सत्यमेव जयते
Government of Gujarat

Department of Science and Technology

Government of Gujarat

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Government of Gujarat

Volume II

CONTRACT
OF
Construction of New Fabricated Classroom & Toilet Block at Gujarat Biotechnology University, Gandhinagar

Gujarat Biotechnology University
GIFT Urban Extension Area, GIFT city road
Gandhinagar- 38235

Brief of the Project:-

The Gujarat Biotechnology University, to be made a world class research-focused academic institution, will nurtured and prepare biotech scientists in product-focused research to create and deliver a strong pipeline of innovative products for the country.

The University will have world-class infrastructure, an intellectual property base and skill sets for education, training, research, product development and technology commercialisation in biotechnology and allied sciences.

The project involves the Construction of Four Fabricated Classroom with Puff Panel & Toilet Block. The goal is to build these classrooms to enhance their functionality, comfort, and aesthetics, aligning with the institution's standards and ensuring they meet the specific needs of the educational environment.

CONTRACT AGREEMENT

This agreement (hereinafter referred to as the "**Contract**") is made at [●], on this the [●] day, of [●], [*insert year*]:

Gujarat Biotechnology University, an University was incorporated under the Gujarat Biotechnology University Act, of the State Government 'as a teaching and affiliating University.' and is subject to all the laws, statutes, rules, regulation and any other state or center directives from time to time that shall, if need be, ONLY as per the interpretation of Registrar, Gujarat Biotechnology University c/o GSBTM, supersede any/all conditions of this Agreement.

Hence forth to be referred to as "Client" or "GBU" or "Gujarat Biotechnology University" or "University" or "Authority"

And,

M/s [……], {company, incorporated under the Companies Act, 1956/2013 (hereinafter referred to as the "**Contractor**" which expression shall, unless repugnant to the context or meaning thereof, include its successors and permitted assigns and substitutes) of the **OTHER PART**

M/s.
PAN Card No:
Address:

The Contract is put in place for the specific and limited purpose of Construction of Green House with Fan and Pad as as per the tender ID no: _____ and all its binding and operative parts that was duly participated in by the Contractor and is awarded the contract.
It is a non-transferable Contract.

CONDITIONS OF CONTRACT

1. **Definitions:**

- The “Contract” means documents forming the tender, all the documents therein and acceptance thereof, together with the letter of intent, work order, schedule of terms and conditions, specifications, drawings, communications, instructions and any other directives issued by the competent authority to the appointed contractor.
- The “Tender Document” means the form of tender, the applicable schedules and/or additional conditions and the specifications and/or drawings as issued to the contractors for the purpose of bidding.
- The expression “works” or “work” when used in the conditions of contract shall, unless there be something in the subject or context repugnant to such construction means, the works or the work contracted to be executed under or in virtue of the contract whether original or altered.
- The “Contractor” means the individual or firm or company, whether incorporated or not, undertaking the works and shall include his or its legal personal representative, successors and permitted assignees.
- “GUJARAT BIOTECHNOLOGY UNIVERSITY” means the Gujarat Biotechnology University, GANDHINAGAR. and the “Accepting Officer” means the officer who is authorized to sign and signs the contract on behalf of the “GUJARAT BIOTECHNOLOGY UNIVERSITY.”
- Tender Inviting Authority who administers and in the case of the term contracts directs the contract.
- The “Engineer-in-charge / Person deligated by Authority” means all officers of the GUJARAT BIOTECHNOLOGY UNIVERSITY appointed by the EIC to supervise the works or part of the works.
- The “Consultant” means designing, supervision agency appointed by Gujarat Biotechnology University.
- “B.S.” means the “British Standard” as issued by the British Standards institution. “A.S.” means the American Standards as issued by the American Standard Institutions and “I.S.” means the “Indian Standards” as issued by the Indian Standards Institutions. Wherever the above mentioned abbreviations are preferred to, in the specifications and / or work orders, they mean the addition with all amendments current at the date of issue of tender documents of work orders. In the case of measurement and terms of contracts “Specifications” means those contained in Gujarat Biotechnology University, GANDHINAGAR schedule together with any amendments etc. embodied in the tender documents, “Drawings” refer to those accompanying the tender documents and/or any work orders referred therein.
- The “Contract Sum” means the sum accepted or the sum calculated in accordance with the prices accepted in the tender and/or the contract rate as payable to the contractor for the full and entire executing and completion of works.
- “The date of completion” is the date or dates of completion of the work or any part of the works set out or ascertained in accordance with the individual work orders and the tender documents or any subsequent agreed amendments there to.

2. **Priority of Documents**

2.1.1 This Contract, and all other agreements and documents forming part of or referred to in this Contract are to be taken as mutually explanatory and, unless otherwise expressly provided elsewhere in this Contract, the priority of this Contract and other documents and agreements forming part hereof or referred to herein shall, in the event of any conflict between them, be in the following order:

(a) the Contract; and

(b) all other agreements and documents forming part hereof or referred to herein.

i.e, the Contract at (a) above shall prevail over the agreements and documents at (b) above.

2.1.2 Subject to the provisions of Clause 2.1.1, in case of ambiguities or discrepancies within this Contract, the following shall apply:

(a) between two or more Clauses of this Contract, the provisions of a specific Clause relevant to the issue under consideration shall prevail over those in other Clauses;

(b) between the Clauses of this Contract and the Schedules, the Clauses shall prevail and between Schedules and Annexes, the Schedules shall prevail;

(c) between any two Schedules, the Schedule relevant to the issue shall prevail;

(d) between the written description on the Drawings /Specifications and Bill of Quantities, the former shall prevail;

(e) between the dimension scaled from the Drawing and its specific written dimension, the latter shall prevail; and

(f) between any value written in numerals and that in words, the latter shall prevail.

2.1.3 In the event that clause 2.1.1 and clause 2.1.2 are unable to resolve the discrepancies, the most restrictive provision(s) among the alternatives shall prevail.

3. Subject to and in accordance with the provisions of this Contract, the applicable Laws, Good Industry Practice, the Authority hereby grants to the Service Provider, and the Contractor hereby accepts the exclusive right and authority to provide the works during the subsistence of this Contract for a period of 10 Weeks (the "**Term**"), unless an early termination occurs in accordance with this Contract. The Contract period shall be commencing from the date of signing of this Contract.

Term of Contract:-

- Construction & Handover – 10 Weeks
  - Milestone 1 i.e. 10% on 15 days.

- Milestone 1 i.e. 40% on 30 days.
- Milestone 1 i.e. 80% on 50 days.
- Milestone 1 i.e. 100% on 70 days.

- Defect Liability of the project – 1 Yr after completion

Compensation for the delay: The time limit allowed for carrying out the work as entered in the tender shall strictly observed by the contractor and shall be reckoned from the date on which the order to commerce the work is given to the contractor pursuant to signing of this Contract. The work throughout the stipulated period of Contract proceeds with due diligence (time being deemed to be essence of contract) and for delay, deduction of 0.5% of contact value per day of delay subject to maximum of 10 % of the contract value from running bills. If the Contractor has not shown any intention to complete the work as per schedule after bidder has been informed of Liquidity Damage deduction. Authority may at its discretion terminate the contract and hand it over to suitable agency at risk and cost of the Contractor.

Defect Liability Period:

i. The Scope of Project shall be subject to a cumulative Defect Liability Period (DLP) of 12 (Twelve) months from the date of issuance of Works Completion Certificate. The Defect Liability Period of 12 (Twelve) months shall be inclusive of any guarantee/warrantee provided by the manufacture/supplier of the Works, equipment. During the Defect Liability Period, the Contractor shall, at its own cost and responsibility, rectify all defects in the Works performed by them in accordance with the Contract. The Authority shall notify the Contractor, in writing, regarding the Defects at the Project. The Contractor, within the time notified by the Authority as per Good Industry Practice, shall repair or rectify the Defect or deficiency.

ii. The Contractor agrees that in the event of failure of any particular part of any equipment and/or the equipment, for more than three times during the DLP, it shall not be repaired but the complete part and/or equipment shall be replaced by the Contractor. However, during the DLP, the Contractor shall be liable for complete replacement of any equipment only once. In case it is found that the above-mentioned failure is due to some connected part of the equipment, that part shall also be rectified or replaced by the Contractor to avoid such failure. For electrical motors during the DLP, if some important part of motor like starter winding shaft bearing squirrel cage, motor etc. becomes defective the Contractor shall replace the same at its own cost and no repairs shall be allowed. Until such time the defects are not remedied, Defect Liability Period shall be deemed to be extended. Any materials or Works with Defects identified as above and replaced or repaired during the Defects Liability Period or the extended Defects Liability Period, as the case may be, would be further warranted for a period of twelve (12) months from the date of completion of such repair or replacement. The Contractor shall upon termination or expiry of this Contract, or upon expiry of the Defects Liability Period, assign any outstanding benefit in respect of any subcontract or any warranty from any Subcontractor, to the Authority or to such other person as the Authority may direct.

iii. The Contractor shall repair defects or deficiencies within the time limit mentioned below or as stated by Authority,

S.N.	Nature of defect or deficiency	Time limit for rectification
1	Breach or blockade of the pavement/ walkways/ Within the museum and the utilities building	4 hours
2	Damage to or silting of culverts and side drain during and immediately preceding the rainy season.	4 hours
3	Damages/defects in retaining wall, weep holes, apron stone pitching/culverts, cover slabs etc.	7 days
4	Any failure of the exterior lighting (including street lighting) and telecom	12 hours
5	Any failure/defect of escalators and elevators	12 hours
6	Defects in electrical/mechanical/HVAC	12 hours
7	Cracks/gaps	2 days
8	Damages in joineries/flooring, walls etc.	2 days
9	Damages to septic tank, STP	6 hours
10	Damages to tube wells &pumps including water tank	6 hours
11	Damages to CCTV and security system	4 hours
12	Damages to electrical substation/transformer	3 hours
13	Damages to DG set	12 hours
14	Damages to indoor and outdoor furniture	7 days
15	Projectors	1 days (repair) 7 days (replacement)
16	Server/ Network/ Wi-Fi system/ entertainment system, computer system	6 hours (repair) 7 days (replacement)
17	All other Minor repairs not mentioned above	2 days
18	All other Major repairs/replacement not mentioned above	15 days

The Contractor agrees, that in the event that the Contractor fails to repair or rectify such Defect or deficiency within the aforementioned period, the Authority at its discretion, may undertake to get the same repaired, rectified or remedied at the Contractor's cost so as to make the Project conform to the Technical Specifications and Standards and the provisions of this Contract. All costs consequent thereon shall, after due consultation with the Authority and the Contractor, be determined by the Authority. The cost so determined, and an additional amount equal to 50% (fifty per cent) of such cost as Damages, shall be recoverable by the Authority from the Contractor and may be deducted by the Authority from Performance Security or subsequent bills/invoices or retention money of the Contractor.

