sizes, colour and design approved by Architect, mixed with cement with desire shade of pigment.

For lighter shade mosaic .terrazzo white cement shall be used and for neutral shade, grey cement shall be used. The proportion of terrazzo mix shall be three parts of cement one part of marble powder by weight. For every part of cement marble powder mix, the proportion of marble aggregate by volume shall be 1.5 parts unless otherwise specified.

The topping shall be mixed and laid in panels as described in IS:2114 and as per decorative designs prepared by Architects. The dividing strips of panels shall be Aluminium or as specified in the Schedule of Quantities. It shall be polished as specified in IS: 2114.

Broken Mosaic Flooring :

Broken mosaic finish shall be laid on an underlayer of thickness as specified in the item.

Pieces of masaic tiles shall be obtained from broken marble mosaic tiles of approved shade conforming to IS:1257. The sizes of pieces shall be suitable to obtain the desired pattern of flooring as shown on the drawings or as approved by Architect.

Broken pieces shall be thoroughly wetted before fixing them. Ordinary or coloured cement grout shall be spread on the bedding. Mosaic tile pieces shall be fixed piece by piece to the desired pattern. The flooring shall be laid to correct level and slopes and compacted by straight screed tamper. The grout shall cream upto the surface. The junctions of the flooring and the wall shall be rounded and the flooring shall be extended along the wall to about 15 cm. (6”). After the day’s work, the surplus cement grout that may have come out of the joints shall be cleaned off. The flooring shall be cured for seven days and then polished with a machine as stipulated in IS:1443.

Broken ChinaMosaic :

Broken China Mosaic flooring shall be exactly as per broken mosaic tile flooring except that the broken pieces shall be of China of approved colour and manufacturer and the floor shall not be polished.

Marble Flooring:

Marble slabs shall be of the best Indian marble of White or other approved colour as specified in the item. They shall be hard, dense, uniform and homogeneous in texture. They shall have even crystalline grain and free from defects and cracks. The surface shall be machine polished to an even and perfectly plane surface and edges machine cut true to square. The rear face shall be rough enough to provide a key for the mortar.

No slab thinner than the specified thickness at its thinnest part. The sizes of the slabs shall be as specified in the respective items.

The slabs shall be paid as described under mosaic tile flooring in every respect.

White Glazed / Ceramic Tiles / Vitrified Tiles in Flooring and Dado :

White Glazed Tiles from an approved manufacturer conforming to IS:777 shall be used. They shall be of specified size and thickness. All specials viz. coves, internal and external angles, corners, beads etc., shall be used wherever directed. Underlayer of specified thickness and mortar of stipulated proportion shall be laid as described in marble mosaic flooring. Tiles shall be washed clean and set in cement grout and each tile being gently tapped with a wooden mallet till it is properly bedded and in level with the adjoining
tiles. The joints shall be kept as thin as possible and I straight lines or to suit the required pattern. After the tiles have been laid, surplus cement grout shall be cleaned off.

The joints shall be cleaned off the grey cement grout with a wire brush or trowel to a depth of 5 mm. (3/16”) and all dust and loose mortar removed. Joints shall then be flush pointed with white cement. The floor shall then be kept wet for seven days. After curing, the surface shall be washed with mild hydrochloric acid and clean water. The finished floor shall not sound not sound hollow when tapped with a wooden mallet.

PLASTERING

Scaffolding :

Scaffolding for carrying out plastering work shall be double steel scaffolding having two sets of vertical supports so that the scaffolding is independent of the walls.

Preparation of surface :

All putlog holes in brick work and junction between concrete and brick work shall be properly filled in advance. Joints in brick work shall be racked about 10 mm. if not raked out while constructing brick masonry work and concrete surface hacked to provide the grip to the plaster, if not hacked earlier projecting burns of mortar formed due to gaps at joints in shuttering shall be removed.

The surface shall be scrubbed clean with wire brush / coir brush to removed dirt, dust etc., and the surface thoroughly washed with clean water to remove efflorescence, grease and oil etc., and shall be kept wet for a minimum of six hours before application of plaster.

Neeru Plaster :

Cement mortar of specified proportion and thickness shall be prepared in small batches and applied to the wall surface / ceiling. The ensure proper thickness, gauged patches shall be made at 1.5 to 2 m. apart and the surface plastered true to line, level and plumb taking special care to finish jambs of windows, doors, wall returns, corners, junctions etc. A thin layer of neeru shall then be applied and rubbed into surface and finished by means of trowel until the surface is even and smooth. The surface shall be kept moist for seven days and then given a coat of white wash.

Sand-faced Plaster :

The surface shall be prepared as above.

The coat of cement mortar in proportion of 1:4 or as specified, shall be applied uniformly all over the surface to a thickness of 12 mm. and finished true to level and line and keys shall formed on the surface. The surface shall be kept moist till the finishing coat is applied.

The finishing coat shall be applied a day or two after. The proportion of mortar for finishing coat shall be one part of cement and three parts of selected, well graded and washed sand, or as specified under item and it shall be applied in a uniform thickness of 6 mm. (1/4").

The surface shall be tapped to uniform grained texture by using sponge pads as directed. Curing shall start after 24 hours and the surface kept wet for seven days.

Rough Cast Plaster:

Except for the finishing coat the surface shall be prepared and base coat of plaster applied as under sand-faced plaster.
Finishing coat mortar shall be in proportion of one part of cement and one part of specially selected and graded sand and one part of gravel of 3 to 6 mm. size. It shall be flung upon the first coat with large trowel to form an even and decorative coat. The work shall generally conform to clause 16.5 of IS:1661-1960. The thickness of the coat shall be about 12 mm. (1/2"). It shall be cured for seven days.

Rough coat plaster with colour finish :

This finish shall be similar to Rough cast plaster above except a high grade mineral pigment of approved shade shall be mixed with white cement instead of ordinary grey cement while preparing the mortar.

Water-proofing Treatment :

Unless otherwise specified, the Contractor shall carry out waterproofing treatment of basements, terrace and water retaining structures through reputed firms having specialisation in the line and approved by the Architects. The Contractor shall also furnish full details of such treatment to the Architects and provide all information / proof etc., regarding the effectiveness

of the treatment when called upon to do so. All such treatment shall have to be guaranteed in the form approved by the Employer for a minimum period of ten years. Any defects / leakages noticed during the guarantee period shall have to be rectified free of cost by the Contractor including reinstating the surface to its original condition and finish.
Water-proofing of sunk portions of floor slabs for baths, W.C. and kitchen mories etc., in residential buildings, unless otherwise specified, shall be done as specified in the schedule and shall generally comprise of :

a) A coat of hot bitumen, min. 6 mm. thick screeded with stone grit.
b) Min. 20 mm. thick cement plaster in cement mortar 1:3 with approved water-proofing cement compound as per manufactures specifications. The plaster shall be cured by pounding for seven days.

The rate for the above treatment shall include drying and cleaning surfaces free of dust etc., and wiping with kerosene before application of bitumen. The vertical faces and returns shall also be treated similarly. The actual area treated including vertical faces and
returns shall be measured and paid for. The work should be done in such a way that the finished flooring in bath has a minimum slope of 20 to 25 mm.

PAINTING

General:

Wherever scaffolding is necessary, it shall be double scaffolding.

The surface shall be thoroughly brushed free from mortar droppings and foreign matter. All steel work shall be cleaned of loose rust, mill scales etc. so as to expose the original surface. All broken edges, cracks, loose plaster and wavy surface shall be brought up either by patch plaster work or by plaster of paris.
All materials viz., dry distemper, oil bound distemper, oil paint, flat oil paint, synthetic enamel paint, plastic emulsion paint, cement primer, red lead and other primers and metallic paints shall conform to respective I.S. specifications and shall be obtained from approved manufactures. All paints shall be brought on site in sealed thins in ready mixed form and shall be applied direct with the addition of thinner, if recommended by the manufacturers.

White Washing:

White was shall be prepared from lime slaked on spot, mixed and stirred with sufficient water to make a thin cream. This shall be allowed to stand for 24 hours and shall be screened through clean cloth. Four kg. gum dissolved in hot water shall be added to each cubic meter of the cream (115 gm. per cft.).

Blue shall be added to give required whiteness. The approximate quantity of water to be added in making cream shall be five liters per kg. of lime.

White wash shall be applied in specified coats by using flat brushes or spray pumps. Each coat shall be allowed to dry before next coat is applied. If additional coats than what have been specified, are necessary to obtain uniform and smooth finish, it shall be given at no extra cost.

The finished dry surface shall not show any signs of cracking and peeling nor shall it come off readily on the hand when rubbed.

If directed by the Architects one coat of chalk and glue shall be applied before application of white / colour wash at no extra cost.

ColourWash :

Colour wash shall be prepared by adding mineral colours not affected by lime to white wash. No colour wash shall be done until a sample of the colour wash to the required tint or shade has been got approved form the Architects.
Colour wash shall be applied as specified under white wash.

Dry Distemper :

Shade shall be got approved from the Architects before application of distemper.

The surface shall be prepared as specified earlier. A primer coat using approved primer or sizing shall be applied. Distemper prepared as per manufacturer's directions shall be applied and each coat shall be allowed to dry before subsequent coat is applied. The finished surface shall be free form chalking when rubbed, even uniform and shall show not brush marks. If additional coats are necessary, they shall be given at no extra cost.

Oil Bound Distemper:

The surface shall be prepared as specified above. A primer coat of either cement primer or any approved distemper primer shall be applied.

After the primer coat has dried, the surface shall be lightly sand papered and dusted to make to smooth to receive distemper.

Distemper shall be prepared as per the directions of the manufacturer and conforming to shade approved. It shall be applied in specified coats, taking care to allow for drying of each coat before subsequent coats are applied.

Water-proof Cement Paint / Sand-tex matt Paint:

The surface shall be prepared as specified above and thoroughly wetted with clean water before water-proof cement paint is applied.

The paint shall be prepared strictly as per manufacturers specifications and in such quantities as can be used up in an hour of its mixing, as otherwise the mixture will set and thicken, affecting flow and finish.

The paint thus prepared shall be applied on clean and wetted surface with brush or spraying machine. The solution shall be kept stirred during the period of application. It shall be applied on the surface which is on the shady side of the building so that the direct heat of the sun on the

surface is avoided. The completed surface shall be watered after the days work. Number of coats shall be s specified in the item.

Painting – Oil / Enamel / Plastic Emulsion etc. :

Ready mixed oil paint, flat oil paint, plastic emulsion paint, ready mixed synthetic enamel paint, etc., shall be brought in original containers and in sealed tins. If for any reason thinner is necessary, the brand and quantity of thinner recommended by the manufacturer or as instructed by the Architect shall be used.The surface shall be prepared as specified above and a coat of approved primer shall be applied. After 24 hours drying approved or specified quality paint shall be applied evenly and smoothly. A filler putty coating may be given to give a smooth finish. Each coat shall be allowed to dry out thoroughly and then lightly rubbed down with sand paper and cleaned of dust before the next cost is applied. Number of coats shall be as specified in the item and if the finish of the surface is not uniform, additional coats as required shall be applied to get good and uniform finish at no extra cost. After completion no hair marks from the brush or clogging of paint puddles in the corners of panels, angles or mouldings etc., shall be left on the work. The glass panes, floor etc. shall be cleaned of stains.

When the final coat is applied, if directed, the surface shall be rolled with a roller of if directed, it shall be stippled with a stippling brush.

POLISHING AND VARNISHING

French Polishing :

French spirit polish shall be of an approved make conforming to IS:348. If it has to be prepared on site, the polish shall be made by dissolving 0.7 kg. of best shellac in 4.5 liters of methylated spirit without heating. To obtain required shade pigment may be added and mixed.

Surface shall be cleaned. All unevenness shall be rubbed down smooth with sand paper and well dusted. Knots, if visible, shall be covered with a preparation of red lead and glue. Resinous or loose knots and gaps shall be filled with season timber pieces and make level with rest of the surface. Holes and identations on surface shall be filled with putty made of whiting and linseed oil. Surface shall be give a coat of filler made of 2.25 kg. of whiting in 1.5 liter of methylated spirit. When it dries, surface shall again be rubbed down perfectly smooth with sand paper and wiped clean.

Piece of clean fine cotton cloth and cotton wool made into shape of pad shall be used to apply polish. The pad shall be moistened with polish and rubbed hard on the surface applying the polish sparingly but uniformly and completely over the entire surface. It shall allowed to dry and another coat applied in the same way. To give finishing coat, the pad shall be covered with a fresh piece of clean fine cotton cloth, slightly damped with methylated spirit and fubbed lightly and quickly with a circular motion, till the finish surface attains uniform texture and high gloss.

Wax Polishing :

Wax polish shall either be prepared on site or obtained readymade from market. Polish made on the site shall be prepared from a mixture of pure bees wax, linseed oil, turpentine oil and varnish in the ratio of 2:1.5:1:1/2 by weight. The bees wax and the

boiled linseed oil shall be heated over a slow fire. When the wax is completely dissolved the mixture shall be cooled till it is just warm, and turpentine oil and varnish added to it in the required proportions and the entire mixture is well stirred.

Surface shall be prepared as described under French polishing except that the final rubbing shall be done with sand paper which has been slightly moistened with linseed oil.

Mixture or polish shall be applied evenly, with a clean cloth pad in such a way that no blank patches are left, and rubbed continuously for half an hour. When the surface is quite dry a second coat shall be applied in the same manner and rubbed continuously for an hour or until the surface is dry. Final coat shall then be applied and rubbed for two hours or more if necessary, until the surface has assumed a uniform gloss and is quite dry showing no sign of stickness when touched. Gloss of the polish depends on the amount of rubbing, therefore rubbing must be continuous and with uniform pressure and frequent change in direction.

Varnishing :

Surface shall be prepared as described above. After preparation of surface, two coats of clean boiled linseed oil shall be applied at sufficient interval of time. After the linseed oil has dried two coats of varnish obtained from approved manufacturer shall be applied at sufficient interval of time. If the surface fails to produce the required gloss an additional coat shall be applied without any extra cost.

GENERAL DEVELOPMENT AND ROAD WORK

EXCAVATION	:	As in Section C–
FILLING	:	As in Section C
DRY RUBBLE PACKING	:	As in Section C

Dry Rubble Pitching :

The pitching shall consist of large stones, regular in shape, as far as possible, and no stone shall be less than 20 cm. x 20 cm. on face and depth shall be s specified in the item. The edges of the stone shall be dressed even and regular by hammer and shall be laid regularly and evenly braking joint as much as possible and shall be beaten down with heavy hammer so as to be embedded into the earth. The interstics between the stones shall be carefully filled in with

stone chips, closely and firmly packed and well driven with hammer. Loose stone in packing shall on no account be allowed. The entire surface shall be thoroughly rammed, set in place and made compact with a log hammer so that the surface of entire pitching when completed shall be flat and even.

Water Bound Macadam :

6 cm. to 7.5 cm. size hand broken metal shall be spread over the prepared base to a thickness of 12 cm. The metal layer shall then be rolled and compacted by a 8 to 10 ton power roller. The thickness of the compacted layer after completing all the operations described below shall not be less than 7.5 cm.

Rolling shall start from edge of rod and proceed towards the crown in longitudinal strips overlapping on successive strips by at least one half the width of the rear wheel of the roller. the operation shall continue till no visible settlement of the metal or movement under the roller is observed. The gradient and camber shall be checked from time to time by means of level stakes, strings camber board etc. Any depression or hump shall be corrected by removing completely the metal layer there at and rolling the same satisfactorily till refusal.

After the dry rolling is completed either murum or stone dust, grit or sand shall be spread. Moderate sprinkling of water and rolling shall be continued and stone dust shall again be spread if required till all voids are completely filled and movement of metal under the wheel ceases. If there is excess powder the same shall be removed by light brooming. The surface shall be checked for camber etc. The unevenness or undulations shall be rectified as required. The whole surface shall be then watered and extra powder added if required, brushed and rolled to obtain mosaic surface. This surface shall be maintained till an upper layer is laid.

The rate of spreading either hard core or earth shall not be less than 0.3 cum. to 0.35 cum. per 10 sqm. area. The first layer of either murum / stone / grit / sand shall not be spread over a wet or watered metal layer.

FULL – GROUT

Spreading of Metal :

2.5 cm. to 4 cm. size stone metal shall be spread to a loose thickness of 10 cm. and compacted to a thickness of about 7.5 cm. by 8 ton power roller.

Applied Bitumen:

Bitumen 30/40 penetration of approved manufacturer, heated to a temperature of 200 C. (400 F) shall be applied hot by means of a pressure distributor or handspray at the rate of 65 kg. / 10 sqm.

Blinding the Surface :

Immediately following the application of bitumen and while it is still hot, key aggregate 12 mm. size shall be evenly spread at the rate of 0.2 cum. / 10 sqm. After spreading the aggregate the whole area shall be thoroughly rolled with a six to eight ton power roller. It is important that this rolling shall be done when the bitumen is still movement under the roller.

Protection of the Surface:

The surface shall be protected from all traffic.

SEMI – GROUT

Spreading of Metal :

2.5 cm. to 4 cm. size stone metal shall be spread to a loose thickness of 7.5 cm. thick and compacted to a thickness of about 5 cm. by 8 ton power roller.

Applied Bitumen:

Bitumen 30/40 penetration of approved manufacturer, heated to a temperature of 200 C. (400 F) shall be applied hot by means of a pressure distributor or handspray at the rate of 25 kg. / 10 sqm.

Blinding the Surface :

As in Full–Grout.

Seal Coat (For Full Grout and Semi Grout Surface) :

The surface shall be brushed free of any loose blindage, taking care that the brushing is not so severe as to remove the blindage but of the voids into which it is set. The surface shall then be tested for depression, which shall be made up by painting with bitumen 30/40 penetration and blinding with aggregate of a size, equivalent to the depth of depression.

Application of Bitumen:

Bitumen 80/100 penetration of approved manufacturer, heated to a temperature of 177 to 190 C. (350 to 375 F) shall than be applied evenly to the road surface by means of a pressure distributor or handspray at the rate of 12.5 kg. / 10 sqm.

Blinding and Final Consolidation:

While the bitumen is still hot the surface shall be blinded evenly with stone aggregate of 6 mm. and down gauge size. The blindage shall be clean and not contain any dust and the rate of application shall be 0.1 cum. per 10 sqm.

After spreading of the blindage the road shall be given a final rolling with a eight ton power. Any soft or depressions detected at a later date shall be made up as directed by the Architect without any extra cost.

Premix Asphalt Carpet :

The rate shall include preparation of surface.

Preparation of Surface :

Clean the surface with wire brush and dust it with gunny bags. All pot holes, depressions and corrugations shall be made good and applying a tack coat of 80/100 penetration bitumen heated to 177 to 191 C. and the depressions made up with suitable size premix aggregate and consolidated by approved means. The surface shall then be painted with 80/100 penetration bitumen heated to 177 to 191 C. at the rate of 7.5 kgs. Per 10 sqm.

Preparation of Premix :

Premix shall be prepared as under :

2.5 cm. thick consolidated.

No		Per 100 Sft.	Per 1000 Sft.
1	Stone metal 2 cm. (3/4”)	5 Cft.	15.25 Cum.
2	Stone chips 10 mm. (3/8”)	3 Cft.	9 Cum.
3	Grit / sand (of desired grade and quality)	4 Cft.	12 Cum.
4	Asphalt 80/100 penetration from approved manufacturer heated to 177 C.	50 lbs.	2450 Kgs.
5	Solvent*	3 lbs.	150 Kgs.
6	Filler	Either clean lime stone powder or Hydrated lime in desired quantity.	

4 cm. thick consolidated (to be done in 2 courses)

Base Course (2.5 cm. thick)

No		Per 100 Sft.	Per 1000 Sft.
1	Stone metal 2.5 cm. (1/4”)	8 Cft.	24.5 Cum.
2	Stone chips 12 mm. (1/2”)	4 Cft.	12 Cum.
3	Asphalt 60/70 penetration from approved manufacturer heated to 177 C.	36 lbs.	1760 Kgs.
4	Filler	As above.	

Wearing Course (1.5 cm. thick)

No		Per 100 Sft.	Per 1000 Sft.
5	Stone metal 12 cm. (1/2”)	5 Cft.	15.25 Cum.
6	Grit / Chips 6 mm. (1/4”)	2 Cft.	6 Cum.
7	Asphalt 60/70 or 80/100 penetration from approved manufacturer heated to 177 C.	22 lbs.	1075 Kgs.

8	Solvent*	1.5 lbs.	65 Kgs.
9	Filler	As above.	

The quantity of solvent may vary depending upon the local weather conditions. Use of solvent and its quantity shall be determined by the Architects before commencement of the work.Batches should be proportioned in accordance with the capacity of the mixer being used. Place clean stone metal and chips in the mixer. Add 2/3 of the batch of quantity of the hot asphalt at the designed temperature along with solvent and mix well. Add grit / sand and filler and continue mixing until the sand / grit is uniformly disturbed throughout the mix. The add remaining quantity of hot asphalt and continue mixing till the whole mix is uniform and homogenous. If desired, the sand / grit shall be heated before use. The mix shall then be carried to the place of deposition by means of wheel barrows.

The proportion suggested above should in the normal course give a dense mix. If necessary the proportions may be varied to obtain a dense mix, at the discretion of the Architects, at no extra cost.

Laying of Premix:

The mix shall be laid to a uniform thickness and to proper level, grade and camber and rolled with six to eight ton power roller. The surface shall be checked for grade and camber during rolling and premix added and removed as required. The thickness shall be as specified after consolidation. When the base course is rolled the wearing course is laid similarly and rolled to give a consolidated thickness as specified in the time.

Premixed Seal Coat :

After the premix carpet is laid the surface shall be sealed with premix grit prepared as described under wearing course above with a suitable cutback added. The premixed seal must be brushed in to fill the interstices, additional material being applied during rolling of found necessary. The quantity of premixed seal shall be approximately 0.15 cum. per 10 cum. The surface shall be finally dusted with stone powder and rolled to give a smooth finish.

Road Concrete :

Specification for aggregate cement and concreting shall be as specified in the section under “Materials”.