4. **Notice for unsatisfactory progress:** If the progress or a particular portion of the work is unsatisfactory the Engineer-in-charge / Person deligated by Authority whose decision shall be final, shall not withstanding that the general progress of work is satisfactory; be

entitled to take after giving the contractor 5 days notice in writing and the contractor will have no claim for compensation for any loss sustained by him owing to such actions.

5. **Action in the case of Default by Contractor** Even after notice, default by the contractor for showing the progress at site or procurement Authority is free to terminate the contract which not allowing bidder from his liability to pay compensation amounting to the whole of his Performance Security and liability of the contractor for past and future compensation shall remain unaffected in the event of the Engineer-in-charge / Person deligated by Authority taking action for taking possessions of all or any tools, plants, materials, and stores in such upon the work or the site thereof belonging to the contractor, or procured by him and intended to be used for the execution of the work of any part thereof paying for allowing for the same in account at the contract rates, or in the case of a contract rates not being applicable to current market rates to be certified by the Engineer-in-charge / Person deligated by Authority whose certificate thereof shall be final. In the alternative, the Engineer-in-charge / Person deligated by Authority may by notice in writing to the contractor or his clerk of works, foremen or other authorized agent, require him to remove such tools, plants, materials or stores from the premises within a time to be specified in such requisition to decisions to the contractor failing to comply with any such requisition, the decision of the Engineer-in-charge / Person deligated by Authority as to the expenses of any such removal and the amount of the proceed and expense of any such sale, be final and conclusive against the contractor.

6. **Extension of Time Limit:** If the contractor shall desire an extension of the time limit for completion of the work on the ground of his having been unavoidably hinder in its execution or on any other ground, he shall apply in writing before 2 weeks of due date of completion of project to the Engineer-in-charge / Person deligated by Authority and the Engineer-in-charge / Person deligated by Authority may, if in his opinion there are reasonable grounds for granting extension, recommend such extension as he may think necessary or proper. The decision of the competent authority in this regard shall be final and binding to the contractor. Any delay attributed to GUJARAT BIOTECHNOLOGY UNIVERSITY shall be compensated only by way of extending the limit.

7. **Test and Completion Certificate:**

7.1 Tests

The Authority and its Representatives or DTA requires the Contractor to carry out or cause to be carried out tests as per the Schedule 3B to check if it Works been completed as per the terms of this Contract and more specifically in a manner and applying the criterion as set out in the Technical Specifications and Standards. The Authority, or its designated representatives, shall be entitled to attend the tests and/or inspections conducted pursuant to this Clause 7.1.1. However, it is clarified that inspection of the Works or the presence of Authority or its designated representatives during any tests and/or inspection, shall in no way relieve the Contractor of its obligations under this Contract.

7.1.1 In accordance with the instructions of Authority and its representatives, the Contractor shall, with due diligence, carry out minimum 10% of tests at GERI. Incase any of the test is not carried by GERI Labs, the testing will be done at any of the Government Institutes approved by the Authority. Remaining balance of the tests shall be done from a lab that is accredited to National Accreditation Board for Testing and Calibration Laboratories (NABL) or Government approved Lab by R&B Department. It is also necessary to carry out testing of all components, elements as per the frequency norms prescribed in Technical Specifications or as per the relevant Indian Standards. 1% of the amount of work done shall be deducted from R.A. Bill of the contractor for testing the quality of material workmanship, irrespective of actual charges.

Further, Agency has to establish testing laboratory on site for the various test to be carried out in the work for this purpose agency shall construct a pukka laboratory building with all facility on site at location specified by the engineer in charge.

7.1.2 If the Project (or any part of the Project) fails to pass any tests required for the Project (or any part of the Project), then the Authority may reject the Works or part thereof by giving notice to the Contractor giving reasons and require the Contractor to promptly make good the defects (at no extra cost to the Authority) so as to ensure that the rejected item(s) of the Works are in compliance with the Technical Specifications and the requirements of the Applicable Laws. The Contractor shall carry out remedial measures and furnish a report to Authority in this behalf. The Contractor shall carry out or cause to be carried out tests to determine that such remedial measures have brought the Works or part thereof into compliance with the Technical Specifications, and the procedure shall be repeated until such Works or part thereof conform to the Technical Specifications. For the avoidance of doubt, the cost of such tests and remedial measures shall be solely borne by the Contractor.

7.1.3 If the defects in the Works deprive the Authority of substantially the whole benefit of the Works or major part of the Works, then the Authority may terminate this Contract as a whole or in respect of such part of the Works which cannot be put to the intended use, and without prejudice to any other right under this Contract, the Authority shall be entitled to recover from the Contractor all sums paid for the Works or for such part, as the case maybe, plus the financing costs, if any and the costs of dismantling the same, clearing the Site and the returning the plant and materials to the Contractor.

7.1.4 Rejection

If, as a result of an inspection, measurement or testing, any plant, materials, design or workmanship is found to be defective or otherwise not in accordance with the provisions of this Contract, the Authority and its representatives shall reject the plant, materials, design or workmanship by giving notice to the Contractor, with reasons. The Contractor shall then promptly make good the defect and ensure that the rejected item complies with the requirements of this Contract.

If the Authority and its representatives requires the plant, materials, design or workmanship to be retested, the tests shall be repeated under the same terms and conditions, as applicable in each case. If the rejection and retesting cause the Authority to incur any additional costs, such cost shall be recoverable by the Authority from the Contractor; and may be deducted by the Authority from any monies due to be paid to the Contractor.

7.1.5 Remedial Work

(i) Notwithstanding any previous test or certification, the Authority and its representatives may instruct the Contractor to:

a. remove from the Site and replace any plant or materials which are not in accordance with the provisions of this Contract.

b. remove and re-execute any work which is not in accordance with the provisions of this Contract and the Technical Specifications

(ii) If the Contractor fails to comply with the instructions issued by the Authority and its representatives under Clause 7.1.5 (i), within the time specified in the Authority and its representatives notice or as mutually agreed, the Authority have the work executed by another agency. The cost so incurred by the Authority for undertaking such work shall, without prejudice to the rights of the Authority to recover Damages in accordance with the provisions of this Contract, be recoverable from the Contractor and may be deducted by the Authority from any monies due to be paid to the Contractor.

8. Works Completion Certificate

(i) Upon successful Completion of all Works, the Contractor shall request Authority/DTA to issue completion certificate ("**Works Completion Certificate**"). Before making such request, the Contractor shall clear all plants, equipment, surplus materials, wreckage, rubbish, and temporary work from the Site.

(ii) The Authority shall after receiving the Contractor's notice and after being satisfied that the entire Works has been completed as per the terms of this Contract and more specifically in a manner and applying the criterion as set out in the Technical Specifications and after determining that tests are successful, and the Site has been cleared of all plants, equipment, surplus materials, wreckage, rubbish, and temporary work by the Contractor:

(a) issue Works Completion Certificates to the Contractor for its Works as specified under the Scope of Project, stating the date on which its Works was completed in accordance with this Contract, except for any minor outstanding works and defects which will not substantially affect the use of the Project or part thereof for its intended purpose;

(b) reject the application, giving reasons and specifying the Works required to be done to enable it to issue Works Completion Certificates. The Contractor shall then complete the Works before applying further for Works Completion Certificate.

(c) After the Works Completion Certificate has been issued, each Party shall remain liable for the fulfilment of any obligation which remains unperformed at that time. For the purposes of determining the nature and extent of unperformed obligations, the Contract shall be deemed to remain in force.

9. Payment to Contractors:

R. A. Bill: On submission of bill by the contractor in prescribed format. Completion of each activity will be checked by DTA and after getting approval of each activity contractor will proceed ahead to next stage. The RA bill submitted will be paid after deduction of 5% as security amount from each bill, which will be paid to the bidder after the project completion as per the terms in the contract. Maximum Two (2) R.A. Bill per month is allowed to raise.

- All R.A. bills shall be scrutinized by DTA and Then Engineer-in-charge / Person deligated by Authority for quality and quantity and shall be processed based on the approval granted by him.
- Unless otherwise specifically prescribed by the Engineer-in-charge / Person deligated by Authority, the rates for several items of works estimated to cost more than **Rs.20,00,000/-** shall be valid only when the item concerned is accepted, having been completed full, in accordance with the sanctioned specification. In case, where the items of the work, are not accepted, as so completed the Engineer-in-charge / Person deligated by Authority, may make payment on account of such items at such reduced rates, as he may consider reasonable in the preparation of final or running accounts bills.

10. Retention Money Security: In addition to performance security for the due fulfilment of the performance under the Contract by the contractor, 5% of the value of the work done shall be deducted from each RA Bill (As Per Payment Terms) by the Authority towards retention money security (Retention money Security). On the DTA issuing a certificate of the completion of the work the 5% retention money Security will be released at the end of contract period and final certification by Engineer-in-charge, Gujarat Biotechnology University.

11. Bills shall be submitted by the contractor end of the work/ month on or before the date fixed by the Engineer-in–charge in original copies as required.

12. Deleted.

13. Works to be executed in accordance with specifications, orders etc. The contractor shall execute in whole and every part of work in the most substantial and workman-like manner and both as regarding materials and in every other respect in strict accordance with the specification. The Contractor also shall confirm exactly, fully and faithfully to the designs, drawings and instructions in writing relating to the work signed by the Engineer-in-charge

/ Person deligated by Authority and lodged in his office and to which the contractor shall be entitled to have access for the purpose of Inspection at such office, or in the site of the work, during office hours and the contractor shall, also if he so requires, be entitled at his own expenses to make or cause to be made copies of the specification, and of all such designs.

14. Extension of Time Limit in consequence of Addition or Alteration

The time limit for the work shall be extended in the proportion that the increase in its cost occasioned by alterations or additions bears to the cost of the original contract work and the certificate of the Engineer-in-charge / Person deligated by Authority as to such proportions shall be conclusive.

15. No compensation for alternation in or restriction of work to be carried out. If at any time, after execution of the contract documents the Engineer-in-charge / Person deligated by Authority shall, for any reason whatsoever, require the whole or any part of the work, as specified in the tender, to be stopped for any period or shall not require the whole or part of the work to be carried out at all or to be carried out by the contractor, he shall give notice in writing of the fact to the contractor who shall thereupon suspend or stop the work totally or partially as the case may be in any such case, except as provided here under the contractor shall have no claim to any payment or compensation what so ever on account of any profit or advantage which he might have derived from the execution, of the work in full but which he did not so derive in consequence of the full amount of work not having been carried out or on account of any loss that he may be put to on account of materials purchased or agree to be purchased or for unemployment of labour recruited by him. He shall not also have any; claim for compensation by reason of any alterations having been made in the original specification, drawings, designs and instructions which may involve any curtailment of the work as originally contemplated. Where however, materials have already been purchased or agreed to be purchased by the contractor before receipt by him of said notice, the Engineer-in-charge / Person deligated by Authority provided they are not in excess or requirement and are of approved quality and /or shall be compensated for the loss, if any, that he may put to in respect of materials agreed to be purchased by him. The amount of such compensation to be determined by the Engineer-in-charge / Person deligated by Authority whose decision shall be final. If the contractor suffers any loss on account of his having to pay, his labour charges during the period, during which the stoppage of work has been ordered under this clause the contractor shall on application be entitled to such compensation on account of labour charges as the Engineer-in-charge / Person deligated by Authority whose decision shall be final, may consider reasonable provided that the contractor shall not be entitled to any compensation on account of labour charges if, in the opinion of the EIC, the labour could have been employed by the contractor elsewhere for the whole or part of the period during which the stoppage of the work has been ordered as aforesaid.