Before concreting, the surface shall be checked for the given profile. Wooden forms equal to the depth road slab thickness shall be erected to correct line and level and held by stakes driven into the ground along the outside edge at suitable intervals and two stakes being placed at each joint. Forms should be supported, strengthened or braced, whenever necessary so that they are able to prevent deformation and resist deformation under pressure of concrete or impact of tamping or vibrating. Working faces of all forms shall be thoroughly cleaned and oiled before use and forms which are used more than once, shall be carefully examined and trued if necessary before re-use.

Sub-grade shall be properly moistened before any concrete is deposited on it, care being taken to see that there are no standing pools of water. It may be advisable to have the sub-

grade watered 12 to 24 hours in advance of placing concrete. Concrete shall be laid in laternate bays not exceeding 30 sqm.

Concrete shall be deposited on sub-grade for the entire width of the slab and shall be kept sufficiently above the level of forms so that when tamped, it becomes a dense mass.

I.R.C. fabric reinforcement, if specified, shall be placed in correct position before commencing concreting.

The concrete shall be brought to the specified contour by means of heavy screed or tamper handles weighing not less than 10 kgs. / meter and not less than 7.5 cm. wide or surface vibrator if directed by the Architects. This screed or tamper may be steel. It shall be drawn with a saw in motion in combination with a series of lefts and drops. At transverse joint tamper shall be drawn not closer than one meter towards the joint and shall than be lifted and set down at the joint and drawn backwards away therefrom. Surplus concrete shall then be taken up with shovels and thrown ahead of the joint. Immediately after the screeding or tamping has been completed the surface shall be inspected for high and low spots and any needed correction made by adding or removing concrete. The entire surface shall then the floated with hand floats one meter long and 7.5 cm. wide and this operation must be performed from bridge provided across the slab. The surface shall be roughened by brooming.

The longitudinal and transverse edges of the slab shall be properly formed with suitable tolls and the same should be rounded to 10 mm. radius.

The finished surface of the slab must conform to the grade, alignment and contours as directed and cured for fourteen days.

After curing period is over the joints shall be filled up with approved bitumastic filler. Unless otherwise specified, the rate shall include filling of joints as specified.

STORM WATER DRAINAGE

The work shall be carried out in accordance with rules and regulations of local Drainage Authority. Necessary provision for sight rails, boning staves etc. shall be made.

Tests regarding water-tightness of joint and cleanliness of pipes shall be performed before the trenches are covered.

Work of laying pipe lines and provided Manholes, Chambers, etc., shall include necessary excavation in any strata including old foundations of any description, refilling the trenches in layers of 20 cm. watering and consolidation.

Pipes :

All hume pipes (Reinforced) shall conform to the relevant I.S.S. and shall be new, perfectly sound, free from cracks, cylindrical, straight and of specified nominal diameter. They shall be made of reinforced cement concrete manufactured by centrifugal or spun process and shall have even texture.

Trenches :

The trenches for laying shall be excavated to lines and levels as directed. The bed of the trench shall be truly and evenly dressed throughout from one change of grade to the next.

The gradient is to be set out by means of boning roads and should the required depth be exceeded at any point, the trench shall be brought to proper grade by means of cement or lime concrete of the specification of the bed concrete without any extra cost.

The bed of the trench, if in soft or made-up earth, shall be well watered and rammed and depressions thus formed filled with sand or other suitable materials as directed by the Architects.

If rock is met with, it will be removed to 15 cm. below the level of the pipe and the trench will be refilled with bed concrete, sand or other suitable material approved by the Architects.

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

The width of trench shall be nominal diameter of the pipe plus 38 cm. but it shall not be less than 52 cm.

Laying of Pipes :

No concreting is ordinarily necessary. In cases where the soil is made up is very soft, concreting may be resorted to form the bed of the trench below the pipe, if directed by the Architects at no extra cost.

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

Jointing :

A few skeins of spun 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 tolls from ends of the collar. More skeins of yearn shall be added and well rammed above.

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

Cement mortar with one part of cement and one part of sand shall be slightly moistened and must on no account be soft or sloppy and shall be carefully inserted by hand in to 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 of 45.

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

Cement mortar joint shall be cured at least for seven days.

Testing :

All joints shall be tested to a head of 60 cm. of water above the top of the highest pipe between two manholes.

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 joint shall then be examined. Any joint found leaking or sweating shall be remade and embedded into 15 cm. layer of cement concrete (1:2:4) 30 cm. in length and the joint retested without any extra cost.

Manholes:

Size of manholes shall be s specified in the item and the sizes specified shall be internal size of the manhole. The work shall be done strictly as per standard drawing and specifications.

Bed Concrete :

Shall be in 1:4:8 cement concrete 23 cm. (9”) thick.

Brick Work:

Shall be with best quality local bricks and proportion of mortar shall be 1:4 unless otherwise specified.

Plaster:

Inside of the walls shall be plastered with 12 mm. thick cement plaster 1:3 and finished with floating coat of neat cement. The external face shall be pointed with 1:3 cement mortar.

Benching:
Channels and benching shall be done in cement concrete 1:2:4 rendered smooth with neat cement.

Foot Rests:

M.S. square rods of 22 mm. (7/8") diameter or C.I. rungs shall be embedded in masonry where the depth of manhole exceeds one meter and they shall be fixed 35 cm. apart and projecting 11 cm. from the wall. Foot rests shall be painted with bitumen as directed.

Manhole Covers:

Covers for manhole in the road proper shall not be less than 200 kgs. on footpaths and backyards. Lightweight covers shall be used whose weight for 45 cm. dia. shall not be less than 58 kgs. and that of 90 cm. x 45 cm. or 61 cm. x 45 cm. 90 kgs.

Drop Connection:

The case of drop connection C.I. pipes shall be provided with heel rest bend at the bottom and bend with access door at the top for cleaning purposes. The pipe shall be encased in 1:3:6 plain concrete.

Miscellaneous Items of Work:

The rates quoted by the Contractor for all miscellaneous items of work viz. cooking platforms, mories, built-in cupboards, counters, partitions, railings, electrical meter, switchboard cupboards, etc., shall be for the work as described in the schedule of quantities and as show in detailed drawings and shall be to the entire satisfaction of the Architects.

MATERIAL TEST LIST

The Contractors will have to take necessary material test as per I.S. code which is applicable, at their own cost for the following materials or any other material using in construction work periodically or as and when required by the Architects / Consulting Engineer.

The materials should be got tested in an approved Laboratory as per IS standard and test reports in duplicate should be submitted to the Architect's Office.

1)	Sand	:	a)	Silt Content.
			b)	Bulking.
			c)	Particle size distribution.
			d)	Or as directed.
2)	Stone aggregate	:	a)	Soft and deleterious material.
			b)	Particle size distribution.
3)	Cement Concrete RCC mix design	:	a)	Slump.
			b)	Cube strength.
			c)	Or as per I.S. 456-2000
4)	Bricks	:	a)	Dimensions
			b)	Water absorption and efflorescence.
			c)	Compressive strength.
5)	Timber	:	Moisture.	
6)	Ceramic/Vitrified Floor Tiles	:	a)	Transverse strength.
			b)	Water absorption.
			c)	Abrasion test.
7)	Steel	:	a)	Tensile
		:	b)	Bend.

Note: The Contractor will have to take necessary material test other than above test as per relevant I.S. code, if required and as directed by Architect / Owner.

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MATERIAL TESTING

A chart showing the recommended time and quantity scheduled for conducting test on various building materials is given. Please ensure that tests are carried our according to the above guidelines. Contractor's rate should include for necessary expenditure for testing including transport of samples of following tests.

No	Material	Test	Test Procedure	Minimum Quantity	Frequency
1	Sand	a) Silt Contendt b) Bulking c) Particle size distribution	Field Field Field	20 Cum 20 Cum 40 Cum	20 Cum or part thereof --- Do --- Every 40 Cum required for RCC work.
2	Stone	a) Soft and Deleterious b) Particle size distribution	IS - 2336 Part – II Field	45 Cum.	As required. Every 45 Cum part thereof for RC work. For rest of work as desired.
3	Cement Concrete or RCC	Slump Cube Strength	Field Field / Laboratory	20 Cum slab, beams and connected columns 5 Cum in columns	Once a day or as desired. Every 20 Cum of a day's concrete. Every 5 Cum column concrete.
4	Steel	a) Tensile Strength	IS - 1529	20 tonnes	Every 20 tonnes or part.
		b) Bend Strength	---- Do ----	---- Do ----	---- Do ----
5	Lime	Chemical and Physical properties of lime.	IS - 6932	5 M.T.	10 M.T. or part thereof

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No	Material	Test	Test Procedure	Minimum Quantity	Frequency
6	Bricks	Dimensions Water absorption Effloresence compressive strength		Designation 100 75) 50) 1,00,000 35) --- Do --- 100-50,000 75) 50) 100,000 35)	Every 50,000 or part thereof. Every 100,000 or part thereof one test for source of 50,000 or part thereof. Two tests for 1st lot of 1,00,000 and one test later for every 2,00,000 and part thereof.
7	Brick Tiles	Compressive Strength Effloresence		50,000 50,000	For 50,000 or part. One test per Source.
8	Marble	Moisture absorption Mhos scale hardness	IS – 1124 – 1974 IS – 1706 – 1972	Rs.10,000/- Value	Rs. 10,000/- or part thereof. (Value)
9	Timber	Moisture	IS – 11215 – 1985	1 Cum.	Every one Cum and part.
10	Aluminium door or window fitting	Thickness of anodic coating.	IS – 5523 – 1969	Rs. 5,000/-	Rs. 10,000/- or part thereof.
11	Ceramic Tiles / Vitrify Tiles / Designer pre-cast Concrete Tiles and interlocking paver block	a) Transverse Strength b) Water Absorption c) Abrasion test	IS – 1237 --- Do --- --- Do ---	200 Tiles --- Do --- --- Do ---	2000 Tiles or part. --- Do --- --- Do ---
12	Flush Door	a) End Immersion b) Knife c) Adhesion	IS – 2207	22 – 65 66 – 100 101 – 180 181 – 300 301 – 500	Destructive tests No. of shutters. 1 2 2 3 4

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				501 – above	5

No	Material	Test	Test Procedure	Minimum Quantity	Frequency
13	Tarfelt Type-3 Grade - I	Conform to I.S. 1322 – 1970			One Test
14	Pig lead	I.S. 782 – 1978			One Test
15	R.C.C. design mix M-25	All test as per I.S.:456-2000		As per directed	As per directed

Note : The Contractor will have to take necessary material test other than above test as per I.S. code for above material or other than above material, if required and as directed by the Architect / Owner.

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SPECIFICATIONS FOR SANITARY, PLUMBING AND WATER SUPPLY INSTALLATION WORK

GENERAL

SECTION – A

The scope of work covers supplying and installing sanitary plumbing, water supply and drainage items of the "Proposed Construction of the additional floor over existing branch building including repairing work of compound wall and installation of paver blocks at Betul, Madhya Pradesh for State Bank of India, Bhopal" in accordance with drawings and relevant I.S. code specifications or prepared by and under direction and to the satisfaction of the Architects, M/s. ParelkarOvalekarParpia, Seksaria Chambers, 139, Nagindas Master Road, Fort, Mumbai 400 001.

CONTRACT :

The form of Contract shall be according to the printed form "Conditions of Contract". The following Clause shall be considered as an extension and not in limitation of the obligation of the Contractor.

DRAWINGS:

All important drawings shall be mounted on boards and placed in racks and indexed; no drawings shall be rolled.

DIMENSIONS :

Figured dimensions shall in all cases be accepted in preference to scaled sizes. Large scale details take precedence over small scale drawings. In case of any discrepancies the Contractors shall ask for clarification from the Architect before proceeding with the work.

CONTRACTOR TO INSPECT SITE :

The Contractor should visit and examine the site of work and satisfy himself as to the nature of existing roads and other means of communication and other details pertaining to the work and local conditions and facilities for obtaining his own information on all matter affecting the execution of the work. No extra charge made in consequence, if any misunderstanding or incorrect information on any these points or on grounds of insufficient description will be allowed.

SETTING OUT :

The Contractor shall set out the drainage, soil, waste and water pipe lines and other fittings and fixtures in accordance with the plans and instructions of the Architects. The Contractor shall be responsible for the correctness of the above and any inaccuracies are to be rectified at his own expense as stated in Clause of the Conditions of Contract. He will be responsible for taking levels of the site before setting out and putting them on record without extra charge.

WORK PROGRAMME :

The Contractor should not that the work should be executed and completed ahead of the 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 and water supply work shall be programmed in such a way that it does not hold up the general construction or works of other trades.

In case of non-availability of materials in metric sizes, the nearest sizes in FPS units shall be provided with prior approved of the Architects for which neither extra will be paid nor any rebate shall be recovered.

If directed, materials shall be tested in any approved Testing Laboratory and the Contractor shall produce the test certificate in original to the Architect and entire chares for originals as well as repeated tests shall be borne by the Contractor. If required by the Architects, the Contractor shall arrange to test portions of the work at his own cost in order to prove their soundness and efficiency. If after any such test the work or portion of work is found, in the opinion of the Architects, to be defective or unsound, the Contractor shall pull down and re-do the same at his own cost. Defective materials shall be removed from the site.

It shall be obligatory for the Contractor to furnish Certificate, if demanded by Architect, from manufacturer or the material supplier, that the work has been carried out by using their material and installed / fixed as per their recommendations.

CEMENT :

Cement shall comply in every respect with the requirement of the latest publication of IS:269 and unless otherwise specified, ordinary Portland Cement shall be used.

The weight of cement in sealed bags shall be considered as 50 kgs. being equivalent to 35 liters (1.2 Cft.) in volumes.

Cement shall be stored in weather-proof shed with raised wooden plank flooring to prevent deterioration by dampness or intrusion by foreign matter.

SAND:

River Sand shall be clean, free from salt, clay, shells vegetable matter and fit for use in the opinion of Architects.

COARSE AGGREGATE :

Coarse Aggregate shall be angular, tough, sharp and well graded stone metal from approved source. It shall be clean and free from any foreign material. If directed the materials shall be washed.

BRICKS:

Bricks shall be locally available and of the approved quality and well burnt, free from cracks, chips, flaws and stones. It shall not absorb water more than 20% of its own weight when dry.

CEMENT MORTAR :

Cement mortar shall be of the proportion specified in the particular item in the Schedule of Quantities. Sand shall be measured in suitable measuring boxes and correct quantity of cement shall be added. The materials are mixed dry on a clean platform. Clean water is then added and mixed thoroughly. It shall be prepared in such quantity as can be readily used up. Mortar which has partially set shall under no circumstances be re-tampered by mixing with additional materials or water.

I. DRAINAGE (INTERNAL AND EXTERNAL)

STONEWARE PIPE AND FITTINGS :

Shall comply IS:651 in every respect and all stoneware pipes, bends, gully traps and sewer traps shall be of the best salt glazed, variety, glazed inside as well as outside, hard, smooth, even, textured, free from fire cracks, blows and blisters. The pipes shall be truly circular in cross section perfectly straight and of standard nominal diameter, length and depth of socket.

TREASURE TROVE :

Should any treasure, fossils, minerals or work of are antiqurial interest be found during excavation or while carrying out the work, the Contractor shall give immediate notice to the Architects of any such discovery and shall make over such finds to the Employer.

ACCESS FOR INSPECTION :

The Contractor shall provide at all times during the progress of the works and the maintenance period, proper, facilities and necessary attendance for inspection or measurement of works by the Architects or their representatives.

WATER SUPPLY:

Water shall be arranged in accordance with Clause No. 56 of Special Conditions of Contract.

ELECTRIC SUPPLY :

Electric energy shall be arranged in accordance with Clause No. 57 of Special Conditions of Contract.

VOUCHERS :

The Contractor shall furnish to the Architects with vouchers on request to prove that the materials are as specified and to indicate the rates at which the materials are purchased in order to work out the rate analysis of the non-tender items which he may be called upon to carry out.

SECTION – B

WORKS TO COMPLY LOCAL REGULATIONS AND RATE TO INCLUDE:

1) All sanitary installations, water supply and drainage work shall conform to the Local Municipal Bye-Laws and / or rules and regulations of Local Bodies and the work shall be inspected and passed by the various authorities having jurisdiction.

2) The work shall be carried out through a Licensed Plumber.

3) The Contractor shall arrange with the Local Municipal and / or Public Authorities for obtaining water and drainage connections and the Employer will reimburse the permanent connection charges on production of receipts.

4) The Contractor shall obtain all necessary permission forms from the various authorities having jurisdiction and shall make application and file all plans required for obtaining permission and satisfactory completion of the work.

5) The rates quoted shall be for complete items as fixed in position and cover all costs of materials, labour, tools, supervision, cutting of holes, chases, etc., and also for providing, fixing arrangements viz. clamps, brackets, wooden blocks etc. The rates shall also include restoration to original condition of all damage to walls, floors etc., during the process of fixing of sanitary installations, water supply and drainage. All debris of plumbers excavation etc., shall be removed without any extra charge.

6) All C.I. pipes, brackets, C.I. cisterns, G.I. pipe and fixtures, M.S. fixtures, A.C. pipes and fittings shall be painted externally with one coat of approved primer and two coats of enamel / flat oil paint. All painting work shall be carried out to the entire

   satisfaction of the Architects. If directed, additional coats of paint shall be applied to get uniform and matching finish without any extra cost.

7) In the interior of the building all pipe whether of Cast Iron lead or G.I. shall be embedded in an approved manner in chases made in walls or floors if required by the

Architects. The plumbers shall make necessary holes in the walls, etc., and restore them to the original condition.

8) All water supply and sanitary fixtures, pipes and pipe fittings, traps etc., which are to be embedded into the concrete or masonry work or other building work shall be placed in position and embedded or concealed at the time of casting concrete or erecting brick work. In case where chasing or cutting of concrete, masonry, or other structural or construction

work is unavoidable, the locations of such fittings, pipe lines and traps, etc., shall be marked suitably and the cutting, chasing or disturbing of the construction work shall proceed only after due approval of the Architects.

9) All cutting, chasing and fixing work shall be completed before commencement of any plastering, tiling or finishing work.

10) Unless otherwise specified Galvanised Iron pipes and pipe fittings shall be of medium quality conforming to IS: 1239 and shall be tested if required by the Architects.

11) The Contractor shall responsible for the adequacy and efficiency of the entire plumbing system and if, in his opinion he finds any serious objection to the system shown on the drawing, he shall set forth his objection or his suggestions to ensure adequacy and efficiency of the said system and notify the Architects before proceeding with the work.

12) The work in every respect during its progress and till final acceptance by the Employer, including raw materials delivered to the work site to be incorporated for use in construction of the work by the Contractor shall be under the charge and in the care of and under the responsibility of the Contractor and at his risk. Any loss or damage to such materials or work prior to final acceptance of the work by the Employer shall immediately be replaced by the Contractor at his expense.

SECTION – C

MATERIALS :

1) Materials shall be of best approved quality obtainable and unless otherwise specified they shall conform to the respective Indian Standard Specification.

2) Samples of all material be got approved before placing order and the approved samples shall be deposited with the Architects.

3) In case non-availability of materials in metric sizes, the nearest size in FPS units shall be provided with prior approval of the Architects for which neither extra will be paid nor any rebate shall be recovered.

4) If directed, materials shall be tested in any approved Testing Laboratory and the Contractor shall produce the test certificate in original to the Architect and entire charges for original as well as repeated tests shall be borne by the Contractor. If required by the Architects, the Contractor shall arrange to test portions of the work at his own cost in order to prove their soundness and efficiency.

   If after any such test the work or portion of works is found, in the opinion of the Architects, to be defective or unsound, the Contractor shall pull down and redo the same at his own cost. Defective materials shall be removed from the site.

5) It shall be obligatory for the Contractor to furnish certificate if demanded by Architect, from manufacturer or the material supplier, that the work has been carried out by using their material and installed / fixed as per their recommendations.

TRENCHES FOR S.W PIPE DRAINS :

EXCAVATION :

The trenches for the pipes shall be excavated to lines and evels as directed. The bed of the trench shall be truly and evenly dressed throughout from one change of grade to the next.

The gradient is to be set out by means of boning rods and should the required depth exceeded at any point, the trench shall be refilled by means of lime concrete of proportion 1:2:4 at the Contractor's own expense.

The bed of the trench, if in soft or made up earth, shall be well watered and rammed and depression thus formed shall be made up with sand or other suitable materials as directed by the Architects without any extra cost.

If rock is met with, it shall be removed to 15 cm. below the level of the pipe and the trench refilled with concrete or sand or other suitable material as directed by the Architects without any extra cost.

The rates shall include keeping trenches dry either by bailing out or pumping water, timbering and shoring of sides of excavation if required and directed by the Architects.

The trench width shall be nominal diameter of the pipe plus 38 cm. (15”) but it shall not be less than 52 cm. (21”).

PROTECTION OF EXISTING SERVICES:

All pipes, water mains, cables, etc., meet with in the course of excavation shall be carefully protected and supported.

REFILLING:

Refilling in trenches for pipes shall be commenced as soon as the joints are tested, approved and haunching is done. The refilling on the top and around the drain shall be done with great care and in such a manner as will obtain the greatest amount of compactness and a solidity possible. For this purpose the earth shall be laid in regular layers of 15 cm. (6”) watered and each layer rammed.

All surplus earth shall be disposed of as directed by the Architects.

CONCRETING:

All pipes shall be laid on bed of 15 cm. (6”) concrete with one part of cement, four parts of sand and eight parts of brickbats of 38 mm. (1.5”) down gauge or stone metal properly consolidated. Concrete shall be laid to the full width of the trench and also in haunches as per the standard drawings.
Or as described under item in Schedule of Quantity.

LAYING AND JOINTING S.W. PIPES :

LAYING :

The pipes shall be carefully laid to the levels and gradients shown on the plans and sections with “Socket Up” the gradient.

JOINTING:

Spun yarn soaked in neat cement wash shall be passed round the joint and inserted in it by means of caulking tool. More skeins of yarn shall be added and well rammed home. Cement mortar with one part of cement and one part of 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 the punched and caulked into the joint and more cement mortar added until the space of the joint has been filed completely with tightly caulked mortar. The joint shall then be finished off neatly outside the socket at an angle of 45 degree.

CURING :

The joint shall be cured atleast for seven days.

TESTING:

All joints shall be tested to a head of two feet of water above the top of the highest pipe between the two manholes. Any joint found leaking or sweating shall be remade or embedded in 15 cm. thick layer of cement concrete (1:2:4) 30 cm. in length and section retested at Contractors own cost.