16. **No Claim for Variation in Quantities of Work**: Quantities shown in the tender are approximate and no claim shall be entertained for quantities of work. Payment will be made as the actual quantity executed and certified by EIC.at site, being either more or less up to any extent than those entered in the tender or less than those entered in the tender or estimate. Will be not the case for any claim in this regard.

17. **No Claim for Compensation for Delay in staring work**: No compensation shall be allowed for any delay caused into starting of work on account of acquisition of land and in the case of clearance for works or any delay in according sanction to estimates.

18. **Entering upon or commencing any portion of work**: The contractor shall not enter upon or commence any portion of work except with the written authority or instructions of the Engineer-in-charge / Person deligated by Authority or his subordinate in charge of the work, failing such the contractor shall have no claim to ask for measurement or payment for work.

19. Method of Payment to contractors shall be made by A/c payee cheques & RTGS.

20. **Acceptance of conditions on tendering for work:**
    Submission to tender or acceptance of work order shall imply acceptance of these conditions of tender by contractor.

21. **Termination**

21.1 Contractor Default

Save as otherwise provided in this Contract, in the event that any of the defaults specified below shall have occurred, and the Contractor fails to cure the default within the Cure Period set forth below, or where no Cure Period is specified, then within a Cure Period of 30 days, the Contractor shall be deemed to be in default of this Contract (a "**Contractor Default**"), unless the default has occurred solely as a result of any breach of this Contract.

a. the Performance Security has been encashed and appropriated and the Contractor fails to replenish or provide fresh Performance Security within a Cure Period of 15 days;
b. subsequent to the replenishment or furnishing of fresh Performance Security, the Contractor fails to cure, within a Cure Period of 15 days, the Contractor Default for which whole or part of the Performance Security was initially appropriated;
c. the Contractor is in material breach of its obligations and / or Scope of Project as laid down in this Contract;
d. In case the Contractor abandons or manifests intention to abandon the Contract, without the prior written consent of the Authority;
e. the Contractor is adjudged bankrupt or insolvent;
f. the Contractor has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of the Authority, a Material Adverse Effect;

g. any representation or warranty of the Contractor herein contained which is, as of the date hereof, found to be materially false or the Contractor is at any time hereafter found to be in breach thereof;
h. the Contractor has failed to fulfil any obligation, for which failure termination has been specified in this Contract;
i. the Contractor repudiates this Contract or otherwise takes any action or evidences or conveys an intention not to be bound by the Contract;
j. if the Contractor, in the judgment of the Authority has engaged in corrupt or fraudulent practices in competing for or in executing the Contract;
k. if, as the result of Force Majeure, the Contractor is unable to perform a material portion of the Contract for a period of not less than thirty (30) days;
l. if the Authority, in its sole discretion and for any reason whatsoever, decides to terminate this Contract;
m. if the Contractor fails to comply with any final decision reached as a result of arbitration proceedings pursuant to Clause 21 hereof.

21.2 Without prejudice to any other rights or remedies which the Authority may have under this Contract, upon occurrence of a Contractor Default, the Authority shall be entitled to terminate this Contract by issuing a termination notice in writing to the Contractor; provided that before issuing the termination notice, the Authority shall by a notice inform the Contractor of its intention to issue such Termination Notice and grant 15 (fifteen) days to the Contractor to make a representation, and may after the expiry of such 15 (fifteen) days, whether or not it is in receipt of such representation, issue the Termination Notice.

21.3 Termination Payment:

a. Upon Termination on account of a Contractor Default during the Term, the Authority shall be entitled to terminate this Contract and forfeit the Performance Security of the Contractor. In such event, the Contractor shall only be entitled to unpaid payment on proportionate basis for the works performed in accordance with the Contract prior to Termination Date after deducting any outstanding amount due and payable by the Contractor to the Authority under the provisions of this Contract. The Authority shall not make any other payment.

b. Upon Termination on account of Authority default, the Authority shall return the Performance Security to the Contractor and shall pay the unpaid payment for the works on proportionate basis for the works undertaken in accordance with the Contract and term hereof prior to Termination Date after deducting any outstanding amount due and payable by the Contractor to the Authority under the provisions of this Contract.

c. For avoidance of doubt, the Termination under this Clause shall be without prejudice to the completion of the works wholly or partially outstanding at the date of such termination.

22. Force Majeure

"Force Majeure" or **"Force Majeure Event"** means the occurrence of any event which (i) is beyond the reasonable control of the Contractor, and (ii) the Contractor could not have prevented or overcome by exercise of due diligence and following Good Industry Practice, and (iii) has material adverse effect on the Contractor, such that it affects the performance by the Contractor of its obligations under this Contract. Such events may include, but are not limited to, wars or revolutions, fires, epidemics, act of God, natural calamities, quarantine restrictions, strikes/ boycotts, Expropriation or compulsory acquisition in national interest of any rights of the Contractor and unlawful revocation of, or refusal to renew or grant without valid cause, any clearance, license, permit etc. which is required by the Contractor to perform its obligations under this Contract.

Upon the occurrence of a Force Majeure Event, the Contractor shall forthwith notify the Authority within 48 hours after it knew, or when it ought to have reasonably known, of its occurrence and shall provide the requisite information sought by the Authority from time to time regarding it. The Contractor shall not be liable for any delay or failure in performance of its obligations under the Contract which is the result of an event of Force Majeure. If a Force Majeure Event subsists for a period of 180 days or more within a continuous period of 365 days, the Authority may in its discretion terminate this Contract by issuing a termination notice to the Contractor without being liable in any manner whatsoever. No payment shall be due and payable by the Contractor to the Authority in case of termination of this Contract due to any Force Majeure Event; provided however that the Authority shall return the Performance Security to the Contractor within 30 days of such force majeure termination and shall pay any outstanding payment for the works undertaken by it till date of termination due to Force Majeure Event after deducting any outstanding amount due and payable by the Contractor to the Authority under the provisions of this Contract.

The termination payments payable in case of occurrence of Force Majeure is as follows:

If Termination is on account of any of the Force Majeure Events, the Authority shall return the Performance Security to the Service Provider. The Service Provider shall only be entitled to payment of unpaid and due O&M Fee on proportionate basis for the Services rendered in accordance with term hereof prior to Termination Date. The Service Provider shall take appropriate Insurance Cover for hedging risks associated with the events of Force Majeure.

23. Dispute Resolution

23.1 Amicable Settlement

23.1.1 The Parties agree that early resolution of disputes is crucial for a smooth execution of the Contract. The Parties shall use their best efforts to settle amicably all disputes arising out of or in connection with this Contract or its interpretation;

23.1.2 Any dispute between the Parties as to matters arising under or out of or in relation to this Contract (including its interpretation) between the Parties that cannot be settled amicably within thirty (30) days after receipt by one Party of the other Party's request for such amicable settlement may be submitted by either Party for settlement in accordance with the provisions specified in Clause 20.2 below.

23.2 Disputes shall be settled by arbitration in accordance with the following provisions:

23.2.1 Any dispute, controversy, or claim arising out of or relating to this Contract, or the breach, termination or invalidity thereof, which could not be settled amicably, shall be settled by arbitration in accordance with the Arbitration Act.

i. Each dispute submitted by a Party to arbitration shall be heard by a sole arbitrator appointed mutually by Parties in accordance with the Arbitration Act.
ii. Arbitration shall be conducted subject to and in accordance with Arbitration Act.
iii. The language of the arbitration shall be English.
iv. The seat of Arbitration shall be [**]
v. The arbitrator shall make a reasoned award (the "**Award**"). Any Award made in any arbitration shall be final and binding on the Parties as from the date it is made, and the Contractor and the Authority agree and undertake to carry out such Award without delay.
vi. The Contractor and the Authority agree that an Award may be enforced against the Contractor and/or the Authority, as the case may be, and their respective assets wherever situated.
vii. This Contract and the rights and obligations of the Parties shall remain in full force and effect, pending the Award in any arbitration proceedings hereunder.

23.3 Arbitration and Conciliation

(i) If the Contractor is of the view that a decision by the Authority's representative is inconsistent with the terms of the Contract, The Contractor shall refer such issue to the Engineer-in-Charge within 14 (fourteen) days from the date of occurrence of such.
(ii) If the issue is not resolved, either Party may refer the matter for conciliation within 15 (fifteen) days from the date of decision by the Engineer-in-Charge. If the Parties fail to resolve the issue via conciliation, the Parties shall refer such dispute to Building Works Committee, GBU.
(iii) If the dispute is not resolved through conciliation, either Party may refer the dispute to Gujarat Public Works Contract Dispute Arbitration Tribunal.
(iv) The reference to arbitration proceeding under this clause shall not;
    (a) affect the right of both the parties under the contract to take possession of all or any tools plants materials and stores in or upon the works of site thereof belonging to the Contractor or procured by him and intended to be used for the execution of the work or any part thereof.

(b) Preclude the Authority from utilizing the materials purchased by the Contractor in any work or from removing such materials to other places, during the period the work is stopped or suspended in pursuance of notice given to the Contractor.

(c) Entitle the Contractor to stop the progress of the work or the carrying out the additional or altered work in accordance with the provisions of Contract.

24. Insurance

24.1 During the entire Term of the Contract, the Contractor shall independently, obtain following insurance cover to secure Scope of Project under this Contract:

a. at its sole cost and expense, obtain, maintain and keep in full force and effect during the Term of this Contract including but not limited to insurance for Works and Contractor's equipments, against injury to persons including labour, workmen and damage to property, third party insurance etc.;

b. require all its Subcontractors to obtain, maintain and keep in full force and effect throughout the time during which they are engaged to perform any Works required to be performed by it including but not limited to insurance for Works performed by them and Subcontractors equipments, against injury to persons and damage to property, third party insurance etc;

c. obtain, maintain and keep applicable insurance policies in accordance with the Applicable Laws, circulars issued by the Government of Gujarat and Good Industry Practice. For avoidance of doubt all applicable insurances for the Works shall be obtained by the Contractor or in the name of the Contractor; and

d. obtain and keep in force all the necessary insurances required for the operations of the facility (from local statutory bodies) and for its employees/Subcontractors in terms of the Applicable Laws, circulars issued by the Government of Gujarat and Good Industry Practice.

If the Contractor shall fail to effect and keep in force all insurances for which it is responsible pursuant hereto, the Authority shall have the option to either keep in force any such insurances, and pay such premia and recover the costs thereof from the Contractor by invoking its Performance Security and/or deducting the amount paid towards such premia from the Payment due to the Contractor by the Authority, or in the event of computation of a Termination Payment, treat an amount equal to the Insurance Cover as deemed to have been received by the Contractor.

24.2 Subject to the provisions of Force Majeure, the Contractor shall, in accordance with the provisions of this Contract, be liable to bear the cost of any loss or damage that does not fall within the scope of this Article 14 or cannot be recovered from the insurers.

24.2A The Contractor shall fully indemnify, hold harmless and defend the Authority from and against any and all losses, damages, costs, charges and/or claims with respect to:
(a) the death of or injury to any person; or
(b) the loss of or damage to any property,

that may arise out of or in consequence of any breach by the Contractor of this Contract during the execution of the Works or the remedying of any defects therein.

24.3 Proof of Insurance

No later than 15 (fifteen) days from the Effective Date, Contractor shall provide to the Authority all certificates, documents and other proofs evidencing that the insurance which the Contractor is obliged to procure under this Contract have been procured and are in full force and effect.

24.4 Deductibles

Any and all deductibles and all losses or damages in excess of the insured limits in the insurance policies required under this Contract shall be to the account of the Contractor, unless otherwise expressly stated in this Contract.

24.5 Insurance Policy Cancellation

In case of cancellation of any insurance policy required to be carried by this Contract, or the insolvency, bankruptcy or failure of any such insurance company that has issued a policy hereunder, the Contractor shall promptly notify the Authority and obtain new insurance policies in the amounts and coverage required hereby.

24.6 Alteration to the Policy Terms

The Contractor shall not make or agree to any material alteration to the terms of any insurance policies without the prior approval of the Authority.

24.7 Insurance policies not to limit Contractor's liability

The insurance policies required to be maintained by the Contractor shall in no way affect, nor are they intended as a limitation of its obligation under the Contract.

24.8 Failure to obtain insurance

If the Contractor fails to take out and/or maintain in effect the applicable insurances required under this Contract, the Authority may take out and maintain in effect any such insurances and may from time to time deduct from any amount due to the Contractor under the Contract towards the premium of such insurances, or may otherwise recover such amount as a debt due from the Contractor and the Contract Price shall be adjusted accordingly.

24.9 Loss Payee

The Contractor shall ensure that all such insurance policies obtained for the Project in terms of this Contract shall be endorsed in the name of the Authority, or any other person designated by the Authority, is named as the first loss payee in all insurance contracts effected by the Contractor pursuant to this Article14.

24.10 Waiver of subrogation

All insurance policies in respect of the insurance obtained by the Contractor pursuant to this Article 14 shall include a waiver of any and all rights of subrogation or recovery of the insurers thereunder against, inter alia, the Authority, and its assigns, successors,undertakings and their subsidiaries, affiliates, employees, insurers and underwriters, and of any right of the insurers to any set-off or

counterclaim or any other deduction, whether by attachment or otherwise, in respect of any liability of any such person insured under any such policy or in any way connected with any loss, liability or obligation covered by such policies of insurance.

24.11 Contractor's waiver

The Contractor hereby further releases, assigns and waives any and all rights of subrogation or recovery against, inter alia, the Authority and its assigns, undertakings and their subsidiaries, Affiliates, employees, successors, insurers and underwriters, which the Contractor may otherwise have or acquire in or from or in any way connected with any loss, liability or obligation covered by policies of insurance maintained or required to be maintained by the Contractor pursuant to this Agreement (other than third party liability insurance policies) or because of deductible clauses in or inadequacy of limits of any such policies of insurance.

25. Performance Security

25.1 The Contractor shall as security for the due and faithful performance and discharge obligations relating to works set out in terms of this Contract, procure and furnish to the Authority a Performance Security, in the form of a bank guarantee from a scheduled commercial bank in India acceptable to the Authority for an amount equivalent to Rs._____/- (Rupees _____). The Contractor shall provide such Performance Security within 5 days (ten days) from the signing of this Agreement. Such Performance Security shall be in the form set forth in Annexure-A hereto. Until such time the Performance Security is provided by the Contractor pursuant hereto and the same comes into effect, the Bid Security shall remain in force and effect, and upon such provision of the Performance Security pursuant hereto, the Authority shall release the Bid Security to the Contractor. No interest shall be payable by the Authority against the Performance Security;

25.2 Upon occurrence of a Contractor Default, the Authority shall, without prejudice to its other rights and remedies hereunder or in law, be entitled to encash and appropriate from the Performance Security the amounts due to it for and in respect of such Contractor Default. Upon such encashment and appropriation from the Performance Security, the Contractor shall, within 15 (fifteen) days thereof, replenish, in case of partial appropriation, to its original level the Performance Security, and in case of appropriation of the entire Performance Security by the Authority, provide a fresh Performance Security, as the case may be, failing which the Authority shall be entitled to terminate this Contract in accordance with Clause 18.1. Upon replenishment or furnishing of a fresh Performance Security, as the case may be, as aforesaid, the Contractor shall be entitled to an additional Cure Period of 30 days for remedying the Contractor Default, and in the event of the Contractor not curing its default within such Cure Period, the Authority shall

be entitled to encash and appropriate such Performance Security as Liquidated Damages, and to terminate this Contract in accordance with Clause 18.

The Performance Security shall remain in force and effect for the entire Term, subject to Clause 22.1 above, the Performance Security shall be released within 3 months after completion of project. In case the Contractor does not adhere to the terms and conditions of the warranty during the Warranty Period upon Expiry Date the Performance Security will be liable to be forfeited by the Authority. "**Expiry Date**" shall mean the date falling on the last date of the Term, or the earlier termination of this Contract.

26. Condition Precedent

The Contractor shall fulfil its Conditions Precedent obligations as per terms hereof within 5 days of date of execution of this Contract or any extension thereof in accordance with terms hereof. The Contractor shall make all reasonable endeavours to satisfy the Conditions Precedent within the time stipulated.

26.1 Conditions to be fulfilled by the Contractor

Subject to Clause 23.3 below, the Conditions Precedent required to be satisfied by the Contractor within a period of 5 (five) days from the date of execution of this Contract shall be deemed to have been fulfilled when the Contractor shall have provided the Performance Security to the Authority;

26.2The date on which the Conditions Precedent are satisfied by the Contractor shall be the Appointed Date for commencement of Term for the works to be undertaken under this Contract. Upon satisfaction of the Conditions Precedent by the Contractor, the Authority shall issue a commencement of work order.

26.3 Consequences of Termination due to non-fulfilment of Conditions Precedent

a. In the event of Termination of the Contract by the Authority, on account of non-fulfilment of Conditions Precedent by the Contractor, the Authority shall be entitled to encash the Bid Security (if Performance Security has not been furnished) or encash equivalent amount from Performance Security, as the case may be, and appropriate the proceeds thereof as Damages, and thereupon all rights, privileges, claims and entitlements of the Contractor under or arising out of this Contract shall be deemed to have been waived by and to have ceased with the concurrence of the Contractor.

27. Counterparts

This Contract may be executed in any number of counterparts, each of which when executed shall constitute a duplicate original.

28. Exclusion of implied warranties etc.

This Contract expressly excludes any warranty, condition or other undertaking implied at law or by custom or otherwise arising out of any other agreement between the Parties or

any representation by either Party not contained in a binding legal agreement executed by both Parties.

29. Severability

If for any reason whatever, any provision of this Contract is or becomes invalid, illegal or unenforceable or is declared by any court of competent jurisdiction or any other instrumentality to be invalid, illegal or unenforceable, the validity, legality or enforceability of the remaining provisions shall not be affected in any manner, and the Parties will negotiate in good faith with a view to agreeing to one or more provisions which may be substituted for such invalid, unenforceable or illegal provisions, as nearly as is practicable. Failure to agree upon any such provisions shall not be subject to the Dispute Resolution Procedure set forth under this Contract or otherwise.

30. No partnership

This Contract shall not be interpreted or construed to create an association, joint venture or partnership between the Parties, or to impose any partnership obligation or liability upon either Party, and neither Party shall have any right, power or authority to enter into any agreement or undertaking for, or act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other Party.

31. Entire Contract

This Contract and the Annexures together constitute a complete and exclusive statement of the terms of the agreement between the Parties on the subject hereof, and no amendment or modification hereto shall be valid and effective unless such modification or amendment is agreed to in writing by the Parties and duly executed by persons especially empowered in this behalf by the respective Parties. All prior written or oral understandings, offers or other communications of every kind pertaining to this Contract are abrogated and withdrawn.

32. Successors and Assigns

This Contract shall be binding upon, and inure to the benefit of the Parties and their respective successors and permitted assigns.

33. Confidentiality

Except with the prior written consent of the Authority, the Contractor and its personnel shall not at any time communicate to any person or entity any Confidential Information acquired in the course of the performance of the works. "**Confidential Information**" means all documents and other forms of information, including oral and electronics communications, disclosed by a Party or its representatives to the other Party or that Party's representatives in connection with this Contract and expressly or impliedly indicated to be confidential;

34. Indemnity

The Contractor expressly acknowledges and undertakes to fully indemnify the Authority from and against all losses, liabilities, costs, damages and claims arising from the Contractor's failure to comply with its obligations under this Contract including but not

limited to any compliance with applicable laws, applicable permits, conditions imposed by the insurance policies affected in accordance herewith.

35. Notices

Any notice direction or communication (including the placing or acceptance of an Order) given hereunder by one party to the other:

a. If sent by post to the last known place of business of the other party shall be deemed to have been served on the date when in the ordinary course of post it would have been delivered to the other party; and

b. If sent by email shall be deemed to have been served at the time and date when the email message is delivered to the email box of the intended recipient, as evidenced by an advice of delivery message automatically returned to the sender by the relevant system and network used for the transmission of such message.

36. Intellectual property rights

Any and all patents, registered designs, unregistered designs, copyright or other intellectual property rights whether or not similar to any of the foregoing in or resulting from any work carried out by the Contractor under or in pursuance of this Contract shall belong exclusively, throughout the world, to the Contractor.

37. Modification and Variation

Any modification or variation of the terms and conditions of this Contract by the Authority for remedying any unforeseen adverse circumstances/events, including any modification or variation of the Scope of work, can only be made by written agreement between the Parties.

38. Relation between the Parties

The Parties unconditionally agree and understand that this Contract is on a principal to principal basis and does not create and shall not be deemed to create any employer-employee or a principal-agent relationship between as between the Authority and the Contractor or its Personnel. The Contractor, subject to this Contract, have complete charge of personnel undertaking the works and shall be fully responsible for the works performed by them or on their behalf hereunder. None of the Parties shall be entitled to, by act, word, or deed or otherwise, make any statement on behalf of the other Party or in any manner bind the other Party or hold out or represent that it is representing or acting as an agent of the other Party.