STONEWARE GULLY TRAPS:

S.W. gully traps of specified sizes and quality as described earlier shall be fixed on 15 cm. thick and 70 cm. square cement concrete 1:4:8 bedding and the gully outlet to the branch drain shall be jointed similar to jointing of S.W. pipes. A brick masonry chamber 30 cm. x 30 cm. internally shall be constructed in half brick masonry with 1:5 cement
mortar and the space between the trap and the wall filled up with cement concrete (1:4:8) and the upper portion of the chamber finished internally with 1:3 cement mortar and
finished with neat cement. The corners and bottom of the chamber shall be rounded off so as to slope towards the grating.

In addition to 15 cm. x 15 cm. C.I. grating, the chamber shall have a C.I. cover with frame 30 cm. (inside) with machined seating faces, fixed on the top of the brick masonry with cement concrete 1:2:4 and rendered smooth. The weight of cover shall not be less than 4.53 kgs. and that of frame 2.72 kgs. The finished top of cover shall be left 4 cm. above the adjoining surface so as to exclude the surface water from entering the gully trap.
Or as described under item in Schedule of Quantity.

HUME PIPE DRAINS :

PIPES :

Shall be reinforced and conform to relevant I.S. Specification. They shall be new and perfectly sound, free from cracks, cylindrical, straight and of specified nominal diameter. Each pipe shall have one collar.

TRENCHES AND REFILLING :

Shall be as described under S.W. pipes.
Or as described under item in Schedule of Quantity.

CONCRETING :

No concreting is ordinarily necessary. In cases where the soil is made up or is very soft, concreting may be resorted to as described under “Stoneware pipe fitting” without any extra cost.

LAYING AND JOINTING :

The pipe shall be laid as described under Stoneware pipe and fittings by placing the collar centrally over the joint.

CAST IRON PIPES FOR DRAINAGE:

All drainage lines passing under buildings, floors and roads, in exposed horizontal positions above ground, shall be cast iron pipes. Pipes shall be sand cast conforming to Class "A" IS:1537 or centrifugally spun cast iron Class LA conforming to IS:1536.

	BARREL					
Nominal dia. in mm.	Outside dia. in mm.	Wall thickness in mm.	Wt. per m (approx.) in kgs.	Socket Wt. in kgs.	Depth of socket in mm.	Total Wt. per 3.66 m. in kgs.
80	98	7.2 (7.9)	14.7 (16)	5.5	84	59 (64)
100	118	7.5 (8.3)	18.6 (20.5)	7.1	88	75 (82)
125	144	7.9 (8.7)	24.7 (26.4)	9.2	91	98 (106)
150	170	8.3 (9.2)	30.1 (33.2)	11.5	94	122 (133)
200	222	9.2 (10.1)	44 (48.1)	16.8	100	178 (193)
250	274	10.0 (11.0)	59.3 (65.0)	22.9	103	240 (261)

Note : Figures in brackets indicate particulars of pipes conforming to Class "A" IS:1537 quality and other particulars remaining the same.

These shall be free from cracks and other flaws. The interior of pipes and fittings shall be clean and smooth and painted inside and outside with Dr. Angus Smith's solution or other approved anti-corrosive paint, if not painted initially by the manufacturer.

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 3 mm. (1/8") rubber insertion packing and when closed and bolted they shall be watertight.

The joints shall be filled with lead as described under Soil Pipes.

MANHOLES, VENT SHAFT, GULLY CHAMBER ETC. :

SIZE OF MANHOLES :

The size specified in the Schedule of Quantities shall be internal size of the manhole.

The work shall be done strictly as per standard drawing and following specifications.

BED CONCRETE:

Shall be in 1:4:8 cement concrete 23 cm. (9") thick.

BRICK WORK :

Shall be with locally available best quality bricks in 1:4 cement mortar.

PLASTER:

Inside of the walls shall be plastered with 12 mm. thick cement plaster 1:3 and finished with a floating coat of neat cement.

In wet grounds 20 mm. thick plaster of the above specification shall be done on the exterior surface of the walls also and this plaster shall be waterproofed with the addition of approved waterproofing compound as per manufacturers specification Or as described under item in Schedule of Quantity.

POINTING:

In dry ground, pointing shall be done in 1:2 cement mortar to the outside surface.

BENCHING:

Channels and benching shall be done in cement concrete 1:2:4 rendered smooth with neat cement.

The following size of channels for the bench shall be added.

Size of Drain		Depth at the Center		Depth at the sides i.e. at walls	
In cm.	In inches	In cm.	In inches	In cm.	In inches
10	4	15	6	25	10
15	6	20	8	30	12
23	9	28	11	38	15
30	12	35	14	45	18
38	15	43	17	53	21
45	18	50	20	61	24

FOOT RESTS:

C.I. foot rests or M.S. square rods of 22 mm. (7/8”) shall be embedded in masonry. They shall be fixed 30 cm. apart and projecting 11 cm. from the wall. Foot rests shall be painted with bitumen as directed.

MANHOLE COVERS :

Manholes covers shall be of tough homogenous cast iron of heavy or light type as specified. The sizes specified are the clear internal dimensions. Covers for manholes in the road proper shall not weight less than 200 kgs. On foot-paths and backyards, lightweight covers of 45 cm. diameter having weight not less than 58 kgs. or covers of size 92 cm. x 45 cm. or 61 cm. x 45 cm. having weight of 90 kgs. shall be used.

Or as described under item in Schedule of Quantity.

DROP CONNECTION:

In case of drop connection C.I. pipes shall be provided with heal rest bend at the bottom and bend with access door at the top for cleaning purposes.

II. SANITARY INSTALLATION:

SANITARY FIXTURES:

INDIAN TYPE W.C.PANS :

The W.C. pan shall be of White Vitreous China, of specified size and pattern. Pan shall be of approved quality and shall bear the mark of the firm manufacturing it. It shall have 10 cm. (4") porcelain trap ("P" or "S" type with effective seal) and 5 cm. (2") vent arm.

ORISSA TYPE PANS :

Shall be from an approved manufactures and traps as specified above.

FIXING :

Pan shall be fixed securely with a cushioning bed in an approved manner taking care that the cushion is uniform and even, without having any hollows between pan and the concrete. The joint between the pan the trap be made with cement mortar 1:1 and shall be leakproof.

Each closet shall be provided with the following accessories and the rate shall be all inclusive.

1) Necessary length of 10 cm.; H.C.I. pipe or lead pipe connecting the pan and plug bend. (The plug bend / tee connection to vertical stack shall be paid under appropriate item).

2) Wherever anti-syphonage pipe connections are required necessary length of lead pipe 6.25 cm. shall be provided.

3) Flushing cistern shall be 10 litres capacity and cast Iron overhead type with heavy G.I. Chain pull unless otherwise specified. If low down cistern is specified it shall be White Vitreous China cistern of best quality from an approved manufacturer with Chromium plated flush handle. The cistern shall have G.I. overflor pipe of length as per Municipal requirement or as per Architects drawing with mosquito-proof Brass screw cap and C.I. brackets with wall plugs and Brass union and couplings for flush pipe etc. complete unit.

4) 12 mm. PVC water inlet pipe with 12 mm. Brass stop cock.

5) The flush pipe from the cistern shall be of 32 mm. dia. telescopic G.I. pipe or lead pipe or as specified, which shall be connected to the W.C. pan by means of an approved type of joint.

6) Painting : All fittings and fixtures shall be painted with two coats of enamel paint over a coat of primer.
   Or as described under item in Schedule of Quantity.

EUROPEAN TYPE W.C. :

The closet shall be of White Vitreous China readily flushed, of wash down type and shall be of best quality manufactured by an approved firm, and fixed to the floor by approved means, as described under item in Schedule of Quantity.,

Each closet shall be provided with the following accessories and the rate shall be all inclusive.

1) **Seat** : Heavy black plastic seat of approved quality and seat cover with rubber buffers fixed to the pan with C.P. Brass bar hinge.

2) **Cistern** : Low level flushing tank 10 litres capacity of White Vitreous China cistern of best quality manufactured by an approved firm with C.P. flush handle and C.P. overflow pipe of length as per Municipal requirement or as per Architects drawing with mosquito-proof brass C.P. Cap etc., complete unit including enameled or C.P. flush pipe and bend.
   Or as described under item in Schedule of Quantity.

3) Necessary length of PVC water inlet pipe and 12 mm. dia. C.P. brass stop cock.

4) Necessary length of porcelain or lead or C.I. connecting pipe 10 cm. dia. (plug bend / tee connection to vertical stack shall be paid under appropriate item).

5) Wherever anti-syphonage pipe connections are required, necessary length of lead pipe 6.25 cm. dia. shall be provided.

PAINTING :

All fittings and fixtures shall be painted with two coats of enamel paint over a coat of primer, externally.

LIPPED URINALS:

Shall be flat back or angle urinal of specified dimensions and shall be of White Vitreous China from an approved manufacturer.
They shall be screwed to the wall with coach screws of Chromium plated Brass on dowel shaped wooden plugs built into the walls or fixed as per manufacturers specification. Each basin should have an outlet with C.P. Brass hinged grating connected to 40 mm. diameter waste pipe through a C.P. bottle trap. When a range of urinals are provided only a straight length of 40 mm. diameter waste pipe and white glazed half round channel with tread platform finished with white glazed tiles complete as per Architects drawings shall be provided. All joints shall be in plumbers wiped solder joint with necessary C.P. Brass sockets and thimble etc.

STALL WALL TYPE URINALS :

Shall be White Vitreous China of approved design and manufacture.

They shall be fixed to the wall as per manufacturer's specification. Each urinal should have an outlet with C.P. Brass hinged grating connected to 40 mm. diameter waste pipe through a C.P. Brass bottle trap. All joints shall be in plumber's wiped solder joint with necessary C.P. Brass sockets and thimble etc.

FLUSHINGCISTERN :

These shall be automatic flushing cistern of vitreous China or as specified in the Schedule of Quantities complete with valveless syphon fittings. Cistern shall be supported on brackets of standard pattern and fixed to wooden dowel plugs embedded in the wall with C.P. Brass screws.

ANGLE VALVE :

The cistern shall be fed with 15 mm. (1/2") C.P. Brass inlet tube angle valve of approved make with necessary length of lead inlet pipe complete with C.P. Brass unions unless otherwise specified in the Schedule of Quantities.

The capacity of flushing cistern and size of the flush pipe for the number of urinals shall be as follows :

	Capacity of flushing cisterns		Mains		Size of distribution	
Numbers of Urinals	In Litres	In Gallons	In mm.	In inches	In mm.	In inches
1	5	1	--	--	15	1/2
2	10	2	20	3/4	15	1/2
3	10	2	25	1	15	1/2
4	15	3	32	1.25	15	1/2

The main and distribution pipe fittings and clamps shall be of C.P. Brass unless otherwise specified in the Schedule of Quantities. Distribution pipes shall feed the urinals with C.P. brass spreaders of approved make.

PAINTING :

All brackets etc., shall be painted with two coats of enamel paint over a coat of primer.

LAVATORY BASINS:

They shall be of White Vitreous China of best quality manufactured by an approved make and size as specified in the Schedule of Quantities. They shall be supported on a pair of C.I. brackets of approved design.

a) **Fittings**: Each lavatory basin shall be provided with a single cold water C.P. Brass pillar tap of approved design and make, C.P. Brass waste, C.P. Brass chain and rubber plug, C.P. Brass bottle trap of approved quality and design, with C.P. brass stop cock and PVC water inlet pipe of standard length 1/2" dia. complete.

b) **Waste Pipe** : Waste pipe beyond bottle trap shall be measured and paid separately under appropriate item.
Where specified, lavatory basins shall be provided with puff pipe with a brass perforated screws cap.

c) **Painting** : All brackets, pipes etc. shall be painted with two coats enamel paint over a coat of primer.

SINKS :

They shall be of White Vitreous China or as specified in the Schedule of Quantities with weir type overflow. The size of sink shall be as specified and shall be of approved make. They shall be supported on a pair of C.I. brackets of approved design.

a) **Fittings** : Each sink shall be provided with 40 mm. (1.5") C.P. Brass waste of approved pattern with C.P. Brass chain and 40 mm. rubber plug and 40 mm. dia. C.P. Brass trap and union which shall be connected to 40 mm. diameter waste pipe.
Waste pipe beyond the trap shall be measured separately and paid under appropriate item.
Where specified sinks shall be provided with puff pipe with a Brass perforated screw item.

b) **Painting** : All fittings, brackets and pipes shall be painted with two coats of enamel paint over a coat of primer.

DRAINAGE BOARD :

Drainage boards of type and size as specified in the Schedule of Quantities shall be provided. These shall be fixed on strong brackets of approved design and where necessary provided with hinges. Brackets shall be painted with two coats of enamel over a coat of primer.

III. TOILET REQUISITES :

MIRRORS :

Mirrors shall be of the best quality , specified size, approved design and make. It shall be mounted on plywood / partical board backing and shall be fixed in position by means of four C.P. Brass screws and cup washers over rubber washers on wooden plugs firmly embedded in the wall. Alternative method for fixing could be by using Brass clamps with C.P. Brass screws. A suitable T.W. cover mould of approved design shall be fixed all round as directed.

GLASS SHELF :

The shelf shall be of glass of approved quality and thickness with edges rounded off. The size of the shelf shall be as specified and shall rest on C.P. Brass brackets which shall be fixed with C.P. Brass screws to wooden plugs, firmly embedded in the wall. The shelf shall have C.P. Brass guard rail all round.

TOWEL RAIL :

Towel rail shall be of C.P. Brass with two C.P. Brass brackets. The size of the rail shall be as specified. The brackets shall be fixed by means of C.P. brass screws to wooden cleats firmly embedded in the wall. Where specified, Aluminium towel rails may be used of approved quality and design.

TOILET PAPER HOLDER :

Toilet paper holder shall be of White vitreous China or as specified. It shall be recessed in wall.

IV. C.I. SOIL, WASTE AND VENT PIPES AND FITTINGS :

C.I. PIPES AND FITTINGS :

Cast Iron Soil, Waste and Vent pipes and fittings shall be of heavy quality conforming to IS:3989 for spun pipes which is preferred to Sand Cast Soil pipes conforming to IS:1729. The standard weights and thickness of pipes are given below and a tolerance upto 4% my however be allowed against these standard weights.

(IS:3989-1967 for centrifugally spun soil pipe)

Nominal dia.		Thickness	Overall weight 1.83 m. length (Six feet)	Internal dia. of socket
In mm.	In inches	In mm.	In kgs.	In mm.
50	2	3.5	8.5	73
75	3	3.5	12.7	99
100	4	4.0	19.2	126
150	6	5.0	35.5	179

(IS:1729-1964 for sand cast soil pipes)

Nominal dia.		Thickness	Overall weight 1.83 m. length (Six feet)	Internal dia. of socket
In mm.	In inches	In mm.	In kgs.	In mm.
50	2	5	11.41	76
75	3	5	16.52	101
100	4	5	21.67	129
150	6	5	31.92	181

LAYING :

The pipes shall be laid as described in the Schedule of Quantities and as shown on the Architects drawings.

FIXING:

The pipes and fittings shall be fixed to walls by using proper holder bat clamps, if directed. The pipes shall be fixed perfectly vertical or in approved alignment. The spigot end shall about the shoulder of the socket and leave no annular space in between. All soil and waste water pipes shall be carried up above the roof parapet wall and shall have vent cowl.

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

NAHANI OR FLOOR TRAPS:

The traps shall be of self cleansing, design deep seal type with a minimum seal of 5 cm. (2”). If directed, 25 mm. puff pipe shall be provided. The other specifications for these shall be the same as those for C.I. soil, waste and vent pipes and fittings.

PAINTING :

All exposed C.I. pipes and fittings shall be painted externally to match the colour of the surroundings with two coats of flat / enamel paint over a coat of approved primer. If directed, additional coats shall be given at no extra cost.

LEAD PIPE :
All lead pipes shall be hydraulic drawn and of equal substance throughout conforming to IS:404-1962. Weights and wall thickness of pipes shall be as under:

Nominal dia.		Wall thickness	Wt. in Kgs.
In mm.	In inches	In mm.	Per meter.
32	1.1/4	2.6	3.28
40	1.5	2.6	3.95
50	2	2.7	5.07
75	3	2.7	7.48
100	4	2.7	9.88

When not supported on bearers, all led pipe shall be supported by strong lead stacks atleast 40 mm. (1.5”) wide soldered on to the pipes at suitable intervals.

WIPED SOLDER JOINTS :

All joints of lead pipe 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 lead. After this, 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 shave hook. Tallow shall then be smeared over the prepared surface. The molten solder, an alloy composed of three parts of tin and seven parts of seven 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 soil pipe at each end beyond the mark. When sufficient solder has long continuous movements in one direction only so as to leave a neatly formed elliptical shaped joint. Surplus solder remaining on the joint shall be removed.

The length of the wiped solder joint shall be as follows :

No	Size of pipe		Length of Joint			
			Minimum		Maximum	
	In mm.	In inches	In mm.	In inches	In mm.	In inches
1	15	1/2	60	2.1/4	70	2.3/4
2	20	3/4	65	2.5	70	2.3/4
3	25	1	70	2.3/4	75	3
4	32	1.1/4	70	2.3/4	80	3.1/4
5	40	1.5	70	2.3/4	80	3.1/4
6	50	2	75	3	90	3.5
7	75	3	75	3	90	3.5
8	100	4	80	3.1/4	90	3.5

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

LEAD PIPE CONNECTION:

The joints between lead pipe and C.I. or stoneware pipe shall be made as follows :

One end of Brass thimble or ferrule 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 C.I. or stoneware pipe. In case of former the joint shall be made with molten lead (lead caulked) and in case of the latter with cement mortar as in stoneware pipe drains.

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 Brass 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.

PAINTING:

All exposed lead pipes shall be painted as in H.C.I. pipes and fittings, externally.

ASBESTOS CEMENT PIPES:

Where specified, asbestos cement pipes and fittings may be used for soil, waste and vent pipes and rain water pipes. Asbestos cement pipes shall be of the best quality conforming to IS:1629-1960.

Pipes shall be of painted as described for C.I. pipes, with two coats of approved quality and shade cement paint.

V. INTERNAL WATER SUPPLY:

G.I. PIPES AND FITTINGS:

The pipes shall be of the class specified in the Schedule of Quantities and shall be of galvanised welded or seamless, screws and socketed and shall conform to IS: 1239. They shall be manufactured by a firm of repute. All fittings shall be malleable iron galvanised fittings of approved best Indian make.

The details of pipes regarding nominal bore thickness and weight are given below.

Approx outside dia.	Nominal Bore		Screwed and Socketed wt. per meter			Screwed and Socketed meter per 1000 kgs.		
In mm.	In mm.	In nearest inch.	Light kgs.	Medium kgs.	Heavy kgs.	Light kgs.	Medium kgs.	Heavy kgs.
10.2	6	1/8	0.364	0.410	0.496	2747	2439	2016
13.5	8	1/4	0.521	0.654	0.773	1919	1529	1294
17.2	10	3/8	0.680	0.858	1.03	1470	1166	971
21.3	15	1/2	0.961	1.23	1.46	1040	813	685
26.9	20	3/4	1.42	1.59	1.91	704	629	524
33.7	25	1	2.03	2.46	2.99	493	407	334
42.4	32	1.1/4	2.61	3.17	3.87	383	316	258
48.3	40	1.5	3.29	3.65	4.47	304	274	224
60.3	50	2	4.18	5.17	6.24	239	193	160
76.1	65	2.5	5.92	6.63	8.02	169	151	125
88.9	80	3	6.98	8.64	10.3	143	116	98
101.6	90	3.5	8.92	9.90	11.8	112	101	84.7
114.3	100	4	10.2	12.4	14.7	98	80.6	68.0
139.7	125	5	--	16.7	18.3	--	59.9	54.6
165.1	150	6	--	19.8	21.8	--	50.5	45.9

Note : The above weights are for black pipes and theoretical weights of galvanised pipes are 6% higher.

LAYING AND FIXING:

Where pipes have to be cut or re-threaded, ends shall be carefully filled out so that no obstruction to bore is offered.

For internal work all pipes and fittings shall be fixed truly vertical and horizontal, either by means of standard pattern holder-bat clamps keeping the pipes 12 mm. (1/2") clear of the wall everywhere or concealed as directed.

For external work, G.I. pipes and fittings shall be laid in trenches. The width of the trench shall be of minimum width required for the working. The pipes laid underground shall not be less than 60 cm. (2 ft.) from ground level. They shall be painted with hot asphalt and wrapped with Hessain cloth and again painted with two coats of hot asphalt (pipe embedded in masonry / concrete shall be treated similarly). They shall be surrounded with 15 cm. thick sand of approved quality all around. The work of excavation and refilling shall be done as directed.

PAINTING:

All exposed pipes and fittings shall be painted with two coats of approved shade of flat / enamel paint over a coat of approved primer and if directed, additional coat of paint shall be given without any extra cost.

TESTING:

All G.I. pipes and fittings shall be tested in an approved manner to ensure that pipes have proper threads and those 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 Contractors expenses.

BRASS WATER FITTINGS:

All Brass water fittings shall be of approved quality and design and shall generally comply with the latest I.S. Specifications. They shall be fixed in the pipeline in a workmanlike manner and care shall be taken to see that joints shall be tested in an approved manner to ensure that the joint are leak proof. The defective fittings and the joints shall be repaired or redone / replaced at Contractor expenses.

VI. EXTERNAL WATER SUPPLY:

CAST IRON PIPES AND SPECIALS:

All pipes and special for water supply shall be of cast or spun iron straight with spigot and socket ends and shall conform to the latest edition of the I.S. Specification for Class "B" pipes. Heavier quality pipes and specials shall be used when the water pressure exceeds 122 meters (400 ft.) of head, flanged end pipes may also be used where required and specifically approved.

Details of nominal bore and weights for Class “B” pipes shall be as specified below.