39. Law Governing the Contract

This Contract and any dispute or claim arising out of or in connection with this Contract or its subject matter, existence, validity, termination, interpretation or enforceability shall be governed by and construed in accordance with the laws of India.

40. Handover of Site:

(a) For the purpose of this Contract, the Authority, in accordance with the terms and conditions set forth herein, shall grant to the Contractor, commencing from the date of

this Contract, a right of way to the site ("Site") together with all and singular rights, liberties, privileges, easements to the said Site belonging to or in any way appurtenant thereto or enjoyed therewith, for the duration of the duration of the Contract and, for the purposes permitted under this Contract, and for no other purpose whatsoever. Provided however that the rights being vested herein does not, and shall not be construed as creating any demise, interest or ownership in the Site, whatsoever; and is a mere permission to enter the Site and perform the works envisaged hereunder, subject to and in accordance with terms hereof.

(b) It is expressly agreed that the rights granted hereunder shall terminate automatically and forthwith, without the need for any separate action to be taken by the Authority, upon the termination of this Contract for any reason whatsoever.

(c) The Contractor shall use only such Contract as are allotted to it by the Authority and shall not use the Site for any other purpose except to carry out its obligations as per the terms of this Contract. Further, the Contractor shall not sub-license its rights hereunder or create Encumbrances/charge of any nature whatsoever, save and except as may be expressly set forth in this Contract.

41. Transfer Requirement

Upon expiration of the duration of the Contract or the termination of this Contract, as the case may be, the Contractor shall comply with and conform to the following transfer requirements ("Transfer Requirements"):

a. Transfer the Site, free and clear of all Encumbrances;
b. Deliver forthwith the actual or constructive possession of the Project, free and clear of all Encumbrances,
c. cure defects, if any, and hand back/hand over all the Equipment to the Authority; provided that in the event of termination during the Term all the Equipment shall be handed back to the Authority on 'as is where is' basis;
d. transfer and/or deliver all Applicable Permits relating to the project to the extent required and permissible under Applicable Laws to the Authority;
e. execute such deeds of conveyance, documents and other writings as the Authority may reasonably require for conveying, divesting and assigning all the rights, title and interest of the Contractor in the Project, including the right to receive outstanding insurance claims to the extent due and payable to the Authority or its nominee; and
f. Comply with all other requirements as may be prescribed or required under Applicable Laws for completing the transfer and assignment of all rights, title and interest of the COntractor in the Project, free from all encumbrances, absolutely unto the Authority.

42. Vesting Certificate:-

- The transfer of all rights, title and interest in the Project shall be deemed to be complete on the date when Authority has paid the Contractor, the remaining payment due under this Contract. In such case, the Authority shall, without unreasonable delay, thereupon issue a certificate ("Vesting Certificate"), which will have the effect of constituting

evidence of transfer by the Contractor of all of its rights, title and interest in the Project in the Authority pursuant hereto. It is expressly agreed that any defect in the Transfer Requirements shall not in any manner be construed or interpreted as restricting the exercise of any rights by the Authority or its nominee on, or in respect of, the Project, even if, all the Transfer Requirements have been complied with by the Contractor.

- For the avoidance of doubt, the cost of fulfilling the Transfer Requirements shall be solely borne by the Contractor.

SPECIAL CONDITIONS: TECHNICAL

1. Contractor shall be responsible for any accident or damage to road gutter, manholes, dustbins, water closet pipeline etc. or any inconveniency caused by contractor for which the necessary compensation shall be paid by the contractor or recovered from the bill as deem fit by the University.
2. If required, the work shall be continued during the extended period without any extra rate and it terms & condition. The time limit of the works shall be considered accordingly.
3. It is the responsibility of the contractor to get the work done satisfactorily by arranging sufficient manpower tool tackles materials etc. as per the requirement. For poor performance of the works, reduced rates shall be paid and necessary action shall be taken as per Corporation's rules.
4. The contractor or his authorized representative shall remain present during working hours and as per requirement.
5. Any description is left out in item the work shall be executed as per the instruction of Engineer-in-charge / Person deligated by Authority.
6. If work is not carried out by the contractor, it will be got done at risk and cost of contractor and amount along with 15% supervision charges will be recovered from the bill.
7. If any dispute arises the booklet of "TENDER AND CONTRACT FOR WORKS' may be referred and it will be treated as part of the contract. Final Call will be taken by Registrar, Gujarat Biotechnology University.
8. Contractor has to carry out the items as per the requirement as and when required and if he fails to carry out the work as required, recovery will be made as per penalty clause.
9. Quantities of each item shown in the tender is approximate and may very up to any extent. Claim shall be entertained for quantities of work, executed being more or less than those entered in the Schedule-B of the Tender.
10. **VARIATION**

a. **Right to vary the Work**

During the Construction Period, the Authority as well as the Contractor shall have a right to seek variation in the Work ("**Variation**") by way of a proposal at any time prior to issuing of the Works Completion Certificate.

Any change in the BOQ, which is not triggered by a change in Scope of Project as defined in shall not constitute Variation

b. Authority's right to vary the Work

(i) The Authority may give a proposal for Variation to the Contractor at any time prior to issuing of the Works Completion Certificate. The Contractor shall execute and be bound by each Variation (as applicable to it) proposed by the Authority unless the Contractor promptly gives notice to the Authority stating (with supporting particulars) that:

(a) it cannot readily execute the Variation, or

(b) the Variation will reduce the safety or suitability of the Project. Upon receiving this notice, the Authority may cancel, confirm or vary the proposal for Variation.

(ii) Once the Contractor agrees and becomes bound by the Variation proposed by the Authority, it shall respond to the Authority in writing as soon as practicable, and submit:

(a) A description of the proposed design of the Variation to be performed and a programme

for its execution;

(b) A proposal for any necessary modifications to the Programme Schedule set out in Schedule 4 (Programme Schedule) and to the Construction Period; and

(c) A proposal for adjustment to the Contract Price in terms of the below Clause 11.

(iii) The Authority shall, as soon as practicable after receiving such proposal, respond with approval, disapproval or comments, and the Contractor and the Authority shall mutually agree to the terms and conditions of the Variation, including the change in Works, terms relating to increase in Contract Price (taking into account reasonable profit for the Contractor), the schedule of payments and extension of Construction Period (if applicable). It is clarified that the Contractor shall not execute any services or works forming part of the proposed Variation unless the Parties have agreed to the change in Works, terms relating to increase in Contract Price (taking into account reasonable profit for the Contractor), the schedule of payments and extension of Construction Period (if applicable) resulting from such proposed Variation.

The Authority shall, as soon as practicable after receiving such proposal, respond with approval, disapproval or comments, and the Parties shall mutually agree to the terms and conditions of the Variation. The proposal for Variation by the Contractor shall not be applicable or binding on the Authority unless the Authority expressly agrees to the terms and conditions of such Variation, and the Contractor shall not proceed with any services or works as part of the proposed Variation unless expressly instructed by the Authority in writing.

Upon instructing or approving a Variation, the Contractor and the Authority shall agree and determine adjustments to the Contract Price and the schedule of payments. These adjustments shall include reasonable profit, and shall take account of the Contractor's submissions under paragraph 1 of this Clause, if applicable.

11. For Any extra items Contractor needs to take prior approval in written from Authority to execute the same. For that the contractor will be paid As per Tendered amount - % of above / below of the SOR rates or the Rate analysis/MR finalized/accepted by Gujarat Biotechnology University shall be paid to contractor. No extra claim shall be entertained of such items.

12. Determination of the Contract Price in case of Variation

In the event of the Variation of the Work, the adjustment in the Contract Price shall be determined in the following manner:

(a) If rate for varied item of Work is specified in the Bill of Quantities, the Contractor shall carry out the varied item of Work ("**Varied Work**") at the rate adjusted with the mark- up quoted by the Contractor for any variations.

(b) If the rate for any Varied Work is not specified in the Bill of Quantities, the rate for the such item of the Varied Work shall be derived from the rate for the nearest similar item specified in the Bill of Quantities and the decision of the Authority as to the nearest comparable item shall be final and binding on the Contractor.

(c) If the rates of any Varied Work is not included in the Bill of Quantities, such item of Work shall be carried out as per the Gujarat Government approved schedule of rates applicable for the year in which the tender was received. In the event if item is unavailable therein, Work shall be carried out as per the Delhi Schedule of Rates applicable for the year in which the tender was received.

(d) If the rate for any Varied Work cannot be determined in the manner specified in (a) to (c) above, then the Contractor will be paid at such fair and reasonable rates as worked out by the Authority on the basis of rate analysis and/or material and labour required to execute the item and allowing 12 percent (twelve percent) towards overhead charges and Contractor's profit.

(e) No extra claim shall be entertained of such items. The decision of the Authority shall be final and binding in this regard.

13. The rate only items shall be considered for tender evaluation and those items shall be operated by Gujarat Biotechnology University as and when required.

14. Scheduling of Work will be done by Contractor, EIC will approve it & Contractor will Work according to that as per the priority given by Engineer-in-charge / Person deligated by Authority.

15. The rate of the tender is firm and no any price escalation shall be paid to the contractor, for the contract period & extended period if any.

16. Look in to the urgency of the particular work. The Engineer-in-charge / Person deligated by Authority will instruct to take up and complete the particular job / work in specified time. Otherwise, to complete the work, Engineer-in-charge / Person deligated by Authority will arrange to execute the same without giving any notice or intimation to get the work executed through any other agency and recovery will be made as per decision of EIC / Person deligated by Authority.

17. The contract shall be deemed to have carefully examined the site. The contractor should be deemed to have fully aware with the local site conditions and also all the terms & conditions scope drawings etc. Attached herewith. The bidders are ADVISE to visit the site, inspect the existing location of executing the work before quoting the rates. No Additional payment will done to start the work.

18. The rates are inclusive of all type of laborers, tools, tackles, equipment's, machineries, removed materials category wise, their protection, preservation, storing, loading, unloading, transporting for all leads lifts & elevations height/depths and inclusive of all risks & all liabilities, providing all safety precautions, Insurance, securities, site cleaning leveling dressing the sites etc. required for completion of the work in all respects.

19. The required licenses, permission of the Govt. authorities to be taken by the contractor in advance at no extra charges.

20. The responsibility and liability of manpower to be engaged for this work will be totally of contractor who has been awarded this contract and he will take away all these manpower

in his own establishments on completion of this contract. The GUJARAT BIOTECHNOLOGY UNIVERSITY will not be held any responsible and liable in any way in the matter.

21. The complete responsibility of compliance of health and safety of all the "persons at site" and all issues connected with environmental laws as well as pollution at site is placed on the contractor for which no additional amount shall be paid.

22. There shall be no vicarious liability on Gujarat Biotechnology University or any of its officials or the consultants or DTA agencies for any violation of any HSE provisions provided in Indian Standard Code, National Building Code, Local authority statutory provisions for HSE and any other specific HSE parameters related to work. HSE manager and contractor/s shall remain solely and wholly liable for any such violation and its civil or criminal liabilities.

23. The "persons at site" shall include entire workforce as well as outsiders, visitors, by-standers and all other persons who are affected by any activity taking place at site.

24. Contractor shall appoint/nominate a representative from his end who shall be solely held responsible for all HSE related activities. This appointee shall be identified as HSE manager.

25. Contractor shall ensure that HSE manager appointed by him is completely aware of all health, safety & environmental protection procedures provided in Indian Standard Code, National Building Code, Local authority statutory provisions for HSE and any other specific HSE parameters related to work being undertaken in the project. It shall be COMPLETE and nontransferable responsibility of the HSE manager to ensure that all HSE procedures provided in Indian Standard Code, National Building Code, Local authority statutory provisions for HSE and any other specific HSE parameters related to work are followed.

26. Contractor agrees that he is aware of and is instructed regarding HSE procedures provided for under the Indian Standard Code, National Building Code, Local authority statutory provisions for HSE and any other specific HSE parameters related to work and it is his responsibility to follow them to the word. If any violation of any HSE rules, laws, codes or measures is observed, contractor shall be solely responsible for negligence.

27. In case of any activity taken up at site that causes damage or loss the a person or property or causes injury or death of a living being; and the cause of accident is identified or adjudged to be negligence of any HSE procedure or violation of any HSE procedures provided in Indian Standard Code, National Building Code, Local authority statutory provisions for HSE and any other specific HSE parameters related to work, contractor and his safety manager shall be held sole responsible for the same.

28. In the case of any event that results in damage or loss the a person or property or causes injuryor death of a living being, contractor shall not be able to seek protection under not-being-informed or instructed regarding HSE procedures provided in Indian Standard Code, National Building Code, Local authority statutory provisions for HSE and any other specific HSE parameters related to work, as he has been explicitly and specifically informed to follow all HSE procedures provided in Indian Standard Code, National Building Code, Local authority statutory provisions for HSE and any other specific HSE parameters related to work from time to time and is made solely responsible to implement them.

29. Apart from general HSE measures, contractor is made aware of the safety to be followed during excavation work, especially the danger of collapse of excavated earth of the excavated pits and is expected to follow all safety procedures provided in Indian Standard Code, National Building Code, Local authority statutory provisions for safety and any other specific safety parameters related to work to safe-guard against such accidents.

30. If contractor or his HSE manager becomes aware of a situation or instruction that can or may lead to a HSE procedure violation, he shall not execute the instruction. He shall make a written representation of the HSE issue and shall execute the work only on receiving a written consent to do so. If written consent is not sought and instruction is executed, contractor shall be solely responsible for the HSE procedure violation. 10.2.6 The

31. Payment for the reinforcement / steel shall be done as per the Annexure B.

Read, understood, agreed to and signed by
Authorized representative of Gujarat Biotechnology University

M/s _____

Authorized representative of _____

M/s _____
DATE:
PLACE:

Schedule - A (Scope of work)

Construction of New Fabricated Classroom & Toilet Block at Gujarat Biotechnology University, Gandhinagar

The scope of work involves Construction of New Fabricated Classroom & Toilet Block at Gujarat Biotechnology University, Gandhinagar as per the Tender terms, SOR & Market Rate items, Tender specifications, relevant IS Codes. The details of the scope to be obtained from the detail item list mentioned in the Bill of Quantities (BOQ) in schedule - B

Bidder must undertake following points in consideration for submitting the tender.

- Scope of work includes construction of 4 fabricated classromm & Toilet Block and successfully handover to Authority. To support this bidder must ensure qualified staff and necessary infrastructure for the same.
- The project involves the construction of 4 fabricated classromm & Toilet Block. The goal is to upgrade these rooms to enhance their functionality, comfort, and aesthetics, aligning with the institution's standards and ensuring they meet the specific needs of the educational environment.
- Bidder or their authorised representative shall have to attend Authoritys query & be immediate (within 1 day) basis for breakdown of any services/equipment.

Schedule - B (Technical Specification Civil)

ITEM NO. 1
Demolishing Including RCC/Brick manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 150 metres lead as per direction of Engineer-in-charge.

GENERAL:
The demolition shall consist of demolition of one or more parts of the building as specified or shown in the drawings. Demolition implies taking up or down or breaking up. This shall consist of demolishing whole or part of work including all relevant item as specified or shown in the drawings.

The demolition shall always be planned before hand and shall be done in reverse order of the one in which the structure was constructed. This scheme shall be got approved from the Engineer- in charge before starting the work. This however will not absolve the Contractor from the responsibility of proper and safe demolition.

Necessary dropping, shoring and under pinning shall be provided for the safety of the adjoining work or property, which is to be left intact, before dismantling and demolishing is taken up and the work shall be carried out in such a way that no damages is caused to the adjoining property.

Wherever required, temporary enclosures or partitions shall also be provider. Necessary precautions shall be taken to keep the dust nuisance down as and where necessary.

Dismantling shall be commenced in a systematic manner. All materials which are likely to be damaged by dropping from a height or demolishing roof, masonry etc. shall be carefully dismantled first. The dismantled articles shall be properly stacked as directed.

All materials obtained from demolition shall be the property of Government unless otherwise specified and shall bee kept in safe custody until handed over to the Engineer-in-charge.

Any serviceable materials, obtained during dismantling or demolition shall be separated out and stacked properly as directed with all lead and lift. All unserviceable materials, rubbish etc., shall be stacked as directed' by the Engineer-m-charge.

On completion of work, the site shall be cleared of all debris rubbish and cleaned as directed.

Mode of measurements and payment
Measurements of all work except hidden work shall be taken before demolition or dismantling and no allowance for increase in bulk shall be allowed. The demolition of lime concrete shall be measured under this item. Specification for deduction for voids, openings etc. shall be on same basis as that employed for construction of work,

All work shall be measured in decimal system as fixed in its place subject to the following limits; unless otherwise stated hereinafter: (a) Dimensions shall be measured to the nearest 0.01 mt. (b)

Area shall be worked out to the nearest 0.01 sq. mt.(c) Cubical contents shall be worked out to the nearest 0.01 Cu.m.

The rate shall include cost of all labour involved and tools used in demolishing and dismantling including scaffolding. The rate shall also include the charges for separating out and stacking the serviceable materials properly and disposing the unserviceable materials with all lead and lift. The rate also includes for temporary shoring for the safety of the portion not required to be pulled down or of adjoining property arid providing temporary enclosures or portions where considered necessary.

The rate shall be for a unit of one Cu.Mt.

ITEM NO. 2

Demolishing Paver Block manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-charge.

Same as Itema No.1

ITEM NO. 3

Demolishing Kerb stone manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-charge.

Same as Itema No.1

ITEM NO. 4

Excavation for foundation upto 1.5 mt.depth All kind of Soil.Including Hard Murram and Soft Rock etc including strutting, sorting & Dewatering out and stacking of unuseful materials and disposing off the excavated stuff upto any lead and lift.(Excavated earth / Stuff to be stacked and surplus earth/unuseble material to be disposed with the permission of local authority any lavies/charges to be paid by agencies and no extra payments will be made and disposed at non objectinable place to be found by the Contractor.)

GENERAL:
Excavation for foundation / pits / raft / trenches in all kind of soil Including Hard Murram and Soft Rock for following depth, by mechanical or manual including sorting out and stacking of useful materials, dressing of the sides, ramming of bottom, disposing of the excavated stuff for all lead including lifts, for Soil all complete as per drawing, specifications, instruction & directions of the Engineer-in-charge. For all civil, plumbing, electrical & infrastructure works. No extra payment will be made for shoring, strutting, stabilizing and dewatering. Up to 1.5 m Any soil which generally yields to the application of pickaxes and shovels, spades, rakes or any such ordinary excavating implement or organic soil, gravel, silt, sand turf loam, clay, peat etc. falls under this category. For materials and workmanship for earthwork and excavation, relevant specifications of IS 1200 (Part I) and IS: 3764 shall be followed. The depth of the excavation shall be as per the item description.

CLEARING THE SITE:
The site on which the structure is to be built shall be cleared and all obstructions, loose stones, materials and rubbish of all kind, bush, and wood shall be removed, as directed. The materials so obtained shall be the property of the Government and shall be conveyed and stacked as directed, within 50-m. lead. The roots of the trees coming in the sides of the trenches shall be cut and coated with hot asphalt. All types of trees, woods etc. which requires prior permission of Govt./Forest Authority, before cutting shall be cut after obtaining such permission from them. It shall be the Contractor's responsibility to obtain such permission from the respective authorities. The rate of site clearance is deemed to be included in the rate of earthwork, for which no extra will be paid.

LOCATION OUT:
After cleaning the site, the centerlines will be given by the Architect and Engineer-in-charge. The Contractor shall assume full responsibility for alignment, elevation and dimension of each and all parts of the work. Contractor shall supply labours, materials, etc. required for setting out the reference marks and bench marks made of MS angle iron and embedded in 1:2:4 CC. They shall maintain the same as long as required and directed.

EXCAVATION:
The excavation in the foundation shall be carried out either manually or by mechanical means, in true line and level and shall have the width and depth, as shown in the drawings or as directed. The Contractor shall do the necessary shoring and strutting or shall provide necessary slopes to a safe angle or steps, as required or directed, at his own cost. No extra payment shall be made for such precautionary measures, taken. The bottom of the excavated area shall be leveled both longitudinally and transversely, as directed, by removing excess soil and watering, as required. No earth filling will be allowed for bringing it to level, if by mistake or any other reason, excavation is made deeper or wider than shown on the drawings or as directed. The extra depth or width shall be made up with concrete of the same proportion, as specified for the foundation concrete, at the cost of the Contractor. The Contractor shall at his own expense and without extra charge make provision of supporting all utility services, lighting the trenches, separating and stacking serviceable materials neatly, shoring, timbering, strutting, bailing out water either sub- soil or rainwater, including pumping at any stage of the work. Trenches shall be kept free of water while masonry or concrete works are in progress and till the Architect and Engineer-in- charge considers it necessary, i.e. till the concrete is sufficiently set.

Filling available selected / approved stacked excavated earth (excluding rock and black cotton soil)) (Earth which is stacked at any location outside the campus non- objectionable place shall be found by the contractor) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm. in depth consolidating each deposited layer by ramming and watering.

DISPOSAL OF THE EXCAVATED STUFF:
The excavated stuff of the selected type shall be used in filling the trenches and plinth or levelling the ground in layers, including ramming and watering etc. complete. The Contractor shall remove the balance of the excavated quantity from the site of work, to a place, as directed, with all lead. Measured from the outer face of the building / work under consideration and for all lift. The lead is the shortest practical route and not necessarily the route actually taken. The decision of Engineer- Incharge shall be final in this regard.