	Barrel				Total weight for one working length in meters			
Nominal dia. meter	Outside dia.	Wall thick-ness	Wt. per meter (approx)	Socket weight (approx)	3.66	4.00	4.88	5.5
In mm.	In mm.	In mm.	In kgs.	In kgs.	In kgs.			
80	98	8.6	17.3	5.5	69	74.5	--	--
100	118	9.0	22.0	7.1	88	95	--	128
125	144	9.5	28.7	9.2	114	124	--	167
150	170	10.0	35.9	11.5	143	125	--	209
200	222	11.0	52.1	16.8	207	255	271	304
250	274	12.0	70.6	22.9	281	305	368	411
300	326	13.0	91.4	29.8	364	395	476	533
350	378	14.0	114.5	37.5	457	495	596	667

Note : Specification and specials shall be coated inside and outside while hot with Dr. Angus Smith’s solution or other approved anti-corrosive paint, if not painted initially by the manufacturer.

TRENCHES FOR C.I. PIPES AND SPECIALS:

Trenches shall be excavated as described under “Drainage” for S.W. pipes.

LAYING:

Before laying the pipes, they shall be examined to see that there are no cracks or defects. Subject to the approval of the Architects the damaged portion of the cracked pipe may be cut at a point not less than 15 cm. beyond the visible extremity of the cracks with diamond pointed chisel.

The pipes shall be thoroughly cleaned of all dust and dirt. Special care shall be taken to clean the insider of the sockets and the outside of the spigots before lowering the pipes into the trenches. Holes to receive the sockets shall be scooped out in the trench bed so as to firmly bed the full length of the pipe.

The pipes shall be lowered into the trench by means of suitable pulley blocks, shear-legs, chains, ropes etc. In no case the pipes shall be rolled and dropped into the trench. After lowering the pipes, they shall be arranged to coincide the center line of pipes with the center line of alignment. The spigot of the one pipe shall be carefully centered into the socket of the next pipe and driven to the full distance to the full distance that it can go and pipe line laid to levels required, being kept in position be earth filling, well watered and rammed at two or more places in its length.

Special shall also be laid in their proper position as stated above. The pipes shall be laid with socket facing the direction of flow of water facing uphill.

Any deviation either in plan or elevation of less than 11.1/4 shall usually be effected by laying the straight pipes round a flat curve of such radius that minimum or 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. Deviation of about 2.1/4 can be effected at each joint in this way. 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 avoid rats and other small animals getting in.

Cement concrete thrust blocks of suitable design shall be provided at 45 to 90 degree bends of the pipes so as to withstand dynamic and static forces likely to be developed due to water running through the pipes. The thrust blocks shall be made after the joints have been caulked with lead and these shall be paid for separately, unless otherwise specified.

LEAD CAULKED JOINTS:

1) Lead for joints: It shall be bluish grey in colour, very soft and malleable, readily melted, free from mixture of zinc or tin.

2) Spun yarn for joints: This shall be of best quality preferably white, it shall be free from dust etc. It shall be soaked into hot coal tar or bitumen and dried before use.

3) Jointing: The spigot shall be carefully centered in the socket by two or three laps of treated spun yarn, twisted into ropes of uniform thickness, well caulked into the back of the socket, leaving the requisite depth for the lead. The laps of the yarn must be longer than the circumference of the pipe. No making up of the pieces shall be allowed.

4) 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.

5) Approximate weight of lead and yarn required for joints for various sizes of C.I. pipes and specials shall be as under :

Dia. of pipe		Lead		Yarn		
In mm.	In inches	In kgs.	In lbs.	In kgs.	In lbs.	In ozs.
75	3	1.8	4	0.114	0	4
100	4	3.0	6.5	0.170	0	6
125	5	3.6	8	0.199	0	7
150	6	4.2	9.5	0.227	0	8
180	7	4.8	10.5	0.255	0	9
200	8	5.5	12	0.298	0	10.5
230	9	6.4	14	0.340	0	12
250	10	6.6	14.5	0.397	0	14
300	12	8.0	17.5	0.539	1	3

6) Caulking : After the joints have been run they must be thoroughly caulked until they are perfectly watertight. Caulking of joints will be done after a convenient length has been laid and laided. The leading rings shall first be removed with a flat chisel and then the joint caulked round three times with caulking tools of increasing thickness and a hammer of 2 to

3 kgs. (4 to 6 lbs) weight. Lead joints shall not be covered till the pipeline has been tested under pressure but the rest of pipeline may be covered to prevent expansion and contraction due to variation in temperature.

7) When it is inconvenient or dangerous to use molten lead for joints, they may be made with lead wool inserted in strings not less than 6 mm. (1/4") thick and thoroughly caulked.

8) Testing : The lead joints shall be tested to a pressure of 7 kgs. per sq.cm. (100 lbs. per sq.inch.) or such head as otherwise, specified after being caulked and should any leakage occur, the leaky joint or joints shall be remade and section retested at Contractor's own expenses, until satisfactory results are obtained.

SLUICE VALVES, FIRE HYDRANTS AND MASONRY CHAMBERS :

1) Sluice Valves : The valve shall be of the specified size and shall be approved quality.

2) The body and cover of the valve shall be of tough, homogeneous cast iron, the spindle of forged bronze, the nut and the valve seats of high grade gun metal and machine-faced. It shall be fitted with a C.I. Wheel or a cap of standard type, marked with an show the direction of turn for opening of the valve. It shall have flanged ends drilled to Indian Standard Specification.

3) The valves shall work easily and smoothly under all conditions and shall be watertight when closed under the working pressure as stipulated as in the relevant I.S.S. unless otherwise specified, valves shall be Class II type as in IS:778:1971.

4) The diameter of the waterway, when the valve is fully opened shall not be less than the diameter of the pipe.

5) Fixing : Fixing of the valve shall be done by means of bolts nuts and 3 mm. (1/8") rubber insertions with the flanges of the spigot and socket tail pieces drilled to the same specifications. The tail pieces shall be jointed to the pipe line by means of lead caulked joints.

APPURTENANCE

The other appurtenances of the pipeline are mentioned below :

1) Air valves: These are placed at every summit in the pipe line to permit the escape of air when the main is filled, and afterwards air, if any is carried into the main (they are also placed on long stretches of nearly level main).

2) Scour valves: These are placed at the bottom of all depressions for emptying the main or letting out sediment.

3) Reflux valves: These are fixed on the ascending parts of the main which open in the direction of flow, but automatically close if a burst occurs and the water flows back. They diminish damage done by the escape of water at a burst.

4) Safety or relief valves: these are fixed at the downstream ends of long lengths of mains or where water hammer may take place so as to reduce to the normal any excessive pressure that may occur.

5) Fire hydrants: These shall be of approved design and be fixed as shown in the drawings and as per Architects direction. The cost of hydrant shall include cost of valve and masonry chamber as shown on the drawings with C.I. cover etc., complete with two coat of enamel paint over a coat of enamel paint over a coat of primer.

6) Water meter: It shall consist of meter, “Y” strainer and other accessories shall be fixed as per requirement of the Local Water Supply Authority. The cost of meter shall include the cost of testing and sealing by Municipal Authorities and fixing including a masonry chamber as shown on the drawing, C.I. cover and locking arrangement complete as directed.

7) Manhole chambers and surface chambers for housing valves etc., shall be constructed as per standard drawing.

MODE OF MEASUREMENT

General :

The description of each item in the Bill of Quantities shall be read in conjunction with its specifications for materials and work and unless otherwise stated shall be held to include for necessary conveyance and delivery, handling, unloading, storing, fabrication, hoisting, lowering, all labour for finishing to the required shape and size, setting, fitting and fixing in position, straight cutting and waste and other incidental operations. Any item not mentioned hereunder shall be measured and paid for as per IS 1200 for the respective item.

External Drainage:

a) Pipes shall be classified according to their diameter. The measurement shall be taken along the center lines of pipes between the inner faces of 2 manholes. The rates shall be inclusive of cutting, jointing, testing and commissioning.

b) Excavation for trenches for laying drainage lines shall be paid as per volumetric measurements. The length of the trench shall be measured along its center line between the outside faces of 2 manholes. The width shall be the average of the width measured at the top and bottom of the trench. The depth shall be arrived at by measuring the depths at, atleast 3 places in the trench, and finding the average of the same. If the ground is undulating, then more than 3 readings shall be taken. The volumetric measurements shall be arrived at by length x Average width x Average depth.

c) Excavation in rock shall be paid on volumetric measurements of the stack after deducting 40% of the volume for voids. Volume of the stack shall be arrived at by using Simpson's Rule.

d) Manholes, chambers, septic tank shall enumerated and paid per number as described.

1) Unless otherwise stated, net length of all pipes shall be measured including all fittings such as bends, junction etc., in running meters. The length shall be taken along the center line of the pipes and fittings.

2) Length of fittings viz. taps, valves, traps, etc., which are paid under appropriate items shall not be measured under liner measurements as enumerated above.

3) Soil waste and vent pipes shall be measured along the center line of thestack including the connecting bends / tees to W.C. Pan, Nahani trap, etc., and shall be paid as enumerated above.

4) W.C. Pans, Lavatory basins, Sinks, Drain Boards, Urinals, Mirrors, Glass shelf, Toilet Paper Holder, shall be measured by number and shall include all accessories as enumerated in detail specification under each item.

5) Unless otherwise specified, all types of taps, valves, etc., shall be measured bynumber and paid separately.

6) Manholes, Inspection Chambers, Gully Traps, etc., shall be constructed according to detail specification, and measured by number and paid separately. The depth of Manhole shall mean the vertical distance from the top of the Manhole cover to the Outgoing invert of the main drain channel.

7) Water meter shall include "Y" strainer and other appurtenances required by the local bodies and shall include brick masonry chamber, with lockable cover etc., as per detailed specifications and items shall be measured by number and paid for accordingly or as or Schedule of Quantity.

Employer's Signature.	Contractor's Signature.

Signature of Contractor with Seal

THEORETICAL CEMENT CONSUMPTION STATEMENT (BASE CPWD)

No	Description of item of work.	Quantity of cement to be used per Unit Quantity of work.	Unit.
1	Cement Concrete (Cast in Situ) Plain or Reinforced.		
a.	1:1:2 (1 Cement : 1 Sand :2 Graded Aggregate).	12.20 Bags.	Cubic Meter
b.	1:1.5:3 (1 Cement:1.5 sand:3 Graded Aggregate).	8.00 Bags.	Cubic Meter
c.	1:2:4 (1 Cement : 2 Sand :4 Graded Aggregate).	6.40 Bags.	Cubic Meter
d.	1:3:6 (1 Cement : 3 Sand :6 Graded Aggregate).	4.40 Bags.	Cubic Meter
e.	1:4:8 (1 Cement : 4 Sand :8 Graded Aggregate).	3.40 Bags.	Cubic Meter
f.	1:5:10(1 Cement : 5 Sand :10 Graded Aggregate).	2.60 Bags.	Cubic Meter
g.	Providing and laying cement concrete 1:2:4 (1 Cement: 2 Coarse Sand: 4 Graded Aggregate of 20 mm. nominal size) including finishing exposed surface with 6 mm. thick cement mortar 1:3 (1 Cement: 3 Fine Sand). Kerbs, Steps, and the like.	7.02 Bags.	Cubic Meter
h.	String or lacing courses, parapets, coping, bed blocks, anchor blocks, plain window cills and the like mouldings in cornices, window cills etc.	7.62 Bags.	Cubic Meter
2.	Cement Mortar		
a.	1:1 (1Cement: 1 Sand)	20.40 Bags.	Cubic Meter
b.	1:2 (1Cement: 2 Sand)	13.60 Bags.	Cubic Meter
c.	1:3 (1Cement: 3 Sand)	10.20 Bags.	Cubic Meter
d.	1:4 (1Cement: 4 Sand)	7.60 Bags.	Cubic Meter
e.	1:5 (1Cement: 5 Sand)	6.20 Bags.	Cubic Meter
f.	1:6 (1Cement: 6 Sand)	5.00 Bags.	Cubic Meter

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g.	1:2 (1Cement: 2 Stone Dust)	13.60 Bags.	Cubic Meter
h.	1:2 (1Cement: 2 Marble Dust)	13.60 Bags.	Cubic Meter
i.	1:5 (1Cement: 5 Marble Dust)	6.20 Bags.	Cubic Meter
j.	1:1:3 (1Cement: 1 Marble Dust: 3 Stone Dust)	7.60 Bags.	Cubic Meter
k.	White Cement Mortar 1:2 (1 White Cement : 2 Marble Dust)	13.60 Bags.	Cubic Meter
l.	White Cement Mortar 1:3 (1 White Cement : 3 Marble Dust)	10.20 Bags.	Cubic Meter
m.	White Cement Mortar 1:5 (1 White Cement : 5 Marble Dust)	6.20 Bags.	Cubic Meter
3.	Cement Lime Mortar		
a.	1:1:3 (1 Cement:1 Lime putty:3 Sand)	8.20 Bags.	Cubic Meter
b.	1:1:6 (1 Cement:1 Lime putty:6 Sand)	5.00 Bags.	Cubic Meter
4.	Brick Work in All Classes		
a.	In Cement Mortar 1:3 (1 Cement:3 Sand)	2.56 Bags.	Cubic Meter
b.	In Cement Mortar 1:4 (1 Cement:4 Sand)	1.90 Bags.	Cubic Meter
c.	In Cement Mortar 1:5 (1 Cement:5 Sand)	1.56 Bags.	Cubic Meter
d.	In Cement Mortar 1:6 (1 Cement:6 Sand)	1.24 Bags.	Cubic Meter
5.	Half Brick Work in All Classes		
a.	In Cement Mortar 1:3 (1 Cement:3 Sand) With or without hoop iron.	28.56 Bags per 100 Square Meter	
b.	In Cement Mortar 1:4 (1 Cement:4 Sand)	21.28 Bags per 100 Square Meter	
c.	In Cement Mortar 1:5 (1 Cement:5 Sand)	14.50 Bags per 100 Square Meter	
d.	Moulding and cornices in brick masonry in cement mortar 1:4 Cement:4 Sand) Joining old brick work with new brick work.	0.18 Bags per 100 Square Meter per cm. girth	
	a) Old Brick in metric or FPS. System with new brick work in metric system in cement mortar 1:4 (1 Cement : 4 Sand).	4.20 Bags per 100 Square Meter	

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	b) Old Brick work in FPS. System with new brick work in cement mortar 1:4 (1 Cement: 4 Sand).	5.44 Bags per 100 Square Meter	
6.	Random Rubble Masonry		
a.	Cement Mortar 1:6 (1 Cement : 6 Sand)	1.70 Bags.	Cubic Meter
b.	Cement Lime Mortar 1:1:8 (1 Cement : 1 Lime Putty : 8 Sand)	1.32 Bags.	Cubic Meter
7.	Coursed Rubble Masonry		
a.	Cement Mortar 1:6 (1 Cement : 6 Sand)	1.50 Bags.	Cubic Meter
8.	Ashlar Masonry In plain ashlar punched (ordinary) in superstructure in cement mortar 1:6 (1 Cement : 6 Sand) including pointing with cement mortar 1:2 (1Cement:6 Stone dust) with an admixture of pigment matching the stone shade.	1.08 Bags.	Cubic Meter
9.	Stone Veneering Work For wall lining etc., average thickness 40 mm. to 170 mm. in cement lime mortar 1:1:6 (1Cement:1 Lime Putty:6 Sand) including pointing in White cement mortar 1:2 (1 White Cement : 2 Stone Dust) with an admixture of pigment matching the stone shade.	17.50 Bags per 100 Square Meter	
10.	Marble work in steps jambs, walls, pillars and other plain work in cement mortar 1:4 (1 Cement : 4 Sand) including pointing in White cement mortar 1:2 (1 Cement : 2 Marble dsust).	0.136 Bags per 1.52 Bags per	Cubic Meter (Grey Cement) Cubic Meter (White Cement)
11.	Marble work in steps jambs, walls, pillars and other plain work in cement mortar 1:4 (1 Cement : 4 Sand) including pointing in cement mortar (1 Cement : 2 Marble dsust).	1.66 Bags per	Cubic Meter
12.	Marble work for wall lining (Veneer) work) 2.5 cm. thick in cement mortar 1:3 (1 Cement : 3 Sand) including pointing in White cement mortar 1:2 (1 Cement : 2 Marble dust).	14.28 Bags per 100 Square Metre (Grey Cement) 3.40 Bags per 100 Square Metre (White Cement)	
13.	Marble work for wall lining (Veneer) work) 2.5 cm. thick in cement mortar 1:3 (1 Cement : 3 Sand) including pointing in cement mortar 1:2 (1	17.68 Bags per	Square Meter

	Cement : 2 Marble dust).		
14.	Marble work for wall lining (Veneer) work) 4 cm. thick in cement mortar 1:3 (1 Cement : 3 Sand) including pointing in White cement mortar 1:2 (1 Cement : 2 Marble dust).	20.40 Bags per 100 Square Metre. (Grey Cement) 3.40 Bags per 100 Square Metre (White Cement)	
15.	Marble work for wall lining (Veneer) work) 4 cm. thick in cement mortar 1:3 (1 Cement : 3 Sand) including pointing in cement mortar 1:2 (1 Cement : 2 Marble dust).	23.80 Bags per 100 Square Metre.	
16.	Cement Concrete Flooring Flooring 1:2:4 (1 Cement : 2 Sand : 4 Graded Stone Aggregate) finished with a floating coat of neat cement including cement slurry rounding of edges and strips etc., but excluding cost of nosing of steps etc., complete.		
a.	25 mm. thick with 20 mm. nominal size stone aggregate.	0.244 Bags	Square Meter
b.	40 mm. thick with 20 mm. nominal size stone aggregate.	0.34 Bags	Square Meter
c.	50 mm. thick with 20 mm. nominal size stone aggregate.	0.404 Bags	Square Meter
d.	75 mm. thick with 20 mm. nominal size stone aggregate.	0.564 Bags	Square Meter
17.	Cement Plaster Skirting (upto 30 cm. height) with cement mortar 1:3 (1 Cement : 3 Coarse Sand) finished with a floating coat of neat cement including rounding of junctions with floor, including slurry complete.		
a.	18 mm. thick.	0.32 Bags	Square Meter
b.	21 mm. thick.	0.35 Bags	Square Meter
18.	Pavement (25 to 50 mm. thick) with 1:2:4 (1 Cement : 2 Coarse Sand : 4 Graded Stone Aggregate 20 mm. nominal size) including finishing complete.	6.80 Bags	Cubic Meter
19.	Terrazo Flooring 40 mm. thick marble chips flooring rubbed and polished to granolithic finish, under layer 34 mm. thick cement concrete 1:2:4 (1 Cement: 2 Coarse Sand : 4 Graded Stone Aggregate 12.5 mm. nominal size) and top layer 6 mm. thick with white,		

	black or white and black marble chips of size 1 mm. to 4 mm. nominal size laid in cement marble powder 3:1 mix. (3 Cement : 1 Marble Powder) by weight in proportion of 4:7 (4 Cement marble powder) by weight in marble powder mix:7 Marble chips) by volume including cement slurry etc., complete.		
a.	Dark shade / Light shade pigment with ordinary cement.	0.339 Bags per	Square Meter
b.	Light shade pigment with white cement.	0.258 Bags per 0.081 Bags per	Square Meter (Grey Cement) (White Cement)
c.	Medium shade pigment with approximately 50% white cement and 50% ordinary cement.	0.298 Bags 0.0440 Bags per	Square Meter (Grey Cement) (White Cement)
20	40 mm. thick marble chips flooring rubbed and polished to granolithic finish, under layer 31 mm. thick cement concrete 1:2:4 (1 Cement: 2 Coarse Sand : 4 Graded Stone Aggregate 12.5 mm. nominal size) and top layer 9 mm. thick marble chips, chips, size 4 to 7 mm. size, laid in cement marble powder mix. 3:1) (3 Cement : 1 Marble Powder) by volume in proportion of 4:7 (4 Cement marble powder mix. 7 Marble chips) by volume including cement slurry etc., complete.		
a.	Dark shade / Light shade pigment with ordinary cement.	0.357 Bags	Square Meter
b.	Light shade pigment with white cement.	0.241 Bags 0.116 Bags	Square Meter (Grey Cement) Square Meter (White Cement)
c.	Medium shade pigment with approximately 50% white cement and 50% ordinary cement.	0.299 Bags 0.058 Bags	Square Meter (Grey Cement) Square Meter (White Cement)
21	40 mm. thick marble chips flooring rubbed and polished to granolithic finish, under layer 28 mm. thick cement concrete 1:2:4 (1 Cement: 2 Coarse Sand : 4 Graded Stone Aggregate 12.5 mm. nominal size) and top layer 9 mm. thick marble		

	chips, chips, sizes 7 mm to 10 mm. nominal size, laid in cement marble powder mix. 3:1) by weight in proportion of 2:3 (2 Cement Marble Powder mix. 3 Marble Chips) by volume including cement slurry etc., complete.		
a.	Dark or Light shade pigments with grey cement.	0.381 Bags	Square Meter
b.	Light shade pigment or without any pigment with white cement.	0.219 Bags 0.162 Bags	Square Meter (Grey Cement) Square Meter (White Cement)
c.	Medium shade pigment with approximately 50% grey cement and 50% white cement.	0.300 Bags 0.081 Bags	S.M. (Grey Cement) S.M.(White Cement)
22	Marble chips skirting (up to 300 mm high) rubbed and polished to granolithic finish top layer 6 mm. thick marble chips of sizes from smallest to 4 mm. nominal size laid to cement marble powder mix. 3:1 (3 Cement: 1 Marble Powder mix. By weight in proportion of 4:7 (4 Cement Marble Powder mix: 7 marble chips) by volume including cement slurry complete.		
a.	18 mm. thick with under layer 12 mm. thick cement plaster 1:3 (1 Cement: 3 Course Sand) dark or light shade pigment with grey cement.	0.298 Bags	Square Meter
b.	Light shade pigment or no pigment with cement.	0.217 Bags Square Meter (Grey Cement) 0.081 Bags Square Meter (White Cement)	
c.	Medium shade colour pigment with 50% grey cement and 50% white cement.	0.258 Bags Square Meter (Grey Cement) 0.0406 Bags Square Meter (White Cement)	
d.	21 mm. thick with under layer 15 mm. thick cement plaster 1:3 (1 Cement: 3 Course Sand) dark or light shade pigment with grey cement.	0.327 Bags	Square Meter
e.	Light shade pigment or no pigment with white cement.	0.246 Bags Square Meter (Grey Cement) 0.081 Bags Square Meter (White Cement)	
f.	Medium shade pigment with 50% grey cement and 50% white cement.	0.286 Bags Square Meter (Grey Cement) 0.04 Bags Square Meter (White Cement)	
23.	Tile Flooring :		

a.	Precast terrazzo tiles 20 mm. thick white black or white and black marble chips of size up to 6 mm. laid in floors treads of steps and landings jointed with neat cement slurry mixd with pigment to match the shade of the tile including rubbing polishing with precast tiles of 30 mm. thick bed of lime mortar 1:1.2 or 1:3 light shade using white cement.	0.088 Bags Square Meter (Grey Cement) 0.088 Bags Square Meter (White Cement)	
b.	Medium shade colour pigment with 50% white cement and 50% grey cement.	0.132 Bags Square Meter (Grey Cement) 0.044 Bags Square Meter (White Cement)	
c.	Dark shades using ordinary cement precast terrazo tiles 20 mm. thick with marble chips of size 6 mm. in skirting and risers of steps not exceeding 30 cm. in height on wall, laid on 12 mm. thick cement plaster 1:3 mix. (1 Cement: 3 Sand) joint with neat cement slurry, light shades using white cement.	0.235 Bags Square Meter (Grey Cement) 0.044 Bags Square Meter (White Cement)	
d.	Medium shade colour pigment with 50% white cement and 50% ordinary cement.	0.257 Bags Square Meter (Grey Cement) 0.022 Bags Square Meter (White Cement)	
e.	Dark shades using ordinary cement.	0.279 Bags	Square Metre
24.	ChequeredTerrazo Tile Flooring		
a.	ChequeredTerrazo Tile 22 mm. thick with marble chips of sizes upto 6 mm. in floors, jointed with neat cement slurry mixed with pigment to match the shade of the tiles including robbing, polishing complete on 28 mm. thick bed of lime mortar 1:1.2 or 1:3.		
a.	Light shade using white cement.	0.088 Bags Square Meter (Grey Cement) 0.096 Bags Square Meter (White Cement)	
b.	Medium shades using 50% grey cement and 50% white cement.	0.136 Bags Square Meter (Grey Cement) 0.048 Bags Square Meter (White Cement)	
c.	Dark shade using grey cement.	0.184 Bags Square Meter (Grey Cement)	
d.	ChequeredTerrazo Tile 30 mm. thick with marble chips of sizes upto 6 mm. in stairs, treads, jointed with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing polishing rounding of nosing etc., complete on 20 mm. bed of :		