MODE OF MEASUREMENT AND PAYMENT:

The measurement of excavation in trenches for foundation shall be made according to the sections of trenches shown on the drawing or as per sections given by the Architect and Engineer-in-charge. No payment shall be made for surplus excavation made in excess of above requirements or due to stepping and sloping back as found necessary, on account of conditions of soil and requirements of safety. The rate shall include for clearing the site, surface dressing, making layout of the building, fixing permanent grid points with MS iron posts, embedded in C.C. 1:2:4, placed sufficiently away from the building and establishing bench marks etc. The rates shall include for necessary shoring, timbering and strutting for protection of sides of the excavated trenches and pits, pumping out rain or surface water at any stage of construction so as to keep the trenches/pits dry, to the satisfaction of the Architect/Engineer-in-charge. The rate shall include leveling and ramming the bottoms of excavations to receive concrete, etc. including trimming to slope wherever necessary etc. complete. The rate shall be for a unit of one m3.

ITEM NO. 5

Filling in plinth with Murram brought from outside including watering, ramming, Compacting with Vibro Roller (If Possible) consolidating and dressing etc. complete. (and compacting the layers to give at least 95% of maximum dry density). Royalty shall be paid by contractor and supproting document submitted to client for verification.

Only material considered suitable by the Owner's Representative shall be employed for the construction and that considered unsuitable shall be disposed off as directed by Owner's Representative at his own cost and no claim for compensation will be entertained. The Contractor shall give the samples of earth, he proposes to use for filling along with the following characteristics of the sample to Owner's Representative prior to collection and use, for approval. Mechanical analysis or gain size analysis as per IS:2720 Part IV. Liquid limit as per IS: 2720 Part V. Plastic limit as per IS: 2720 Part V. Moisture density relationship as per IS: 2720 Part VIII. The material (soil) used for filling shall be free from boulders, lumps, tree roots, rubbish or any organic deleterious matter. Material (soil) having plasticity index less than 20 shall be used for filling purposes. Soil having laboratory maximum dry density of less than 1.5 gm/cc shall not be used. Care shall be taken to see that unsuitable waste material is disposed of in such a manner that there is no likelihood of its getting mixed with the materials proposed to be used for filling. The work shall be so planned and executed such that the best available material (soil) is reserved for the top portion of embankment. Filling for Embankments and Shoulders the area where filling is to be placed must be cleared of all loose material and virgin soil must be exposed. Such exposed surface must be consolidated properly to obtain 90% of maximum laboratory dry density of the soil. All soft patches must be worked out to remove the soft soil and selected approved earth must be filled back and compacted. Payment for the removal of loose top soil as described in clause 3.2.1 above shall be included in the item for earthwork in filling. No separate payment for consolidation of exposed ground surface will be made. The rate quoted for the earthfall shall be inclusive of the cost of clearing and stripping, consolidation, including watering, testing etc. of the exposed ground. Approved fill material shall be spread in uniform layers not exceeding 20 cms in loose depth for embankment filling. Shoulder construction shall be so organized as to keep pace with the construction of different layers of the pavement, which may require earth fill thickness less than 20 cm. All clods, lumps etc. shall be broken before compaction. In general, the soil shall be spread uniformly over the entire width of embankment or shoulder as the case may be. For large embankments, the spreading of soil shall be as directed by Engineer-in Charge. Successive

layers of filling shall not be placed until the layer under construction has been thoroughly compacted to satisfy the requirements laid down in this specification. Prior to rolling, the moisture content of material shall be brought to within plus or minus 2% of the optimum moisture content as described in IS: 2720- Part-VIII. The moisture content shall preferably be on the west side for potentially expensive soils. After adjusting the moisture content as described in Clause 3.2.6, the layers shall be thoroughly compacted by means of rollers till 90% of maximum laboratory dry density is obtained as per IS:2720 Part VIII. Each layer shall be tested in field for density and accepted by Owner's Representative subjected to achieving the required density before laying the next layer. A minimum of one test per 500 M2 area for each layer shall be conducted. All type of rollers that should be employed for compaction shall be as per direction of Owner's Representative. If the layer fails to meet the required density, it shall be reworked or the material shall be replaced and method of construction altered as directed by Owner's Representative to obtain the required density. The filling shall be finished in conformity with alignment, levels, cross sections and dimensions as shown in the drawings.
Extra material shall be removed and disposed off as directed by Owner's Representative. Tolerance Embankment and shoulders for roads, units etc. shall

Mode of Measurement and Payment:
The rate shall be for a unit of one cubic meter.

ITEM NO. 6

Filling in plinth with sand under floors including watering, ramming, consolidating and dressing etc. complete.(Royalty shall be paid by contractor and supproting document submitted to client for verification.)

GENERAL:
Filling in plinth with sand under floors including watering, ramming, consolidating and dressing etc. complete. (Royalty shall be paid by contractor and supporting document submitted to client for verification.)

Materials: Sand shall conform to M-6.

ITEM NO. 7

Providing, driving with hydraulic piling rigs with power units and installing driven cast-insitu reinforced cement concrete piles of grade M-25 of specified diameter and length below the pile cap, to carry safe working load not less than specified, excluding the cost of steel reinforcement but including the cost of shoe and the length of pile to be embedded in the pile cap etc. all complete. (Length of pile for payment shall be measured from top of shoe to the bottom of pile cap)
A. 450 mm dia piles

Mode of Measurement
Work will be measured in unit of Sq.Mtr & paid in same unit

ITEM NO. 8

Providing and laying cement concrete 1:2:4 (1- Cement : 2- Coarse sand : 4- graded stone aggregates 20 mm nominal size) and curing complete Including cost of formwork in (A) Foundation and Plinth

Materials:
Cement concrete 1:2:4 (1-Cement: 2-coarse sand: 4-crushed stone aggregates 20 mm nominal size) In Foundation & plinth and curing complete Water shall conform to M-1. Sand to M-6. Cement to M-3. Black trap stone aggregate 40/ 20mm mm. Maximum nominal size to M-13. Nominal mix design shall be done as per IS

Workmanship:
General: Cement concrete including cost of formwork, Shoring, strutting & dewatering if require etc. No extra payment will be made for shoring, strutting and dewatering. Before commencing the concreting, the depth and width of the excavated foundation shall be checked as per the drawing. The bed of foundation trenches shall be cleared off of all loose materials, leveled, watered and rammed, as directed. The concrete mix is not required to be designed by preliminary tests and only nominal mix as per IS: 456-2000 shall be followed. The proportion of the concrete mix shall be 1:2:4 (1 cement: 2 coarse sand: 4 graded Black trap stone aggregate 20 mm. nominal size) by volume. All Concrete work shall have fair finished concrete surface unless otherwise specified. Mix design shall be carried out for environmental exposure condition as given in IS 456:2000 page 18 table 3. The nominal mix concrete shall only be used for concrete grade lower than M15. The ingredients required for ordinary concrete containing one bag of cement of 50 Kg. by weight (0.0347 m3.) for different proportions of mix shall be as under : (as per IS 456:2000 Table 9 pg. 23)

Grade of Concrete	Total Qty. of Dry aggregate by mass per 50 kg of cement to be taken as the sum of individual mass of fine and Coarse aggregate, (Maximum) in kg	Proportionof fine aggregate tocoarse aggregate	Qty. of water per 50kg of Cement, (Maximum) liters
M 10 (1:3:6)	480	Generally 1:2 for FA to CA by volume but subject to upper limit of 1:1.5 and lower limit 1:2.5	34
M 15 (1:2:4)	330		32
M 20 (1:1.5:3)	250		30

The proportion of the fine to coarse aggregates shall be adjusted from upper limit to lower limit progressively as the grading of fine aggregates becomes finer and the maximum size of coarse aggregate becomes larger. Graded coarse aggregate shall be used. For an average grading of fine aggregate (Zone II of table 4 of IS 383), the proportions shall be 1:1.5, 1:2 and 1:2.5 for the maximum size of aggregates 10mm, 20mm and 40mm respectively. The water cement ratios shall not be more than those specified in the above table. The cement of the mix specified in the table shall be proportionately increased, if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction so that the water cement ratio specified in the table is not exceeded. The workability of the concrete shall be controlled by maintaining a water-cement ratio that is bound to give a concrete mix which is just sufficiently wet to be placed and compacted without difficulty, with the means available. The maximum size of coarse

aggregate shall be as large as possible within the limits specified but in no case greater than 1/4th of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form. For reinforced concrete work, coarse aggregates having maximum nominal size of 20 mm. are generally considered satisfactory. For heavily reinforced concrete members as in the case of ribs of main beams, the nominal maximum size of coarse aggregate should usually be restricted to 5 mm. less than the minimum clear distance between the main bars, or 5 mm. less than the minimum cover to the reinforcement, whichever is smaller. Coarse and fine aggregate shall be batched separately. All in aggregate may be use if specified by Engineer-in-charge. Admixture (chloride free) may be used in concrete only with approval of the Engineer-in-charge based upon the evidence that with the passage of time, neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete and steel impaired by the use of such admixtures. The cost of the formwork shall be included. For hot and cold weather precautions to be taken are as follow: Temperature of coarse aggregate shall be maintained as per IS specifications by use of Ice Flakes for mass concrete. In hot weather, ice flakes shall be added in the concrete or aggregate shall be kept cool by sprinkling water. Necessary corrections shall be performed in the mix design of the concrete. Coarse aggregate shall be stored under shed in case of hot weather temperature. Avoid concreting in the noontime in case of hot weather and during night time in case of Cold weather. In hot weather, the formwork shall be sprinkled with water before commencing the concrete work. Proportioning:

Proportioning shall be done by volume, except cement which shall be measured in terms of bags of 50 Kg. weight. The volume of one such bag being taken as 0.0347 m3. Boxes of suitable sizes shall be used for measuring sand and aggregate. The size of the boxes (internal) shall be 30 cm. x 30 cm. and 38 cm. deep or as per the convenience of the contractor. The Internal volume of the box shall be taken as 0.0347 m3. While measuring the aggregate and sand, the box shall be filled without shaking ramming or hammering. The proportioning of sand shall be on the basis of its dry volume and in case of damp sand; allowances for bulkage shall be made.

Mixing:

For all work, concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class working condition and maintained throughout the construction. The mixer shall comply with IS 1791 and IS 12119. Measured quantity of aggregate, sand and cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After about half a minute of dry mixing, measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute. Mixing shall be continued till materials are uniformly distributed and uniform colour of the entire mass is obtained and each individual particle of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement. In no case shall the mixing be done for less than 2 minutes after all ingredients have been put into the mixer. When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on a smooth watertight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water. Mixing platforms shall be so arranged that no foreign material gets mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture of uniform colour. Specified quantity of water shall then be added gradually through a rose-can and the mass turned over till a mix of required consistency is

obtained. In hand mixing, quantity of cement shall be increased by 10 % above that specified. 3.2.3 Mixers, which have been out of use for more than 30 minutes, shall be thoroughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer-in-charge, the first batch of concrete from the mixture shall contain only 2/3rds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

Consistency:
The degree of consistency which shall depend upon the nature of the work and methods of vibration of concrete, shall be determined by regular slump tests in accordance with IS : 1199-1959. The slump of 10 mm. to 25 mm. shall be maintained for workability. The concrete shall be compacted with vibrator -needle or surface type depending on the nature of application.