	Lime mortar 1:1:1 (1 Lime putty:1 Surkhi:1 Coarse Sand) :		
i.	Light shade using white cement.	0.088 Bags Square Meter (Grey Cement) 0.136 Bags Square Meter (White Cement)	
ii.	Medium shades using 50% grey cement and 50% white cement.	0.154 Bags Square Meter (Grey Cement) 0.066 Bags Square Meter (White Cement)	
iii.	Dark shade using grey cement.	0.220 Bags Square Meter (Grey Cement)	
e.	Cement mortar 1:4 (1 Cement:4 Coarse Sand)		
i.	Light shade using white cement.	0.258 Bags Square Meter (Grey Cement) 0.132 Bags Square Meter (White Cement)	
ii.	Medium shades using 50% grey cement and 50% white cement.	0.324 Bags Square Meter (Grey Cement) 0.066 Bags Square Meter (White Cement)	
iii.	Dark shade using grey cement.	0.39 Bags Square Meter (Grey Cement)	
25.	White Glazed Tiles.		
	White Glazed Tiles 5,6 or 7 mm. thick in flooring treads risers of steps skirting and dado on 12 mm. thick cement plaster 1:3 (1 Cement : 3 sand) in base and cement joined with white cement slurry etc. complete.	0.188 Bags Square Meter (Grey Cement) 0.050 Bags Square Meter (White Cement)	
26.	Marble Stone Flooring		
	Marble Stone slab flooring over 20 mm. thick base of lime mortar 1:1:1 (1 Lime putty:1 Surkhi:1 Sand) and jointed with grey cement slurry etc. (all marble slabs).		
a.	20 mm. thick	0.098 Bags Square Meter	
b.	30 mm. thick	0.102 Bags Square Meter	
c.	40 mm. thick	0.107 Bags Square Meter	
	Marble stone slab flooring over 20 mm. thick base of cement mortar 1:4 (1 Cement:4 Sand) and jointed with grey cement slurry etc., (all marble slabs).		
d.	20 mm. thick	0.268 Bags Square Meter	
e.	30 mm. thick	0.273 Bags Square Meter	
f.	40 mm. thick	0.277 Bags Square Meter	
g.	Extra if white cement slurry is used instead of grey cement slurry in joints of marble stone flooring.	0.015 Bags Square Meter (White Cement)	
h.	Marble slabs 30 mm. thick in risers of steps, skirting dado, wall and pillars, laid on 12 mm. thick cement mortar 1:3 (1 Cement : 3 Sand) and jointed with grey cement slurry.	0.246 Bags Square Meter (White Cement)	
27.	Kotah Stone Flooring		

	Kotah stone slab flooring over 20 mm. thick base of lime mortar 1:1:1 (1 Lime putty:1 Surkhi:1 Sand) and jointed with neat cement slurry etc.		
a.	25 mm. thick	0.128 Bags Square Meter	
b.	30 mm. thick	0.136 Bags Square Meter	
c.	40 mm. thick	0.152 Bags Square Meter	
	Kotah Stone slab flooring over 20 mm. thick base of cement mortar 1:4 (1 Cement:4 Sand) and jointed with neat cement slurry etc.		
d.	25 mm. thick	0.298 Bags Square Meter	
e.	30 mm. thick	0.306 Bags Square Meter	
f.	40 mm. thick	0.322 Bags Square Meter	
g.	Kotah stone slab 25 mm. thick risers of steps, skirting, dado and pillar laid on 12 mm. thick cement mortar 1:3 (1 Cement:3 Sand) and jointed with neat cement slurry etc.	0.275 Bags Square Meter	
28	Sand Stone Flooring		
a.	40 mm. thick sand stone flooring over 20 mm. thick base of cement mortar 1:5 (1 Cement :5 Sand) with joints finish flush.	0.155 Bags Square Meter	
b.	40 mm. thick sand stone flooring over 20 mm. thick base of cement mortar 1:5 (1 Cement :5 Sand) including pointing with cement mortar 1:2 (1 Cement : 2 Stone Dust).	0.186 Bags Square Meter	
c.	40 mm. thick sand stone flooring over 20 mm. thick base of lime mortar 1:1:1 (1 Lime :1 Surkhi:1 Sand) including pointing with cement plaster 1:2 (1 Cement :2 Stone Dust).	0.031 Bags Square Meter	
d.	40 mm. thick fine dressed and rubbed stone flooring over 20 mm. thick base of cement mortar 1:5 (1 Cement :5 Sand) with joints 5 mm. thick finished flush.	0.166 Bags Square Meter	
e.	40 mm. thick fine dressed and rubbed stone flooring over 20 mm. thick base of lime mortar 1:5 (1 Cement : 5 Sand) with joints 5 mm. thick including pointing with cement mortar 1:2 (1 Cement : 2 Stone Dust).	0.196 Bags Square Meter	

f.	25 mm. thick cast iron grid flooring using grid tiles of required size weighing 47 kg. per square metre on bed of 12 mm. thick cement concrete 1:2 (1 Cement : 2 Stone Aggregate 6 mm. nominal size) including filling the hollows with cement concrete same mix and tamping with 10 mm. dia. iron bars and grouting the joints with neat cement slurry complete.	0.025 Bags Square Meter
g.	Filling cement concrete 1:2:4 (1 Cement :2 Coarse Sand : 4 Graded Stone Aggregate 12.5 mm. nominal size) in gaps of A.C.Sheet corrugations and wings of ridges.	3.82 Bags Square Meter
29.	Cement Plaster	
a.	12 mm. 1:3 (1 Cement : 3 Sand).	14.68 100 Square Metre
b.	12 mm. 1:4 (1 Cement : 4 Sand).	10.94 100 Square Metre
c.	12 mm. 1:5 (1 Cement : 5 Sand).	8.92 100 Square Metre
d.	12 mm. 1:6 (1 Cement : 5 Sand).	7.20 100 Square Metre
e.	15 mm. 1:3 (1 Cement : 3 Sand).	17.54 100 Square Metre
f.	15 mm. 1:4 (1 Cement : 4 Sand).	12.08 100 Square Metre
g.	15 mm. 1:5 (1 Cement : 5 Sand).	10.66 100 Square Metre
h.	12 mm. 1:6 (1 Cement : 6 Sand).	8.60 100 Square Metre
i.	20 mm. 1:3 (1 Cement : 3 Sand).	22.84 100 Square Metre
j.	20mm. 1:4 (1 Cement : 4 Sand).	17.02 100 Square Metre
k.	20 mm. 1:5 (1 Cement : 5 Sand).	13.88 100 Square Metre
l.	20 mm. 1:6 (1 Cement : 6 Sand).	11.20 100 Square Metre
30.	Cement Plaster with a Floating Coat of neat cement	
a.	12 mm. 1:3 (1 Cement: 3 Sand).	19.08 100 Square Metre
b.	12 mm. 1:4 (1 Cement: 4 Sand).	15.34 100 Square Metre
c.	12 mm. 1:3 (1 Cement: 3 Sand).	21.94 100 Square Metre
d.	12 mm. 1:4 (1 Cement : 4 Sand).	17.48 100 Square Metre
e.	15 mm. 1:3 (1 Cement : 3 Sand).	27.24 100 Square Metre
f.	15 mm. 1:4 (1 Cement : 4 Sand).	21.42 100 Square Metre
31.	Cement Plaster in two coats	
a.	20 mm. Cement Plaster in two coats under layer 12 mm. cement plaster 1:4 (1 Cement :4 Sand) finished with a top layer 8 mm. thick cement plaster 1:3 (1 Cement : 3 Sand)	20.00 Bags per 100 Square Metre

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b.	18 mm. thick Cement Plaster in two coats under layer 12 mm. thick cement plaster 1:5 (1 Cement :5 Sand) finished with a top layer 6 mm. thick cement plaster 1:3 (1 Cement : 3 Sand)	16.26 Bags per 100 Square Metre
32.	6 mm. Cement Plaster	
a.	6 mm. Cement Plaster to ceiling 1:3 (1 Cement :3 Sand)	7.34 Bags per 100 Square Metre
b.	6 mm. Cement Plaster to ceiling 1:4 (1 Cement :4 Sand)	5.48 Bags per 100 Square Metre
c.	6 mm. Cement Plaster to ceiling 1:3 (1 Cement :3 Sand) finished with a floating coat of neat cement.	11.74 Bags per 100 Square Metre
d.	Neat Cement Punning.	4.40 Bags per 100 Square Metre
33.	Sand Cement Neeru Finished Plaster	
a.	Sand cement smooth neeru finished plaster for ceiling in cement mortar mix 1:4 (1 Cement :4 Sand), 10 to 15 mm. thick average, finished top smooth with neeru.	13.00 Bags per 100 Square Metre
b.	Sand cement smooth neeru finished plaster for walls in cement mortar mix 1:4 (1 Cement :4 Sand), 18 to 20 mm. thick average, finished top smooth with neeru.	19.00 Bags per 100 Square Metre
34.	Rough Cast Plaster	
	Rough Cast Plaster with a mixture of sand and gravel or crushed stone from 2.36 mm. to 12.5 mm. nominal size dashed over and including the fresh plaster in two layers, top layer 10 mm. cement plaster 1:3 (1 Cement: 3 Sand) mixed with 10% finely grounded hydrated lime by volume of cement and under layer 12 mm. cement plaster : 1:4 (1 Cement: 4 Sand)	
a.	With ordinary cement finish or cement pigment finish.	23.18 Bags per 100 Square Metre
b.	With white cement and pigment finish.	10.94 Bags 100 Sqm.(Grey Cement) 12.24 Bags 100 Sqm. (White Cement)
	1:5 Cement Sand (1 Cement:5 Sand)	
c.	With ordinary cement finish or cement and pigment finish.	21.16 Bags 100 Sqm.(Grey Cement)
d.	With white cement and pigment finish.	8.92 Bags 100 Sqm.(Grey Cement) 12.24 Bags 100 Sqm. (White Cement)
35.	Pointing on Stone Work	

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a.	Flush or ruled pointing on stone work with cement mortar 1:3 (1 Cement : 3 Sand)	2.34 Bags per 100 Square Metre
b.	Raised and cut pointing in stone work with cement mortar 1:3 (1 Cement : 3 Sand)	3.88 Bags per 100 Square Metre
36.	Waterproofing	
a.	Proprietary waterproofing treatment to the terrace with brick-bat coba, cement base.	55.00 Bags per 100 Square Metre
b.	Proprietary waterproofing treatment to the canopy with brick-bat coba, cement base.	45.00 Bags per 100 Square Metre
c.	Waterproofing chajja with sand cement plaster average 25 mm. thick in cement mortar 1:3 (1 Cement :3 Sand)	25.00 Bags per 100 Square Metre
d.	Proprietary waterproofing treatment to the sunk portion of toilet, cement base.	30.00 Bags per 100 Square Metre

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THEORETICAL CEMENT CONSUMPTION STATEMENT (BASE CPWD)

No	Description of item of work.	Quantity of cement to be used per Unit Quantity of work.	Unit.
1.	Cast Iron Pipes		
	Providing and fixing on wall face C.I. rain water pipes including filling the joints with spun yarn soaked in neat cement slurry and cement mortar 1:2 (1 Cement : 2 Sand)		
a.	75 mm. dia pipe	0.132 Bags per 100 Metre	
b.	105 mm. dia pipe	0.176 Bags per 100 Metre	
c.	150 mm. dia pipe	0.264 Bags per 100 Metre	
2.	Cast Iron Accessories		
	Providing and fixing on wall face C.I. Accessories for rain water pipes including filling the joints with spun yarn soaked in neat cement slurry and cement mortar 1:2 (1 Cement : 2 Fine Sand)		
a.	75 mm. dia pipe C.I. Plain bend.	0.0052	Each
b.	100 mm. dia pipe C.I. Plain bend.	0.0062	Each
c.	150 mm. dia pipe C.I. Plain bend.	0.010	Each
d.	75 mm. dia C.I. head flat or corner type.	0.003	Each
e.	100 mm. dia C.I. head flat or corner type.	0.003	Each
f.	150 mm. dia C.I. head flat or corner type.	0.0052	Each
g.	75 mm. dia C.I. plain shoe.	0.003	Each
h.	100 mm. dia C.I. plain shoe.	0.003	Each
i.	150 mm. dia C.I. plain shoe.	0.0052	Each
j.	75 mm. dia C.I. single branch (plain)	0.0052	Each
k.	100 mm. dia C.I. single branch (plain)	0.0062	Each
l.	150 mm. dia C.I. single branch (plain)	0.0010	Each
m.	75 mm. dia C.I. double branch (plain)	0.008	Each
n.	100 mm. dia C.I. double branch (plain)	0.009	Each
o.	150 mm. dia C.I. double branch (plain)	0.0052	Each
p.	C.I. off-sets (plain) 75 mm. dia. 55 mm. projection.	0.0052	Each

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q.	C.I. off-sets (plain) 75 mm. dia. 150 mm. projection.	0.0052	Each
r.	C.I. off-sets (plain) 100 mm. dia. 55 mm. projection.	0.0052	Each
s.	C.I. off-sets (plain) 100 mm. dia. 55 mm. projection.	0.0062	Each
t.	C.I. off-sets (plain) 100 mm. dia. 75 mm. projection.	0.0062	Each
3.	A.C. Fittings & Pipes		
	Providing and fixing on wall face asbestos cement rain water pipes including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 Cement 2 Coarse Sand) complete.		
a.	50 mm. dia.	0.150	100 Metre
b.	80 mm. dia.	0.250	100 Metre
c.	100 mm. dia.	0.300	100 Metre
d.	150 mm. dia.	0.320	100 Metre
e.	Providing and fixing A.C. Pipe (or any diameter) wall plugs and standard holder bat clamps comprising of two semi-circular halves of flat and cast iron base screwed on wooden plugs.	0.0004	100 Metre
f.	Providing and fixing on wall face asbestos cement rain water pipes including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 Cement 2 Coarse Sand) complete.		

		50 mm. (2”)	80 mm. (3”)	100 mm. (4”)	Unit
g.	Bend of required degree with door or without door.	0.0072	0.012	0.015	Each
h.	Off-set 52.2 mm. projection.	0.0058	0.0090	0.0116	Each
i.	Off-set 76.2 mm. projection.	0.0058	0.0090	0.011	Each
j.	Off-set 114.3 mm. projection.	0.0058	0.0090	0.0116	Each
k.	Off-set 152.4 mm. projection.	0.0058	0.0090	0.0116	Each
l.	Off-set 228.6 mm. projection.	0.0058	0.0090	0.0116	Each
m.	Off-set 304.8 mm. projection.	--	0.0090	0.0116	Each
n.	Off-set 457.2 mm. projection.	--	0.0090	0.0116	Each
o.	Off-set 609.6 mm. projection.	--	--	0.0116	Each
p.	Junction equal single of required degree with or without door.	0.0072	0.0116	0.0146	Each
q.	Junction equal double with or without door or required degree.	0.0108	0.0174	0.0220	Each

r.	Standard shoe.	0.00400	0.0058	0.0058	Each

4.	Sanitary Fittings		
a.	Fixing long pan pattern or Orissa pattern squatting pan or pedestal type water closet 12.5 litres or 15 litres flushing cistern and brackets, telescopic flush pipe or bend with fittings and clamps, overflow pipe with specials and mosquitoproof coupling complete including cutting and making good the walls and floors.	0.10	Each
	Fixing flat back or wall corner type, lipped front, urinal basin of 430 x 260 x 350 mm. and 340 x 430 x 265 mm. size respectively, white glazed earthenware with automatic C.I. flushing cistern with fittings, brackets, standard size flush pipe and spreaders with brass union and G.I. clamps complete including painting of cistern and fittings, cutting and making good the walls and floors.	0.050	Each
b.	One urinal basin with 5 litres C.I. automatic flushing cistern.	0.050	Each
c.	Range of two urinal basins with 10 litres C.I. automatic flushing cistern.	0.08	Each
d.	Range of three urinal basins with 10 litres C.I. automatic flushing cistern.	0.134	Each
e.	Range of four urinal basins with 15 litres C.I. automatic flushing cistern.	0.190	Each
	Fixing white glazed fire clay stall urinal with automatic C.I. flushing cistern with fittings R.S. or C.I. brackets standard size C.P. brass flush pipe and spreaders with unions and clamps, C.I. trap with outlet grating and other coupling in C.P. brass including painting of cistern and fittings, cutting and making good the walls and floors.		
f.	Single stall urinal with 5 litres C.I. automatic flushing cistern.	0.102	Each
g.	Range of two urinal basins with 10 litres C.I. automatic flushing cistern.	0.204	Each
h.	Range of three urinal basins with 10 litres C.I. automatic flushing cistern.	0.306 Bags	Each
i.	Range of four urinal basins with 15	0.406 Bags	Each

	litres C.I. automatic flushing cistern.		
	Fixing one piece construction white squatting plate urinal with an integral longitudinal flushing pipe 100 mm. dia. half round channel automatic C.I. flushing cistern with fittings R.S. or C.I. brackets, standard size. G.I. flush pipe for back and front flush with standard spreader pipes with fittings G.I. clamps, white vitreous tiling 1200 mm. high to the front and side walls with white vitreous china corners and angles set in neat cement, standard urinals C.I. trap 65 mm. diameter with vent arm and outlet grating and coupling in C.P. brass complete, including painting the cistern and fittings and making good the walls and floors.		
j.	Single squatting plate with 5 litres C.I. automatic flushing cistern.	0.102 Bags	Each
k.	Range of two squatting plates with 10 litres C.I. automatic flushing cistern.	0.204 Bags	Each
l.	Range of three squatting plates with 10 litres C.I. automatic flushing cistern.	0.306 Bags	Each
m.	Range of four squatting plates with 15 litres C.I. automatic flushing cistern.	0.406 Bags	Each
n.	Fixing lavatory basin with brackets, pillar taps, rubber plug, waste of standard pattern, trap and unions complete including cutting and making good the walls.	0.050 Bags	Each
o.	Fixing white pedestal for wash basin completely recessed at the back for reception of pipes and fittings.	0.032 Bags	Each
p.	Fixing sink with brackets, 40 mm. rubber plus, brass chain, waste, trap with necessary unions complete including cutting and making good the walls.	0.050 Bags	Each
q.	Fixing teal-wood draining board with skirting and beading, wax polished with brackets painted white complete including making good the walls.	0.028 Bags	Each
5.	Sanitary Fittings (Items separately ordered)		

a.	Fixing long pan pattern or Orissa pattern squatting, or pedstal type W.C. pan.	0.050 Bags	Each
b.	Fixing a pair of white glazed earthenware or vitreous china foot rests of standard pattern for Indian type W.C. pan.	0.010 Bags	Each
c.	Fixing flat back or wall corner type lipped front urinal basin of 430 x 260 x 350 mm. and 340 x 430 x 265 mm.	0.020 Bags	Each
d.	Fixing white glazed fire clay stall urinal of standard size.	0.04 Bags	Each
e.	Fixing white squatting plate urinal with integral longitudinal flush pipe. .	0.040 Bags	Each
f.	Fixing wash basin including making all connections excluding cost of fittings.	0.030 Bags	Each
g.	Fixing kitchen sink including making all connections complete.	0.030 Bags	Each
h.	Fixing in position 32 mm. diameter glavanised steel telescopic flush pipe complete including cutting and making good the walls and floor.	0.020 Bags	Each
6.	Sand Cast Iron Pipe and Fittings		
a.	Fixing M.S. holder bat clamp to 100 mm. dia. sand cast iron pipe embedded in cement concrete blocks 10 x 10 x 10 cm. of cement concrete 1:2:4 (1 Cement : 2 Sand : 4 Stone Aggregate) including cost of cutting holes and making good the walls etc.	0.010 Bags	Each
b.	Fixing M.S. stays and clamps for 100 mm. diameter sand cast iron pipe.	0.010 Bags	Each
c.	Fixing M.S. holder bat clamps for 50 mm. diameter sand cast iron pipe embedded in cement concrete block 10 x 10 x 10 cm. of 1:2:4 (1 Cement : 2 Sand : 4 Stone Aggregate) including cost of cutting holes and	0.010 Bags	Each
	making good the walls etc.		
d.	Fixing M.S. stays and clamps for 50 mm. diameter sand cast iron pipe.	0.010 Bags	Each
e.	Fixing sand cast iron trap 100 mm. inlet 100 mm. outlet of selfcleaning design with sand cast iron screwed down or hinged grating with or without vent arm complete including cost of cutting without and making	0.050 Bags	Each

	good the walls and floor.		
f.	Fixing 100 mm. inlet and 50 mm. outlet sand cast iron floor trap of self cleaning design with sand cast iron screwed down or hinged grating with or without vent arm complete including cost of cutting and making good the walls and floors.	0.050 Bags	Each
7.	Asbestos Cement Soil, Waste and Vent Pipes and Fittings		
	Providing and fixing on wall face asbestos cement soil waste and vent pipe including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 Cement: 2 Sand) complete.		
a.	For 100 mm. diameter.	0.300 Bags	100 Metre
b.	For 50 mm. diameter.	0.150 Bags	100 Metre
	Fixing wooden plugs and standards holder bat clamps comprising of two semicircular halves of flat iron and cast iron base screwed on wooden plugs.		
c.	For 100 mm. diameter.	0.0004 Bags	Each
d.	For 50 mm. diameter.	0.0004 Bags	Each
	Providing and fixing A.C. bends of required degree with access door insertion rubber washer 3 mm. thick, bolts and nuts or plain bend of heel rest unitary bend including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 Cement : 2 Sand)		
e.	For 100 mm. diameter.	0.0020 Bags	Each
f.	For 50 mm. diameter.	0.0010 Bags	Each
	Providing and fixing double equal or unequal A.C. junctions of required degree plain or with access door, insertion, rubber washer 3 mm. thick bolts and nuts, including jointing with spun yarn cement mortar 1:2 (1 Cement : 2 Sand) complete.		
g.	100 x 100 x 100 x 100 mm. double equal junctions or 100 x 100 x 50 x 50 mm. double unequal junctions.	0.004 Bags	Each
h.	50 x 50 x 50 50 mm. double equal junctions.	0.002 Bags	Each
	Providing and fixing single equal or		

	unequal A.C. junctions of required degree plain or with access door, insertion, rubber washer 3 mm. thick bolts and nuts, including jointing with spun yarn cement mortar 1:2 (1 Cement : 2 Sand) complete.		
i.	100 x 100 x 100 x 100 mm. single equal junctions or 100 x 100 x 50 x 50 mm. single unequal junctions.	0.0030 Bags	Each
j.	50 x 50 x 50 50 mm. single equal junctions.	0.0016 Bags	Each
	Providing and fixing plain A.C. invert branch of required degree including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 Cement : 2 sand).		
l.	50 x 50 x 50 x 50 mm.	0.002 Bags	Each
m.	50 x 50 x 50 x 50 mm.	0.0016 Bags	Each
	Providing and fixing A.C. offset including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 Cement : 2 Sand)		
n.	100 mm. dia. A.C. offset with any projection.	0.002 Bags	Each
o.	50 mm. dia. A.C. offset with any projection.	0.0010 Bags	Each
	Providing and fixing A.C. loose socket including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 Cement : 2 Sand) complete.		
p.	100 mm.	0.002 Bags	Each
q.	50 mm.	0.0010 Bags	Each
	Providing and fixing A.C. Terminal guard including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 Cement : 2 Sand).		
r.	100 mm.	0.002 Bags	Each
s.	50 mm.	0.0010 Bags	Each
t.	Cutting chase in brick masonry walls for fixing 100 mm diameter sand cast iron pipes and making good the same with brick work in cement mortar 1:3 (1 Cement : 3 Sand)	10.00 Bags	100 Metre
u	Cutting chase in brick masonry walls for fixing 50 mm. diameter sand cast iron pipes and making good the same with the brick work in cement mortar	6.66 Bags	100 Metre

	1:3 (1 Cement : 3 Sand).		
8.	Drainage		
	Jointing glazed stone ware pipes grade "A" with stiff mixture of cement mortar in the proportion of 1:1 (1 Cement : 1 Sand)		
a.	100 mm. dia.	4.34 Bags	100 Metre
b.	150 mm. dia.	6.46 Bags	100 Metre
c.	200 mm. dia.	8.66 Bags	100 Metre
d.	230 mm. dia.	9.74 Bags	100 Metre
e.	250 mm. dia.	10.80 Bags	100 Metre
f.	300 mm. dia.	12.94 Bags	100 Metre
g.	450 mm. dia.	19.54 Bags	100 Metre
	Laying cement concrete 1:5:10 (1 Cement : 5 Sand : 10 Graded Stone Aggregate 40 mm. nominal size) alround S.W. pipe including bed concrete 15 cm. thick.:		
h.	100 mm. dia. S.W. Pipe.	47.32 Bags	100 Metre
i.	150 mm. dia. S.W. Pipe.	50.70 Bags	100 Metre
j.	200 mm. dia. S.W. Pipe.	58.24 Bags	100 Metre
k.	230 mm. dia. S.W. Pipe.	62.92 Bags	100 Metre
l.	250 mm. dia. S.W. Pipe.	66.04 Bags	100 Metre
m.	300 mm. dia. S.W. Pipe.	73.58 Bags	100 Metre
n.	350 mm. dia. S.W. Pipe.	81.12 Bags	100 Metre
o.	400 mm. dia. S.W. Pipe.	88.40 Bags	100 Metre
p.	450 mm. dia. S.W. Pipe.	96.20 Bags	100 Metre
	Laying cement concrete 1:5:10 (1 Cement : 5 Sand : 10 Graded Stone Aggregate 40 mm. nominal size) upto haunches of S.W. pipe including bed concrete 15 cm. thick.:		
q.	100 mm. dia. S.W. Pipe.	31.72 Bags	100 Metre
r.	150 mm. dia. S.W. Pipe.	34.84 Bags	100 Metre
s.	200 mm. dia. S.W. Pipe.	40.56 Bags	100 Metre
t.	230 mm. dia. S.W. Pipe.	44.20 Bags	100 Metre
u.	250 mm. dia. S.W. Pipe.	46.54 Bags	100 Metre
v.	300 mm. dia. S.W. Pipe.	52.26 Bags	100 Metre
w.	350 mm. dia. S.W. Pipe.	58.24 Bags	100 Metre
x.	400 mm. dia. S.W. Pipe.	62.96 Bags	100 Metre
y.	450 mm. dia. S.W. Pipe.	69.94 Bags	100 Metre
z.	Laying light duty non-pressure NP2 or P1 class R.C.C. pipes with collars jointed with stiff mixture of cement mixture of cement mortar in the proportion of 1:2 (1 Cement : 2 Sand) including joints etc.		

Z1.	100 mm. dia. R.C.C. pipe (NP2) or (P1)	1.00 Bags	100 Metre
Z2.	150 mm. dia. R.C.C. pipe (NP2) or (P1)	1.20 Bags	100 Metre
Z3	250 mm. dia. R.C.C. pipe (NP2) or (P1)	1.80 Bags	100 Metre
Z4.	300 mm. dia. R.C.C. pipe (NP2) or (P1)	2.20 Bags	100 Metre
Z5.	450 mm. dia. R.C.C. pipe (NP2) or (P1)	4.80 Bags	100 Metre
Z6.	500 mm. dia. R.C.C. pipe (NP2) or (P1)	5.20 Bags	100 Metre
Z7.	600 mm. dia. R.C.C. pipe (NP2) or (P1)	6.40 Bags	100 Metre
Z8.	700 mm. dia. R.C.C. pipe (NP2) or (P1)	7.40 Bags	100 Metre
Z9.	800 mm. dia. R.C.C. pipe (NP2) or (P1)	8.40 Bags	100 Metre
Z10	900 mm. dia. R.C.C. pipe (NP2) or (P1)	9.80 Bags	100 Metre
Z11	1000 mm. dia. R.C.C. pipe (NP2) or (P1)	11.00 Bags	100 Metre

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TECHNICAL SPECIFICATIONS FOR ELECTRICAL INSTALLATION WORK

SCOPE OF WORK:-

The Electrical Contractor's scope of work covers the following:-

Supply, testing prior to installation, testing after installation of electric meter/s and other installation and commissioning the complete Electrical Installation work associated with power supply system, lighting and domestic appliances, concealed wiring network as directed, earthing and lightning protection system, installing Heavy Gauge PVC / Black enamelled H.G. threaded conduits suitable for heavy mechanical stresses, concealed / open in slabs, walls / shafts, as required for Electrical wiring, telephones network and TV cable system for distribution in flats, basement, stilts etc., installing telephone and T.V. outlet boxes as required including fish wire. Telephone wires and co-oxial cable for T.V. outlets from the shafts as directed, alternate Emergency Power Panel including stand-by Diesel Generator Set and power supply network from this alternate stand-by D.G.Set, installation of fixtures and fittings issued by the Client or as ordered in B.O.Q. after testing, including holding their safe custody until handing over of the installation to the Clients, power supply to Domestic water pumps, fire pumps and any other related works for completion of the Building for its occupancy, Liaisoning with Electric Supply Company and / or Concerned Authorities and getting the installation approved by them and installation of electric meter/s is also included in the scope of Contractors work.

DRAWINGS, SPECIFICATION AND DEVIATIONS:-

The drawings and specification lay down minimum standards of equipment and workmanship. Should the tenderer wish to depart from the provision of the specification and drawings either on account of manufacturing practice or for any other reasons, he should clearly draw attention in his tender to the proposed points of departure and submit such information, drawings and specifications as will enable the relative merits of the deviations to be fully appreciated. In the absence of such information on the deviations, it will be deemed that the tenderer is fully satisfied with intents of the specification and drawings and their compliance with the statutory requirements, all the relevant I.S.Codes, I.E. Rules, Local Codes as governed by the Concerned Electric Supply Company, N.E.C. Electrical Inspector, etc.

The Contractor shall prepare fabrication and working drawings as well as concealed / open conduits layout drawings which will be got approved from the Architect / Clients / Consultants prior to execution and all work shall be to the approved working drawings. Approval of these drawings does not relieve the Contractor of his responsibility to meet the intents of specifications. All such drawings for approval are to be submitted in triplicate to the Owner / Consultants / Architects.

After virtually completing the work, the Contractors should submit AS BUILT drawings of all systems in triplicate along with his Final Bill.

SCOPE:-

The Scope of work shall cover the supply, installation and commissioning of all the power panels, incorporating circuit breakers, switch fuse units, busbars, interconnections, earthing etc., meeting the requirements shown in equipment schedule and the drawings.

Entire works shall comply with the latest issue of following standards, rules, codes of practice, unless specified otherwise in the specific requirements.

STANDARDS:-

The following standards and rules shall be applicable:-

IS : 2516	:	Specification for A.C. circuit breakers.
IS : 4047	:	Specification for heavy duty air breaker switch gear and fuses for Voltage not exceeding 1000 V.
IS : 3072	:	Code of practice for installation and Maintenance of Switch gear.
IS : 3106	:	Code of practice for selection, installation and maintenance of fuses (Voltage not exceeding 650 V).
IS : 4237	:	General requirements for switch gear and control gear for voltage not exceeding 1000 V.
IS : 2607	:	Air break isolators for voltage not exceeding 1000 V.
IS : 8623	:	Specification for factory built assemblies of switch gear and Control gear for voltage upto and including 1000 V. A.C. and 1200 V. D.C.
IS : 375	:	Marking arrangement of switch gear bus-bars main connections and auxiliary wiring.
IS : 694	:	PVC insulated copper wires for 650 / 1100 Volts grade.
IS : 1554	:	PVC insulated (heavy duty) electric cables for working voltages upto and including 1100 Volts.
IS : 3961	:	Recommended current rating for cables.
IS : 732	:	Codes of practice for electrical wiring.
IS : 2274	:	Installation (system voltage not exceeding 650 Volts).
IS : 12360	:	Voltage bands for electrical installation.

IS : 2309	:	Protection of building and allied structures against lighting.
IS : 4648	:	Guide for electrical layout in Residential Building.
IS : 1646	:	Fire Safety of Buildings.
IS : 5216	:	Guide for Safety Procedures and Practices in Electrical Work.
IS : 3043	:	Code of practice for earthing.
IS : 3202	:)	
IS : 4047	:)	Climate proofing of electrical equipement.
IS : 2147	:)	Heavy duty air-break switches and
IS : 4064	:)	Composite units of air-break switches.
	)	and fuses for voltages not exceeding
IS : 4237	)	1000 Volts.
	)	
IS : 6875	:)	
IS : 2208	:)	HRC cartridege fuse domestic and similar purpose.
IS : 5133(I)	:)	Boxes for enclosures of electrical accesscries.
IS : 3854	:)	Heavy duty air-break switches and
IS : 3452	:)	Switches for domestic and similar purpose.
IS : 371	:)	Three terminals ceiling roses.
IS : 4615	:)	
IS : 1293	:)	
	)	Switch socket outlet.
IS : 4160	:)	
IS : 4343	:)	
IS : 8828	:	Miniature air-break circuit breaker for A.C. circuits.
IS : 2312	:	Exhaust Fans.
IS : 374	:	Ceiling fans and regulators.
IS : 2082	:)	
IS : 3725	:)	Storage types electrical water heaters.

Signature of Contractor with Seal

IS : 2266 :	Call bells and buzzers for indoor use.
IS : 1534 :)	
IS : 1717 :)	
IS : 1913 :)	Luminaires, ballasts, maintenance and safety requirements.
IS : 10322 :)	
IS : 2713 :	Tubular poles for overhead power lines & street lights.
IS : 2551 :	Danger notice plates.
IS : 2509 :)	
)	Regid PVC conduits for electrcial wiring.
IS : 3419 :)	
IS : 9537, Part II :	Rigid M.S. conduits.
IS : 3480 :	Flexible steel conduits for electrical wiring.
TD-S-113-18	Code of practice by India Telephone – Department.
ITD-S/WS- :)	
144C,)	Insulation and conductor resistance of telephone
BS : 6746 :)	wires and cables.
IS : 4984 :)	HDPE pipe and fittings.
ITD-S/WS- :)	
113B,)	PVC insulated, colour coded, twisted into paris,
BS : 6746 :)	laid-up taped and overall.
CBL : 7000 :)	
BS : 6746 :)	PVC sheathed telephone cables.
IS : 1554 :)	
MUMBAI TELEPHONES	Revised code of practice for telephone wiring of multistoreyed Buildings – 1985.

Codes of practise of Indian Standards or relevant British Standards in the absence of Indian Electricity Act and Rules National Electrical Code, Local Regulation prevalent in Maharashtra

or the state which work-site exists, Regulations of Fire Insurance – Tariff Advisory Committee, Rgulations and Standards of Mahanagar Telephone Nigam Ltd., etc.

SYSTEM DETAILS:

Entire electrification work and its associated accessories shall be designed for the system data given hereunder.

Rated System Voltage	:	415 Volts (+/-) 10%, 3 – Phase, 4 Wire.
Rated System Frequency	:	50 Hz (+/-) 3%
Rated System Fault level	:	35 MVA at 415 Volts symmetrical.
Highest System Voltage	:	456 Volts r.m.s. line to line at 415 Volts.
Rated Lighting Control System Voltage	:	250 Volts, 1 – Phase, 2 Wire and earth, 50 Hz
System Earthing	:	Effectively earthed neutral.

All material and its associated accessories shall also be designed to withstand for the desired services due to fluctuations in supply voltage and variation in frequency as permissible under Indian Electricity Act and Rules.

Meter Room Works :

150 mm. dia. R.C.C. pipe/s shall be provided for laying of Electric Supply Company's power cables from outside of plinth protection upto a chamber in the meter room. In case the distance from the outer edge of the plinth protection upto the chamber in meter room is more than 2 meters additional pipes shall be laid and all the pipes shall be properly laid and jointed with collars etc. the pipe at the end of the plinth protection shall at the level of 600 mm. below the ground level.

One end of the R.C.C. pipe inside the meter room shall open in a brick masonry chamber of size 300 mm. x 600 mm. and 300 mm. deep.

One no. 8 SWG G.I. Wire shall be laid in the R.C.C. pipe for pulling the power cables.

One / two / three / four light point/s shall be provided in the meter room, the control switches for which shall be near the door but inside, from the wiring provided for the staircase lights. A teak wood plank of 20 mm. thick and varnished (with two coats) on all sides shall be provided in the meter room for fixing of Electric Supply Co s Bus System, Cutouts, I.C. cutouts for individual meters and ELMCBs for flats, cable end box to terminate main incoming supply cables shall be provided for the S.F. unit with suitable cable glands. O n the outgoing side of S.F. unit a 3 phase and neutral busbar chamber shall be provided. The busbars rating shall be 50% more than the capacity of the S.F.U. controlling it.

The lead wired to individual meters and cutouts shall be taken out from this busbar chamber. Each load distribution on all phases and the proper colour code is to be observed for lead wire. Lugs shall be crimped at both ends of these lead wires for termination.

Wherever the energy meters are to be fixed in the wooden meter box / cabinet, the same shall me made out of 50 mm. x 25 mm. wooden frame and 20 mm. thick wooden planks on all sides and metal grill shall be fixed on the front door (side). The door shall have locking arrangement and lock with keys shall be provided. The meter box shall be fixed
to the wall and before polishing / painting, anti-termite treatment shall be given to it. Polishing / painting, has to be done to all the sides of the box / cabinet.

The meter box shall accommodate main S.F.U. for terminating incoming cable, T.P.N. Bus chamber and other switch gears like I.C. cutouts main switches, ELMCBs energy meters etc. All meters, switches etc., shall be interconnected with wires of size suitable for the connected load / meter capacities as directed.

All wiring in the meter room related to metering etc. shall be carried out with single core PVC stranded copper wires of adequate size, fixed on the T.W. Plank with brass clips and brass takes. Earth wire shall be provided with the lead wires for connecting earth terminates of meters, main switches etc.

The Contractor shall submit the layout drawing of the meter room wherein all the above items shall be shown. This layout shall be got approved by the Contractor from the Clients as well as from the Electric Supply Co. In the meter room, outgoing from the meters will be taken to the main switch, ELMCB, the outgoing from which either cables or copper wires, as specified, will lead to the respective destinations as specified.

All codes and standards mean the latest, wherever not specified otherwise, the installation shall generally follow the I.S. codes of practice of the relevant Standard Codes of Practice in the absence of corresponding Indian Standard.

Switch fuse units and disconnects :

Switch fuse units shall have quick-make, quick-break silver plated preferable double break contacts, with operating mechanism suitable for rotary operation in the case of cubical mounting. All switches shall be rated according to equipment schedule or drawings, and shall withstand the system prospective fault current let through. Cam operated rotary switches with higher rating S.F. units shall be heavy duty type conforming to IS : 4047.

Fuses shall be HRC cartridge type conforming to IS:2208 with a breaking capacity corresponding to system fault level. Fuses shall be line type with visible indication. Screw type diazed fuses are not acceptable for any rating.

All disconnects shall consists of switch units quick-make, quake-break type with silver plated contacts. The switches shall preferably have double breaks. All switches shall be mounted in sheet steel enclosures, which in turn is mounted on suitable angle iron frame work. In wet location switches shall have cast iron enclosures Disconnects shall have minimum breaking capacity.

Cubical Boards :

All boards shall be combination of 14 & 16 SWG sheet steel, free standing, extensible totally enclosed. Dust-tight, vermin-proof cubical, flush dead front and modular construction suitable for 3 phase, 415 V, 4 Wire, 50 Hz system. All boards shall be accessible form the front for the maintenance of switches, Bus-bars, cable terminations, meters etc. Cables shall be capable of entering the board both from top as well as from bottom. All panels shall be machine pressed, with punched openings for meters etc. All sheet steel shall be rust infibited through a process of degreasing, acid pickling, phasephating etc. The panels shall be finished with two coats of synthetic enamel paint of approved colour over one coat of red oxide primer. Engraved plastic labels shall be provided indicating the feeder details including the size of the incoming / outgoing cables, capacity and danger signs.

Earthing:

All switches panels shall be provided with an earth bar as specified earthing of the switch boards shall be through the equipment earthing system provided in the building.

All meters shall be calibrated and tested through secondary injection tests.

All field tests shall be witnessed by Clients representatives, lost certificates shall be furnished by the Contractors.

Installation :

All panels shall be supported on MS Channels incorporated in the panel during the fabricating. All such supports shall be coated with primer followed by two coats of approved synthetic enamel colour paint. After completion of the work, all panels shall be touched up for damaged painting. All work shall be carried out as per IS: codes, I.E. Rules, NEC.

All panels shall be meggared at phase and phase to Neutral using 1000 V meggar with all outgoing feeders in closed position. The meggar value should not be less than 2.50 megohms between phases and 1.50 megohme between phase and neutral.

Fabrication drawings of all panels shall be submitted by the Contractor to the Clients in triplicate and they shall proceed for fabrication after Clients approval.

Testing and Inspection :

All switch boards shall be factory inspected before finishing and dispatch, with the Clients representatives.

Certificate for all routine and type tests for circuit-breakers in accordance with IS:2516-1963 shall be furnished from the manufactures. In addition, all panels shall be meggared phase to phase and phase to Neutral, using 1000 V meggar with all the switchgear in closed position. The meggar value should not be less than 2.50 megohms between phases and 1.50 megohms between phase and Neutral.

Distribution Board :

Scope :

The scope of work shall cover supply, installation, testing and commissioning of lighting and power distribution boards. Associated civil work required for the erection of the D.B.S. is also included in the scope of this contract.

Standards :

The following standards and rules shall be applicable :

1)	IS : 2675 – 1983	:	Enclosed distribution fuse boards and cutouts for Voltage not exceeding 1000 V
2)	IS : 375 – 1963	:	Marking and arrangement of switchgear busbars main connections and auxillary wiring.
3)	IS : 8828 – 1978	:	Miniature circuit-breakers.
4)	IS : 2607 – 1976	:	Air-break isolators for Voltage not exceeding 1000 V.
5)	IS : 9926 – 1981	:	Fuse wire used in rewirable type Elec. fuses upto 650 V.

6) Indian Electricity Act 1910 and Amendments issued there under.

All codes and standard mean the latest, where not specified otherwise, the installation shall generally follow Indian Standards Codes of Practice and the relevant British Codes of Practice in the absence of Indian Standard.

Distribution boards along with the controlling M.C.B.s, Fuse or Isolator as shown be fixed in an M.S. Box, suitable for recessed mounting and in wall. D.B.S. should be factory made from the standard "approved" manufactures and not fabricated by the tenderer. D.B.S. shall be made of 16 SWG sheet duly rust inhibited through a process of degreasing, acid pickling, phosphating and spray painted or powder coated to an approved colour over a coat of red oxide primer. Three phase boards shall have phase barriers and wire channel on three sides. Neutral bars shall be solid tinned copper bars
with tapped holes and chase headed screws. For three phase D.B.S. 3 Nos. independent neutral bars shall be provided.

There shall be earth busbar of adequate size provided separately to terminate all outgoing circuit earth wire conduit knockouts shall be provided as required / shown on drawings and entire board shall be rendered dust and vermin proof and shall have conduit knockout entry.

MCBs shall have quick make and break non-welding self wiping alloy contacts both on the manual and automatic operation. Each pole of the breaker shall be provided with inverse time

thermal overload and instantaneous over current tripping elements, with tripping must be on all the poles and operating handle must be common. Breakers must conform to MBS 3871 with facility for locking in off position. Pressure clamp terminals for stranded / solid conductor insertion are acceptable upto 4 sq.mm. aluminium of 2.5 sq.m.. copper conductors and for higher conductor sizes the terminal shall be suitably shrouded. Wherever MCB isolators are specified they are without tripping elements.

Distribution Boards shall have MCBs as shown on the drawing / schedule. D.B.S. shall meet with the requirements of IS:2675 and marking arrangement of Bus-bars shall be accordance with IS: 375, Bus-bars shall be suitable for incomer switch rating and sized for a temperature rise of 35 Centigrade over the ambient temp. circuit diagram indicating the distribution shall be pasted on the inside of the DB s instructed. One earthing terminal for single phase and two terminals for 3 phase D.B.S. shall be provided with an earth strip connecting these earthing studs / terminals and the outgoing ECC earth bar. All
MCBs shall be with a minimum short circuit rating of 10 Kamps. All outgoing feeders shall terminate or by means of insulated single conductor copper wires.

All termination shall be carried out by using crimping type ferrules or reducer type terminal lugs.

Installation and Testing :

All distribution boards shall mounted as directed either recessed or on adequate size of angle iron frame work in case they are to surface mounted. All mounting frames shall be coated with one coat of red oxide primer followed by two coats of synthetic enamel paint of approved colour, after installation. All D.B.S. shall touched up for damaged painting. All work shall be carried out as per NEC.

All boards shall be meggard phase to phase and neutral, using 1000 V meggar with all switchgear in close position. The meggar value should be not less than 2.50 megohms between and 1.50 megohms between phase and neutral.

E.L.C.B. (Earth Leakage Circuit Breaker) :

The E.L.C.B.s shall have leakage sensitivity of 30 ma / 30 Secs and shall have a short circuit current rating equal to that of MCB i.e. mini. of 10 KA. Current rating and No. of poles shall be as described in the B.O.Q. / Drawing. A test push knob facility shall be provided to periodically test the operation of E.L.C.B.s.

Medium Voltage Cabling :

Scope :

The scope of work shall be cover supply, laying, connecting, testing and commissioning of medium voltage power cables inclusive of all labour.

Standards :

The following standards and rules shall be applicable :

1) IS : 1554 (P-I) : PVC insulated electric cables (heavy duty)

2) IS : 1753 : Aluminium conductors electric cables (heavy duty)

3) IS : 3961 : Recommended current ratings for cables.

4) Indian Electricity Act and Rules.

5) NEC.

All codes and standards mean the latest. Whereas not specified otherwise, the installation shall generally follow Indian Standard Codes of Practice and the relevant British Codes of Practice in the absence of Indian Standard.

Cables :

All cables shall be 1100 Volt Grade, PVC insulated and extruded inner sheath with or without steel armouring as specified and with an outer PVC Protective sheet. Cables shall have high conductivity stranded aluminium or copper conductor as specified. Cores shall be colour coded as per Indian Standard.

All cables shall be new without any kind of visible damages. The manufactures name, insulating material, conductor size, voltage class and ISI mark shall be embossed on the surface of the cable at every 600 mm. centres.

Installation :

Cables shall be laid in the routes marked in the drawings, where the route is not marked, the Contractor shall mark it out on the drawing and also on the sire and obtain the approval of the Architect / Consultant before laying the cable. Procurement of cables shall be on the basis of actual site measurements and the quantities shown on the schedule of work shall be regarded as a guide. Payment shall be restricted to the quantity of cable installed (and measured jointly as per unit stated) at site. Cables rising indoors shall laid on walls, ceiling, shafts or trenches. Cables shall be fixed to walls or ceiling with supports saddles. Cables trays will be used wherever directed / necessary. All supports shall be at not more than 500 mm. apart. Plastic identification tags shall be provided at every 20 M in general at every floor in the rising shaft in particulars. Oversize M.S. Sleeves shall be used for cables passing through the walls. Cables shall be bent to a radius not less than 12 times the recommendations, whichever is higher, in case of direct buried cables the cable route shall be parallel or perpendicular to roadways, walls cushion to provide cushion against abrasion. Width of excavated trenches oversand cushion shall be covered with a mini. of excavated trenches will be as per drawings or as directed. The laid cables in protective layer of bricks on both sides and top. Backfill of the trench shall be with a minimum earth cover of 600 mm. to be properly rammed and consolidated. At road / pathway crossings cables have a pulled through R.C.C. pipe of 150 mm. dia. to be laid for each cable by the Electrical Contractor. A mini.of 100 mm. thick concrete bed has to be spread before laying the RCC pipes, topped by 150 mm. thick concrete to avoid any damage to the RCC pipe.

The cables shall be provided with cable route markers at every 20 meters and also at every in the direction of the route.

All cables shall be full runs from panel to panel without any joints or splices. A minimum of Eight (8) M loop shall be provided at each end of every cable. Cables shall be identified at end terminations indicating the feeder number and the Panel / Distribution

Board from where it is being laid. All cable terminations shall have tinned copper compression lugs. Cable terminations shall have necessary Brass glands. The Brass glands and armouring shall be earthed at both the ends of the cable. The end terminations shall insulated with a minimum of six half lapped layers of PVC taps.

Testing :

MV cables shall be tested before and upon installations with a 1000 V meggar and the following established.

1) Continuity on all phases.
2) Insulation Resistance
   a) Between conductors.
   b) Between all conductors and ground.

All test reading shall be recorded. Cables will be charges only after the above reading are found to be satisfactory.

Mode of Measurement :

Cables will be measured on the basis of unit length and shall include the following :

1) Cables, clamps, supports and spacers.
2) Installation, testing and commissioning.
3) Cable marking.

Each cable termination will be measured as one unit for payment.

1) Cable glands, lugs, bolts, nuts.
2) All joining materials.
3) Installation, testing and commissioning.
4) Earthing of glands and armour.

Cables buried underground will be measured on the basis of unit length and paid for unit rates and shall includes.

1) Excavated and backfilling as described above.
2) Sand for cushioning and protective bricks.
3) Cable route markers.

C.T.S. Wiring :

Scope :

The scope of work shall cover supply, installation, testing and commissioning of all C.T.S. wiring work.
All size of teak-wood battens should be varnished before fixing on the wall. The batten should be from good teakwood battens and should not have any knot in between, varnishing of batten is to be done on all sides. As far as possible overlapping of the battens should be avoided by providing the bridge. The wires should be fixed with appropriate types of tinned brass joint clips at every 2" to 2.5 distance. The teak-wood wires shall be fixed nettlefold screws and not by nails. Earthing wires shall be stranded copper conductor with Green / Yellow – Green colour insulation of 440 V Grade.

Conduits Wiring :

Scope :

The scope of work shall cover supply, installation, testing and commissioning of all conduit wiring. All works shall be carried out as per NEC.

Standards :

The following standards and rules shall be applicable :

1)	IS : 732	:	Code of Practice for Electrical Wiring installation (System voltage not exceeding 650 V)
2)	IS : 1646	:	Code of Practice for fire safety of buildings (General Electrical installation (Part II).
3)	IS : 9537	:	Rigid steel conducts for Electrical wiring (Part II)
4)	IS : 2667	:	Fittings for rigid steel conducts for Electrical Wiring.
5)	IS : 3480	:	Flexible steel conduits for Electrical Wiring.
6)	IS : 3837	:	Accessories for rigid steel conduit for Electrical Wiring.
7)	IS : 694	:	PVC insulated cables.
8)	IS : 9537	:	Rigid non-metallic conduits for Electrical Wiring.
9)	IS : 6946	:	Flexible (pliable) non-metallic conduits for

			Electrical Wiring.
10)	IS : 1293	:	3 – Pin plugs and sockets.
11)	IS : 8130	:	Conductors for insulated electric cables and flexible cods.
12)	IS : 5133	:	For switch boxes and other conduit accessories.

13) Indian Electricity Act 1910 and Amendments issued thereunder.

14) Regulations for the electrical equipment in buildings issued by the Mumbai Regional Council of Insurance Association of India.

15) NEC.

Rigid and Flexible conduits.

All conduits shall be heavy gauge black enamelled mild steel or galvanised steel or as specified in schedule of works. Conduits shall be with ISI mark.

Flexible conduits shall be formed from a conditions length of spirally wound inter locked strip steel with a fused zinc coating on both sides. The conduit shall be terminated in brass adaptors.

Accessories :

Conduit fittings such as bends, elbows, reducers, chase, nipples, split couplings, plug, etc., shall be specifically designed and manufactured for their particular application. All conduit fittings shall conform to IS : 2667 – 1964 and IS : 3887 – 1966. Conduit bends and elbows shall not be used. Instead, wherever bending is required, the conduit shall be properly bent using the bending machine. Only in unavoidable conditions, use of bends and elbows may be permitted.

Cast iron round junction boxes used for light and fan points shall be normally 75 mm. deep in case of slabs and 50 mm. deep in case of walls. Bottom of the junction boxes shall be flush with wall / bottom of the slab. The fabricated junction boxes shall be 1.60 mm. thick and of suitable dimension and minimum 75 mm. deep. Other dimensions shall be as per IS:5133. These boxes may be used for light / bell point in walls. Theses boxes shall be galvanised M.S. boxes. Checknuts shall be used on either side of the box for conduits. At conduit entry, bushes shall be provided to avoid cutting of insulation of wires.

Notes of Concealed Conduiting:

1) Routing of concealed conduits Location of conduit drop or rise in walls, location of junction boxes, vertical surface conduit runs in shafts etc. Wherever shown on the drawing is schematic only. Adjustments / Re-routing of the same shall be carried out by the Contractor to suit layout of lighting fixtures, ceiling fans, receptacles, telephone outlets, TV outlets room switch boards etc., shown on relevant drawings and to suit site conditions.

2) Passing of embedded conduit through columns for any reason whatsoever is totally prohibited, except in any of the really unavoidable situation, where Structural Consultants express permission in wiring will be a must before so doing.

3) Cross over of embedded conduit in slab, except at locations unavoidable should not be done, in case of cross-over of conduits where it is a must, the contractor shall obtain the specific permission for the location of cross-overs from the Consultant prior to concerning the slab.

4) Conduits droppers in columns shall not be permitted.

5) Concealed conduit running along the length of beam is to be avoided. Suitable conduit sleeves shall be provided in lintel beams where conduit droppers are required to be extended through such beams.

6) Standard typical details shall be referred for concealed conduit routing through sunk slab through staircase, walls, etc., and for provision of junction boxes, wherever required.

7) Conduit routing at Lift Machine Rooms and at Lift Wells shall be installed in consulation with Elevator Contractor.

8) The Contractor shall select the routes of surface conduiting in such a way that embedded conduits laid during civil works need not be punctured. In case embedded conduits get damaged, it shall be the responsibility of the Contractor to rectify the defective work at his own cost.

9) All conduit shall be of 25 mm. nominal bore except specified otherwise.

10) Bending radius of concealed conduit shall not be less than ten times the outside diameter of the conduit. Maximum distance between two junction boxes shall not be more than four meters.

11) Cast iron junction box for fan hooks shall be at appropriate location so as to avoid interference.

12) Conduit sleeves with threaded projections (50 mm.) shall be provided at suitable locations in Auxillary Beams, Lintel Beams to facilitate extension of conduits in walls.

13) Junction boxes, conduits etc., shall be suitably tied to reinforcing bars in slabs to avoid displacement and misalignment. Minimum 25 mm. thick concrete cover around conduit / junction box shall be ensured.

14) To facilities pulling of wires / cables, pull-out wires shall be provided in each length of conduit to be concealed. Also all open faces of junction boxes and open ends of conduits shall be suitably plugged or covered by the Contractor with care to avoid ingress of stones / sand / concrete mix etc. into junction boxes / conduits during pouring of concrete. Similar care must be taken at the locations where couplers etc., are used for extension of conduit.

15) During civil works, Contractor shall arrange to provide conduit sleeves (of adequate size and adequate in number) at ceiling level or walls for the passage of surface – conduits so as to avoid routing of conduits along the beam contours at a later stage. Co-ordination in this regard shall be Contractor's responsibility.

16) Supply and installation of 150 mm. / 250 mm. dia. Hume pipes for main power cable, for earthing conductors and for direct line telephone cables shall be in Contractors scope. These pipes shall be laid in typical standard details as directed to avoid damage to these pipes.

17) Two Nos. earth electrode stations shall be provided for general earthing system of the buildings to be located to suit site conditions. Distance between two earth electrode stations shall not be less than 3.5 meters and that between the outer edge of plinth protection of the building and earth electrodes shall not be less than 2.00 meters.

Wiring :

All wires shall be single core stranded copper PVC insulated to IS: 694 and shall be 1100 V Grade. All wires including earth wire shall be terminated using crimping type ferrules or lugs. Earthing shall be of stranded copper conductor with Green or Yellow Green insulation of 440 V Grade with ISI Mark.

All wires shall be colour coded as follows:

Phase	Colour of Wires
R	Red
Y	Yellow
B	Blue
N	Black
Earth (if any)	Green (insulated) Grey.

All wires shall be with ISI Mark.

Installation :

All works shall be carried out as per National Electrical Code. The size of conduits shall selected in accordance with the number of wires permitted table given below :

Note : Even though 20 mm. dia. conduit is indicated in the table.
Contractor has to use minimum size of the conduit of 25 mm. dia. unless otherwise indicated. Size of wires shall be not less than 1.5 sq.mm.

Nominal Cross Section & Area (Sq.mm.) of wire.	20 mm.	25 mm.	32 mm.	40 mm.	No. of Strands Dia. in mm.
1.50	6	10	14	---	3/0.80
2.50	5	10	14	---	3/1.04
4.00	3	6	10	14	7/0.85
6.00	2	5	9	11	7/0.04
10.00	---	4	7	9	7/1.35
16.00	---	2	4	5	7/1.70

The above table is applicable for both straight as well as deviated runs.

Conduits shall be kept at a minimum of 100 mm. from the pipes of other Services such as T.V., Telephones etc., Pull / Junction Boxes shall be provided for straight conduit runs of more than 10 meters and also for deviated runs with more than 3 Nos. of 90 bends.

Separate conduits / raceways shall be used for

1) Normal lights, and 5 A – 3 pin sockets on lighting circuits.
2) Power outlets : 15 A – 3, 20/A 30 A 2 pin + scraping earth metal clad socket.
3) Separate conduit runs shall be used for incoming and outgoing circuits.
4) Wires of various circuits but of different phases.

Conduits runs in the slab shall be properly laid, fixed to the reinforcement bars, before concerning of the slab all conduit entries shall be properly blocked or sealed to avoid ingress of concrete slurry.

For vertical conduits drops in the wall proper chasing shall be carried out and conduit laid and fixed, chase restoration shall be done after installing the 24 SWG G.I. wiremesh over the chase and after which plastering shall be carried out to give a neat smooth finish.

<u>As far as possible horizontal chase in the wall shall be avoided. If unavoidable, it shall not exceed 300 mm.</u>

All final branch circuits for lighting and appliances shall be single core stranded copper conductor cable run inside conduits. The conduits shall be properly threaded and screwed into sockets junction boxes etc. or fixed properly, using epoxy soin, in case of PVC pipe. The exposed threading shall be given a coat of rust inhibiting chemical / paint.

Branch circuit conductor sizes shall be as shown in schedule of quantities and / or drawings.

Final branch circuits shall preferably be kept in a separate conduit uptocct. Branch distribution boards. No other wiring shall be bunched in the conduit except those belonging to the same phase. Each lighting branch circuit shall not having more than ten (10) outlets or 800 watts whichever is lower.

Flexible cords for connections to appliance, fans and pendants shall be 650 / 1100 V Grade (three or four cores i.e. with insulated neutral and earth wires of the same size) with stranded

copper wires insulated twisted and sheathed. Colour of the sheath shall be subject to Architect's approval.

Looping system of wiring shall be used. Wires shall not be jointed. Where joints are unavoidable they shall be made through approved mechanical connection. Earth wire shall be provided fir all light, fan, bell and socket points, control switches having marking for light or fan as required shall be connected in the phase conductors only and shall be ON when knob is down. Unless otherwise stated, switches shall be fixed in 3 mm. white colourHylam sheet on M.S. Boxes with cover plate as specified. Chromium plated brass screws shall be used. M.S. switch boxes for switch board shall be of sufficient dimensions to accommodate required no. of choke type fan regulators for flush mounting or electronics regulators as the case may be.

M.S. Boxes shall be fabricated from 1.6 mm. thick M.S. sheet and shall be galvanized. Switch boards accommodating 3 or more than 3 switches shall be provided with slide-in fuse holder of 10 Amps. Rating and proper rating fuse-wire.

Power wiring shall be distinctly separate from lighting circuit, M.S. conduits not less than 2.5 mm. and wires not less than 2.5 sq.mm. shall be used for power wiring. Wire size for circuits will be as per schedule of quantity.

Testing :

The entire installation shall be tested for :

A) Insulation resistance.
B) Earth continuity.
C) Polarity of single pole switches.

A test certificate shall be submitted in the Format, in triplicate as required / specified by the Electric Supply Company / M.S.E.B.

Point wiring rates shall include, but not limited to supply and installation of the following items.

PVC heavy gauge or M.S. conduiting embedded CONCEALED type or exposed SURFACE type as called for, branch and sub-circuit wiring with all items such as fabricated junction boxes, conduit fittings and accessories such as couplers, bends, tees, nipples, spacers, saddles, pull-out wires (2 mm. G.I. Wire), hardware, ceiling fan boxes to be embedded in the ceiling etc. Supports for exposed surface conduits shall be at an interval of 750 mm. for vertical run and at the interval of 450 mm. for horizontal run.

Recessed type M.S. covers as specified for various items such as room switch boards, receptacle board or light switch board etc. Housing with knock outs shall be tailor made or as specified to accommodate all switches, sockets, outlets, fan regulators, etc., as necessary for a particular location.

PVC insulated, unsheathed, stranded copper wires for phase, neutral and earth for branch circuits, for sub-circuits and for point wiring, cable, / wire upto lamp holder.

SP or DP or TPN / MCBs / ELCBs individual switches and accessories.

All consumables such as insulation tape, hardware, pipe sleeves and any other item not specified but required for completion of point wiring.

All work in complete wiring of a switch circuit of any length from the D.B. to the following via the switch board.

1) 3 Plate ceiling rose.
2) Connector.
3) Blank Plate.
4) Socket.
5) Lamp holder – Angle / Straight.
6) Fan boxes, hooks.
7) Any other terminal outlet.

All metal boards and boxes sunk or surface mounted.

Supply and installation of this item of work shall comply with all above requirements in co-ordination with the construction of civil works for provision of sleeves in walls / beams / slab and for laying embedded junction boxes / inspection boxes / pull out boxes / pull out wire etc. as required.

Earthing :

Scope :

This item of work is required for providing the earth-pits for electrical power network and also for lighting protection network. Earth pits for power network and lighting protection network shall be separate from each other without any interconnection. However, all Earth pits for power supply shall be interconnected with each other through buried earth conductors, similarly all earth pits for lighting protection shall be connected with each other through buried earth conductors. Spike earthing for St. Light poles is also covered. Each down common conductor of lighting protection network shall be terminated to a separate earth electrode pit through test-link.

Standards :

The following Standards and rules shall be applicable

1) IS : 3043 – 1987 Code of Practice for earthing.
2) Indian Electricity Act and Rules Electric Supply Co.'s Rules.
3) NEC.
4) IS : 2309 – Protection of building and allied structures against lighting.

All codes and standards mean the latest. Where not specified otherwise, the installation shall generally follow the Indian Standard Code of Practice. In the absence of Indian Standards, the relevant British Standard Codes shall be followed.

General Requirements :

1) The earthing shall generally carried out in accordance with the requirements of I.E. Rules as amended from time to time and relevant regulations of B.E.S.T / Electric Supply Company, If Rules No. 32, 51, 61, 62, 67, 69, 88(2) and 90 are particularly applicable.

2) All earth connections shall be carefully made visible for inspection and testing of individual earth electrode shall be possible.

3) The earthing electrode shall be away at a minimum distance of 2 mt. From the outer surface of plinth protection / Diaphragm wall in case of basements. A minimum clearance of twice the depth of electrode shall be maintained between two earth stations. Wherever adequate distance cannot be maintained due to site constraints. The decision of the Architect / Consultant will be final and binding.

4) A brick masonry chamber cement plastered from both inside and outside shall be provided on the top of the each earth station to house the funnel for watering and the earth connection. The size of this chamber will be 300 mm. x 300 mm. deep. The

   chamber will be provided with a lockable cast iron cover hinged to the C.I. frame embedded in the top portion of the masonry wall, by providing spikes for grouting. Lock with key shall be supplied for each pit. The top of the masonry chamber shall be 50 mm. above the surrounding G.L.

5) The earth conductor from electrode shall be taken out of the masonry chamber through a protecting pipe embedded in the masonry laid atleast 250 mm. below the ground level.

6) Earthing system shall be mechanically robust and the joints shall be capable of retaining low resistance even after passage of fault currents / strockes.

7) Joints shall be welded / soldered / tinned and double rivetted. All the joints shall be mechanically, electrically continuous and effective, joints shall be protected against corrosion by giving suitable treatment duly approved by Architect.

8) Contractor shall use the layout drawing issued by the Architect / Consultant for guidance only. He shall submit working drawings for approval of the Architect prior to execution of the work. He will thereafter submit as built drawings for conductor route showing locations of earth pits etc., for final records and reference alter executing the work.

9) Contractor shall use the schematic layout drawings for the quantity and route of the conductor issued by Architect / Consultant for guidance only. He shall work out the exact quantity of earth conductors with its associated accessories required for the job.

Earth Electrodes :

1) The materials of earth electrode and earth conductors shall be galvanised iron unless specified otherwise in the bill if quantities, specifications or drawings.

2) The earth electrode shall be free from paint, enamel, grease etc.

3) The earth electrode shall be embedded as far as possible in the moist soil and below permanent moist level.

4) Earth electrode shall not be installed in the proximity of a metal fence.

Types of Earth Electrodes :

The earth electrode shall be either a pipe electrode or plat electrode, as detailed in schedule of quantities. Plate electrodes shall be used for sub-stations and large medium voltage network and pipe electrodes for small medium voltage network and installations.

Pipe Electrode :

1) Pipe Electrode shall consist of 2.50 meter long single piece heavy duty G.I. pipe of minimum 40 mm. N.B. and shall be cut tapered at the bottom. 12 mm. dia. holes in a staggered manner shall be frilled on the pipe as per IS : 3034.

2) This Electrode shall be buried vertically in a specially prepared earth pit of size 30 cm. x 30 cm. and the earth pit shall be filled with alternate layers of charcoal, salt and fine washed sand with a minimum thickness of 150 mm. for each layer. A funnel with wiremesh inside shall be fixed to the top of G.I. pipe for watering purpose.

3) The earth conductor of 50 mm. x 6 mm. G.I. strips shall be connected to the electrode just below the funnel with proper terminal lugs, check nuts the other end of this 50 mm. x 6 mm. strip shall be terminated through a removable test-link, on the earth bus at meter room. Test link is to be provided in masonry chamber.

4) Details of chamber etc., have been already give below.

Plate Electrode :

1) The plate electrode shall consist of G.I. Plate of size 600 mm. x 600 mm. x 6.3 mm. as per B.O.Q. or drawings.

2) The electrode plate shall be buried vertically in a specially prepared earth pit which shall be dug up 2.50 M. deep from the ground level. The earth plate shall be placed in the earth pit with its faces vertical and embedded in the alternate layers of coal fine washed sand and salt with a minimum thickness of 150 mm.

3) The earth conductor of 50 mm. x 6 mm. G.I. strip shall be connected to the earth electrode plate with terminal lugs, the other end of this 50 mm. x 6 mm. G.I. strip shall be terminated through a removable test link provided in the masonry chamber, on the earth bus at meter room.

4) A 20 mm. G.I. pipe heavy gauge, shall be provided from the masonry chamber upto the top earth late for watering purpose. The G.I. pipe shall be provided with a funnel having wiremesh inside for watering.

5) Details of masonry chamber etc. have been already give above.

Simple Pipe Electrode for earthing individual Street Light Poles etc. with chamber :

1) Pipe Electrode shall consist of 2.50 meter long single piece heavy duty G.I. pipe of minimum 40 mm. N.B. and shall be cut tapered at the bottom. 12 mm. dia. holes in a staggered manner shall be frilled on the pipe as per IS : 3034.

2) This Electrode shall be buried vertically in a specially prepared earth pit of size 300 mm. x 300 mm. and 3 M. deep. The pit shall be filled with alternate layers of salt, charcoal, salt and fine washed sand, with a minimum thickness of 150 mm. for each layer.

3) The earth conductor of 25 mm. x 5 mm. G.I. strips shall be connected to the electrode just below the top with G.I. nuts and bolts and spring and flat washers with check-nuts. Other end of this earth strip shall be connected to the equipment to be earthed using suitable lugs for termination at both ends, etc.

Sub-Station Earthing:

In case of Sub-Stations, large installations and wherever specified earth electrode shall be 600 mm. x 600 mm. x 3.15 mm. copper plate. The earth lead shall be connected to earth plate, using termination lugs and brass nuts, bolts and washers, masonry chamber details being as given above, including heavy duty 40 N.B. G.I. Pipe, funnel for watering etc.

Earth leads and connections :

Earth lead shall be either bare copper or aluminium or galvanized steel as specified with sizes in the B.O.Q. Copper lead shall have a phosphor content of not over 0.15% aluminium and galvanized steel buried in ground shall be protected with bitumen and hessian wrap or polythene faced hessian and bitumen coating. At road crossings necessary hume pipes shall be laid. Earth lead run on surface of wall or ceilings, columns, beams etc., using G.I. spacers of minimum 6 mm. thick and saddles. The complete earthing system shall be mechanically and electrically continuous and robust and should provide an independent return path to the earthing source.

Testing of Earth-Stations / Pits :

After the erection of Earth-Stations is complete, Contractor should arrange for an earth-tester, carry out earth-resistance test (- average of 4 – readings -) in the presence of the Clients representative and records the results.

For substation earth-stations, the resistance of each earth station should not exceed 0.5 ohms.

For other earth-station, it shall be less than 0.2 ohms.

In case of higher resistance values, either the electrode shall be driven of more depth or to construct additional earth-pit assesblies at a distance minimum three meter apart to achieve the combined resistance less than or equal to the desired results as stated above.

Sizes of the G.I. Strips to be used :

1) 50 mm. x 6 mm. G.I. earth strip shall be used for connecting the earth-bus at meter room / meter box of chamber to be earth electrode pit.

2) 40 mm. x 6 mm. G.I. strip shall be used for interconnection of earth pits by directly buried underground system to a minimum depth of 600 mm. to form an earth grid.

3) 20 mm. x 3 mm. G.I. earth strip shall be used for connections between earth-bus and S.F. / M.C.B. / M.C.C.B. / E.L.C.B. units at meter room. Two pole units shall be connected with one such earth strip and three or four pole units shall be connected by two such earth strips.

4) 32 mm. x 6 mm. G.I. strip shall be used for horizontal air-termination network at terrace / roof level and for down covers to bond with earth-electrode pit through test-link.

5) The overlapping of strips at joints where necessary, shall be 75 mm. (minimum). The joints will be double riveted and then welded and painted with silver paint.

Equipment Earthing:

All apparatus and equipment transmitting or utilizing electric power shall be earthed in the following manner. Copper earth wires / strips shall be used where specified in B.O.Q.

1) **Power transmission apparatus** :

   a) Metallic conduits shall not be accepted as an earth continuity conductor. A separate insulated earth continuity conductor or bar of the size 50% of the size of the phase conductor subject to the maximum as given below shall be provided.

Copper	Galvanized Iron
Minimum 2.5 Sq.mm.	6 Sq.m..
Minimum 6.5 Sq.mm.	200 Sq.m..

The earth continuity conductor may be drawn inside the conduit in which case it should be insulated.

b) Armour of the cables shall be earthed by two distinct earth connections at both the ends to the armouring, the size of the connection being as for the metallic conduit.

c) In case of unarmoured cable, an earth continuity conductor shall either be run outside along the cable or should form a separate core of the cable.

d) 3 phase power panels and distribution boards shall have two distinct earth connections of the size co-related to the incoming cable size. In case of single phase D.B.'s and isolating switches 1 earth connection and in case of 3 phase, two distinct earth connections shall be provided, sizes being co-related to the sizes of incoming cables.

Testing :

The following earth resistance shall be measured with an approved earth-tester and recorded.

1) Earth resistance of each earth station.
2) Earthing system as a whole.
3) Earth continuity conductors.

Prohibited Connections :

Use of following as earth conductor is strictly prohibited for earthing an installation or ever as a link in the earthing system.

Neutral conductor, sprinkler pipes, gas pipes, water pipes, structural steel work, metallic enclosures or armour of cables and conductors, metallic conduits lighting protection system conductors are all prohibited to be used earth conductor.

Mode of measurement – as per schedule of quantity. However, the cost of earthing the following items shall become part of the item itself and no separate payment / rate of earthing these items shall be made.

a) Motors – earthing forming part of cabling / wiring for the motors.

b) Isolating switches and starters shall form part of mounting frame, switch starter etc.

c) Fan lightings, Exhaust fan fittings Light fittings – These shall form part of installation of these fittings only.

d) Conduit wiring cabling – shall form part of the wiring or cabling.

e) Street Lighting – should form that of the street light pole.

External Lighting :

The scope of the work covered the supply, installation and testing and commissioning of lighting poles, wiring to the fixtures, cable laying as specified and shown on drawings / B.O.Q. etc. All work shall be carried out as per NEC.

Standards :

The following standards and rules shall be applicable :

1) IS : 1913 – 1969 : General and safety requirements for light fittings.

2) IS : 1944 – 1981 : Code of Practice for Lighting Public through fares.

3) IS : 3528 – 1966 : Water Proof Electric Lighting fitting.

4) IS : 2713 – 1978 : Swaged type tubular poles.

5) IS : 2149 – 1970 : Luminaries for street lighting.
650 V.

6) Indian Electricity Act & Rules.

7) N.E.C.

All codes and standards mean the latest. Where not specified otherwise, the installation shall generally follow the Indian Standards Codes of Practice or the British Standard Codes of Practice in the absence of Indian Standards.

Lighting Poles :

The lighting poles shall be fabricated from heavy duty cold rolled street tubes to IS:2713 and hot dip galvanized of painted as specified. The pole shall have M.S. base plate and Junction Box a large access panel shall provide easy access to multiway porcelain connector and fuse board to be mounted inside the Junction Box. The access shall be specially fabricated with adequate reinforcement and weather gasket to prevent ingress of moisture and vermin proofed. Poles shall have large diameter entries for incoming and outgoing cables and two earth studs. The contractor shall make a drawing and have it approved before fabricated.

Cable Laying :

Cable shall be generally laid as specified in section “Cabling” cable shall be terminated in a 4-way terminal block inside the pole of attached therewith. Contractor shall mark out the cable route and got it approved before laying the cables.

Earthing:

All street lighting fixtures and poles shall be earth as specified under section "Earthing"

Mode of Measurement :

Each light fitting with lamp, control gear, earthing etc., shall be considered as one unit for measurement and payment. Each lighting pole, concreting, coping, base plate, earthing etc., shall be considered as one unit for measurement and payment. Wiring from terminal block to the light fitting shall be considered as one unit for measurement and payment. All cabling work shall be measured on the basis of unit length for supply and installation. The excavation and backfilling of cable trench, cable-termination in Junction Boxes or Terminal Box of the pole etc., shall not be measured separately.

Power Panel Boards :

The salient features of construction of power panel boards shall be as follows :

1) Construction : Totally enclosed, dust and vermin proof conforming to IP-54 of IS:2147, free standing, floor mounting, single front compartment, cubicle extensible type at both ends.

2) Welded shall be fabricated with shipping sections bolted together. All such joints to be gaskets. Lifting lugs shall be provided.

3) Panel shall be fabricated out of CRCA Sheets 1.6 mm. thick for front and rear doors and cover. Bottom and top of the panel for cable glands and component, mounting plates shall be fabricated out of 2 mm. thick CRCA Sheets. Frame work – 2 mm. thick.

4) All doors to be hinged type except bus-bar chamber which shall be bolted type. Panel shall be flush door design suitable for access from front.

5) Fabricated panel shall undergo seven tank process and two coats of primer before giving Epoxy resin paint finish. Final colour shall be Shade No. 631 of IS:5. No welding or drilling shall be done on the panel after final painting.

6) Vertical bus-bars will be red from main horizontal bus-bars located at top. Panel compartment, bus-bar chamber and cable alley will be operated from, front. Depth of MCCB panel shall be 1000 mm. and the width of it shall be 7000 mm. The depth of the other section shall be minimum 500 mm. and width shall be 500 mm. vertical bus-bar chamber and cable alley width shall be 300 mm. Height of earth bus-bar chamber at the bottom shall not be less than 150 mm. Total height of the panel shall not exceed 2400 mm. Foundation channel shall be provided at the bottom and shall be of type MC 1000.

7) Bus-bars shall be electrolytic grade aluminium suitable for the current capacity as per BOQ and shall be supported by high quality FRP insulator of SMC type, to withstand short circuit of 500 KA at 415 Volts. Bus-bars shall be provided with heat shrinkable PVC

sleeving with R, Y, B and neutral colour coding for identification. All bus-bar connections (huts and bolts) shall be accessible so that they can be checked with normal tools.

8) In a blank compartment provided at the bottom, G.I. earth bus-bar of 50 mm. x 6 mm. run through entire length shall be provided and project outside in vertical. Formation with facility for connection earth strip at either terminals on opposite sides to connect external earth conductor. All accessible live terminals / portion of components shall be provided with shoruds.

9) Separate compartment shall be provided for each three phase feeder. Each feeder compartment shall be provided with three pilot lamps with red lens on each for indication of power supply.

10) Indicating lamps shall be panel mounting type with filament or Neon lamps. Filament type lamps shall be provided with series resistors to prevent short circuiting of control supplies on fusing of lamps filaments. The lens shall be easily replaceable from the front.

11) **Indication Instruments and Meters** :

These shall be provided as per BOQ and shall be 96 mm. square size suitable for flush mounting and zero adjustment from outside. All meters except KWN meter shall be AE make. KWN meter shall be GEC / IMP make.

12) Current transformers shall be bar primary cast type or dry type, and shall have short-circuit-time withstand rating equal to that of associated switchgear for 1 sec.

13) **Push Buttons** : The push buttons shall be of the momentary contract to actuate for 10 Amp. At 240 V AC and 2200 V.D.C., provided with integral inscription plates engraved with their functions. They shall have required “NO’ ass “NC” contacts. Only “Siemens” or E.E. Push Buttons shall be used.

14) All HRC switch Fuse Units, Contactors, single phase preventive and O/L relays, indicating lamps will be only “Siemens”, “English Electric” or “Havells” Brands only.

15) **Control and Selector Switches** :

The control switches and selector switches shall be of rotary type having enclosed contacts, adequately rated for application but with a minimum rating of 10 Amps, at 2400 V AC and at 220 V.D.C. the plats shall have clear position markings, control switches shall have momentary contacts, spring return to centre, with pistol grip handles, instrument and selector switches shall have stay-out contacts with oval knuried handles.

16) **Name Plates** : Main name plate shall be fixed at the top centre, name plate giving feeder details shall be provided and are to be fixed by screws. All labels / name plates shall be black plastic with white engravings of letters or minimum 6 mm. size.

17) **Internal Wiring** : All internal power wiring shall be done either stranded PVC Copper wire 2.5 sq.mm. size 1000 V Grade or strips of insulated copper conductor of adequate size.

Small wiring for control circuit shall be done with stranded Copper wire PVC conductor 1100 V Grade.

Each end of control cable shall be provided with identification Ferrules Yellow in colour with black letters.

All wiring shall be terminated on stud type terminal blocks through crimping sockets. Not more than 2 connection shall be made on any one terminal block. All spare auxiliar contacts of contactors shall be wired to terminal block.

18) **Terminal Blocks** :

Terminal blocks for power and control wiring shall be of reputed make stud type, with washers, nuts, and lock nuts, and identification mark. All adjacent terminals shall have insulating barriers. All power terminal blocks shall be rated for a minimum current of 300 Amps. Terminal blocks for controls and instrument circuit shall be rated for minimum 115 Amps., and shall be suitable to receive 100 Sq.mm. conductor. All sets of power control power terminal blocks shall be identified with engraved plastic labels, black background and white letters.

19) **Cable Terminators** :

Dublic compression type of brass cable glands mounted on gland plates shall be provided to receive and support all power and control cables entering the switchgear. Size of the cable gland shall be suitable for cables entering the switchgear. Cable gland shall have earthing facilities for earthingarmour of the cable.

20) **Tariff Advisory Committee and CPRI Tested** :

The switchgear shall be approved by the TAC for fire insurance and CPRI tested for short-circuit test and enclosures test.

21) **Tests** :

Following tests shall be performed before shipped the switchgear panels to Site :

1) high Voltage Test at 2.5 KV.
2) Insulation Resistance test before and after H.V. test, using 1000 V Meggar.
3) Operational Test.
4) Three sets of Test Certificates to be submitted.

22) **Documentation** :

Contractor shall arrange to get from Manufacturers and shall supply following drawings in quadruplicate for approval before starting manufacturing operations within 4 weeks from the LOI / date of order.

a) General Agreement Drawings.
b) Scheme and Wiring Diagram Drawings.
c) Instructions and Service manual for all the Components.

Approval of drawings by Clients / Consultant does not relieve the contractor of the "Performance" of the panels.

After supply and installation and commissioning of the panels and switches Contractor shall submit 6 sets of the above documents of as built in panels.

23) **Air-Break Switches** :

For all places in this project : Metal Clad.

1) The air-break switches shall be of AC 23, heavy duty, quick make-quick break type as per IS : 4047.

2) Switches shall be capable of withstanding the mechanical and thermal stresses produced by overloads and short-circuits.

3) All switches of all rating shall have interlocks with the compartment doors. Switches 250 A and above shall be lockable in "OFF" position. All live parts shall shrouded. It shall be possible to intentionally defeat the interlocks if required.

4) Red indicating lamps shall be provided for "ON" indication.

5) Brands : Only L & T, Siemensm English Electric, Hevells, controls and switchgear brands to be used.

The switches shall have the following standards rating :
32, 63, 100, 125, 200, 250, 300, 400 and 600 Amps.

24) **Fuses** :

The fuses shall comply with the following :

1) HRC Cartridge Fuse : Link type with carriers.

2) Certified reputing capacity not less than 46 KA at 415 Volts A.C .as per IS : 2000.

3) All fuses shall have visible indication to indicate "Blown" condition.

4) Pressure clamp terminals for wires upto 4 sq.mm. and bolted lugs for higher ratings.

5) HRC Fuses:Make : E.E., L & T, Siemens, Havells.

6) Fuse Puller: Contractor shall supply 3 sets of Fuse Pullers.

25) **Moulded case circuit breakers** :

M.C.C.B.

1) The M.C.BC.B.'s shall be 4 pole construction wherever specified and shall have independent Manual opening and closing mechanism of quick make, quick break type and they shall be trip free in operation. "ON" , "OFF" and "TRIP" mechanism shall be clearly indicated.

2) They shall conform to IS : 2516.

3) Bolted type neutral link will be provided with T.P. M.C.C.B. only.

4) It shall be possible to mount accessories on the M.C.C.B's like shunt trip, U.V. release, alarm contacts etc.

5) The M.C.C.B.'s shall have adjustable thermal / static trip devices.

26) **Contactors** :

1) The Motor starter contactors shall be of electro-magnetic type double break, non-gravity type rated for uninterrupted duty suitable for operation under AC – 3 utilization category of as per IS : 2959. The contacts shall be silver plated.

2) 2 Nos. and 2 NC auxiliary contacts shall be included.

3) The operating coils shall have Class "E" insulation of wire and shall be suitable for operation of any specified control supply systems.

27) **Thermal overload Relays** :

1) These shall be 3 elements, positive action, ambient, temperature compensated with a time lag and adjustable settings.

2) The setting range shall be selected according to the ratings of the motor.

3) The relay shall be self – reset type / hand reset type. The reset button in case of hand reset type – shall be fixed on the compartment door.

4) The relay shall have atleast on "NO" and one "NC" or changeover contact or as per requirements.

LIST OF APPROVED MANUFACTURERS FOR LT ELECTRICAL WORKS

S.N.	MATERIALS	APPROVED MANUFACTURERS
1	Moulded Case Circuit Breaker (MCCB)	i) Schneider
		ii) Hager
		iii) Siemens
		iv) L & T
		v) Legrand
2	Switch Fuse Unit (SFU)	i) L & T
		ii) Siemens
		iii) ABB
3	Power Contactors	i) L & T
		ii) Siemens
		iii) Schneider
4	Meters	i) HPL
		ii) IMP
		iii) L & T
5	Armoured LT cable	i) Polycab
		ii) Finolex
		iii) R R Kabel
		iv) CCI
6	Cable Termination	i) Dowells
		ii) Comet
7	Cable Tray	i) Profab
		ii) Metalemms
		iii) Asian Ancillary Corporation
8	PVC Conduit & Accessories	Precisions make only
9	Wires (FR)	i) RR Kabels
		ii) Havells
		iii) Finolex
		iv) Polycab

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10	Modular Switches & Sockets with PVC Box	i) Vinay - (Corum model)
		ii) North West - (NOWA model)
		iii) Crabtree (Havells) - (Verona model)
		iv) Anchor Roma.
		v) Schneider - (Opale model)
11	Distribution Board, MCB, RCCB & RCBO	i) Schneider
		ii) Hager
		iii) L & T
		iv) Siemens
		v) Legrand
12	Voice Cable & accessories	i) RR Kabels
		ii) Finolex
13	Light Fixtures	i) Wipro
		ii) Philips
		iii) Havells
		iv) GE
		v) Bajaj
14	Tubes, PL's & CFL's	i) Philips
		ii) Osram
15	Ceiling Fan	i) CG
		ii) Havells
		iii) Bajaj
		iv) Orient
16	Exhaust Fan	i) CG
		ii) Almonard
		iii) Alstom
17	Speakers	i) BOSCH
		ii) Ahuja
18	Amplifier	i) BOSCH
		ii) Ahuja

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19	Electrical LT Panel	CPRI Approved Panel Manufacturer Only.
20	Capacitors	i) Siemens
		ii) L& T
		iii) GE
		iv) ABB
		iii) Universal
21	CT'S / PT'S	i) AE
		ii) Kappa
		iii) Ricco
		iv) Rishabh
22	APFC Relay.	i) HPL
		ii) Emercon
		iii) Alstom
		iv) Beluk
		v) L & T
23	Contactor / Timer	i) Schneider
		ii) Hager
		iii) L & T
		iv) Siemens
		iv) Legrand
24	Energy Meters	i) HPL
		ii) Schneider
		iii) L & T
		iv) Tecnic
		v) AE
25	Concrete Earthing	i) Marconite
		ii) Equivalent as approved by the Client / Consultant

Signature of Contractor with Seal