Inspection:
Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms, to permit him to inspect and accept the false work and forms as to their strength, alignment and general fitness but such inspection shall not relieve the Contractor of his responsibility for the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned. Contractor shall proper access with railing for inspection of work. Centering design and its erection shall be got approved from the Engineer-in-charge. One carpenter with helper shall invariably be kept present throughout the period of concreting. Movement of labour and other persons shall be totally prohibited after reinforcement is laid in position. For access to different parts, suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks/ PVC cover of suitable size and thickness as per the drawing shall be tied to the reinforcement. Timber, kapachi or stone pieces shall not be used for this purpose. For exposed concrete members PVC blocks of grey color shall only be used. All formwork shall be cleaned and made free fromstanding water, dust, snow or ice immediately before placing of concrete. No concrete shall be placed in any part of the structure until the approval of the Engineer-in-charge has been obtained

Formwork:
Material:

The shuttering to be provided shall be of ordinary timber planks shall conform to M-26A. Shuttering plywood shall conform to M-26B.The dimensions of scantling and battens shall conform to the design. The strength of the wood shall not be less than that assumed in the design. For concrete shuttering material shall be as follows:

Columns:
Molds from marine ply with wooden battens or steel plates

Straight walls / Curved wall in plan :
Marine plywood with wooden battens / Acro make or equivalent makes steel plates and soldiers.

Beam& Slab:
Steel plates and marine ply with battens

Workmanship:
The form work shall conform to the shape, lines and dimensions as shown on the drawings and shall be so constructed so as to remain sufficiently rigid and water-tight, during the placement and compaction of the concrete. Adequate arrangement shall be made by the Contractor to safe guard against any settlement of the form work during the course of concreting and after concreting. The form work of shuttering, centering, scaffolding, bracing, etc. shall be as per the design. Cleaning & Treatment of Forms : All rubbish, particularly chipping, shaving and saw dust shall be removed from the interior of the form before the concrete is placed and the form work incontact with concrete shall be cleaned and thoroughly wetted or treated. The surface shall be coated with soap solution, applied before concreting is done. Soap solution for the oil or from oil of approved manufacture may be applied, incase steel shuttering is used. Care shall be taken that the coating is not applied on the construction joints surface and steel reinforcement bars.

Stripping:
In normal circumstances and where ordinary Portland cement is used, form work may be struck after expiry of the following periods:(a)Sides of walls columns and vertical faces of beams 24 to 48 hours.(b)Beam soffits (Props left under) 7 days.(c)Removal of props for slabs - (i) Slabs spanning upto 4.5 m. 7 days. (ii) Slabs spanning over 4.5 m. 14 days.(d)Removal of props to beams and Arches (i) Spanning upto 6 m. 14 days.(ii) Spanning over 6 m. 21 Days.The Engineer-in-charge shall be informed in advance by the Contractor of his intention to strike the formwork. While fixing the time for removal of formwork, due consideration shall be given to local conditions, character of the structure, the weather and other condition that influence the setting of concrete and of the materials used in the mix. In normal circumstances (generally where temperature are above 20Degree) and where ordinary concrete is used, forms may be struck after expiry of periods specified in IS 456:2000 11.3.1 page 25 for respective item of formwork or mentioned above. All formwork shall be removed without causing any shock or vibration as would damage the concrete. Before the soffit and struts are removed, the concrete surface shall be gradually exposed, where necessary in order to ascertain that the concrete has sufficiently hardened. Centering shall be gradually and uniformly lowered in such manner as to permit the concrete to take stress due to its own weight uniformly and gradually. Where internal metal ties are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal part shall have less than 25 mm covers to the finished concrete surface. Where it is intended to re-use the formwork, it shall be cleaned and made good to the satisfaction of the Engineer-in- charge. After removal of formwork and shuttering the Engineer-in-charge shall inspect the work and satisfy by random checks that concrete produced is of good quality. The number of props left under, their sizes and disposition shall be such as to be able to safely carry the full load of the slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction. Immediately after the removal of forms, all exposed bolts etc. passing through the cement concrete member and used for shuttering or any other purpose shall be cut inside the cement concrete member to a depth of at least 25 mm. below the surface of the concrete and the resulting holes are filled by cement mortar. All fine mortar lines caused by form joints, all cavities produced by the removal of form ties and all other holes and depressions honeycomb spots, broken edges or corners and other defects shall be thoroughly cleaned saturated with water and carefully pointed and rendered true with mortar of cement and fine sand. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surfaces, which are pointed, shall be kept moist for a period of 24 hours. For repairing concrete members, suitable bonding agent shall be used as directed by the consultant. If rock pockets/honeycombs in the opinion of Engineer-in-charge are of such an extent or character so as to effect the strength of the structure, materially

or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and Centering:

The centering to be provided shall be got approved. It shall be sufficiently strong to ensure absolute safety of the form work and concrete work before, during and after pouring concrete. Carpenter and helper shall be invariably be kept present to watch the behavior of centering and form work is satisfactory during concreting. Erection should also be such that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed. The props of centering shall be provided on firm foundation or base of sufficient strength to carry the loads, without any settlement.The centering and form work shall be inspected and approved by the Engineer-in-charge, before concreting. But this will not relieve the Contractor of his responsibility for strength, adequacy and safety of form work and centering. If there is a failure of form work or centering, the Contractor shall be responsible for the damages to the work, injury to life and damage to property.

Scaffolding and staging:
All scaffolding, hoisting arrangements and ladders, etc. required for facilitating of concreting shall be provided and removed on completion work by Contractor, at his own expense. The scaffolding, hoisting arrangement, ladders etc. shall be strong enough to withstand all live, dead and impact loads expected to act and shall be subject to the approval of the Architect and Engineer-in-charge. However, Contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work and workmen, etc. The scaffolding, hoisting arrangements and ladders shall allow easy approach to the work spot and afford easy inspection.

Reuse:
Before re-use, all forms shall be inspected by the Engineer-in-charge and their suitability shall be ascertained. If, any of the forms are found to be unsuitable, they shall be immediately removed from the site. The forms ascertained for re-use, shall be scarred, cleaned, and joints gone over and repaired, wherever required. The inside surface shall be retreated to prevent adhesion to concrete.

Transportation, laying and compaction:
The method of RMC transporting and placing concrete shall be as approved by Engineer-in-charge. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material takes place. Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete, which has been in position for more than 30 minutes, unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Except where otherwise agreed to by the Engineer-in-charge, concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 m. when internal vibrators are used and not exceeding 0.3 m. in all other cases. Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 m. when trucking or chutes are used they shall be kept closed and used in such a way so as to avoid segregation. When concreting has to be resumed on a surface, which has hardened, it shall be roughened, swept clean, thoroughly wetted and covered with a 13-mm. thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13-mm. layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgment of any particles or coarse aggregate. The surface shall then be thoroughly

wetted, all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150 mm. in thickness and shall be well rammed against old work, particular attention being given to corners and close spots. All concrete shall be compacted to produce a dense homogeneous mass with the assistance of needle or surface vibrators/ iron rammer, unless otherwise, permitted by the Engineer-in- charge for exceptional case, such as concreting under water, where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns. Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream upto form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to dry mixture. During compaction, it shall be observed that needle vibrators are not applied on reinforcement, as it tends to destroy the bond between concrete and reinforcement.

Sampling and testing of concrete:
The contractor shall set up a site laboratory to carry out various tests as specified. The laboratory shall include equipment like cube testing machine, slump cone, cube molds for concrete and mortar, mechanical balance, sieve set, flakiness testing apparatus, core cutter etc.

Samples from fresh concrete shall be taken as per IS : 1199 and cubes shall be made, cured and tested at 7 days or 28 days as per requirements in accordance with IS : 516. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units. The minimum frequency of sampling of concrete of each grade shall be in accordance with following:

Quantity of Concrete in Work	Nos of Sample of Concrete for testing of 28 days
1 – 5 M3	1
6-15 M3	2
16-30 M3	3
31-50 M3	4
51 M3and Above	4 Plus One Additional for each 50 M3or part thereof

NOTE: At least 1 sample shall be taken from each shift. Three test specimens shall be made for each sample for testing at 28 days. Additional samples must be taken to determine strength at 7 or 3 days or at the time of striking the formwork, or to determine the duration of curing, or to check the testing error. The samples of concrete shall be taken on each day of the concreting as per above frequency. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases. The test results of the sample shall be average of the strength of 3 specimens. The individual variation shall not be 15% of the average strength of the sample. The compressive mean strength for the group of 4 non-overlapping consecutive test results shall be as per col. 2 table 11 of IS 456:2000 and individual test results shall be as per col. 3 of table 11 of IS 456:2000.

Mode of Measurements and Payment:
The consolidated cubical contents of concrete work as specified in item shall be measured. The concrete laid in excess of section shown on drawing or as directed shall not be measured. No deduction shall be made for: (as per SP 27) Ends of dissimilar materials such as joists, beams, posts, girders, rafters, purline trusses, corbels and steps etc. upto 500 cm2. in section. Architectural openings upto 0.1 m2. No extra labour should be paid for forming such openings, voids or pockets of any shape. The rate includes cost of all materials, labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing as directed, curing and all other incidental expenses for producing concrete of specified strength, for all floors as per BOQ Provision, all shapes at any height and level, and in any position.No extra payment will be made towards Shoring, strutting, Dewatering if require The rate shall be for a unit of one m3. The cost of the formwork shall be included as per the item description.

ITEM NO. 09
Providing and laying cement concrete 1:3:6 (1- Cement : 3- coarse sand : 6- hand broken stone aggregates 40 mmnominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth

All workmanship & Material shall be followed as describe into item no 08.

ITEM NO. 10

Providing and laying controlled cement concrete M-25 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in Foundation.

Relevant Specification of should be followed as above. This concreting should be done in **Foundation** etc. all kind of RCC structures work levels and shapes. No extra payment will be made towards **Shoring, strutting, dewatering if require** for the all kind of RCC structures work and except the Concrete Grade & Level. Concrete Grade should be **M-250** for the all kind of RCC structures work for Plinth level at various levels as per BOQ Provision. The minimum cement content for the various mixes shall be **450 Kg/cum** or as per Mix Design whichever is higher and the details regarding proportioning and works control shall be in accordance with IS: 456:2000 The proportion given for a particular grade shall not, however, be placed in higher grade on the ground that the test strength are higher than minimum specified.

The relevant specification shall be followed as per item no 10 except that the work to be carried out in superstructure instead of Foundation and plinth. The rate shall include the cost of scaffolding apart from the. Work above Plinth level at various levels as per BOQ Provision.

ITEM NO. 11

Providing and laying controlled cement concrete M-25 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in Plinth BEAMS / Ground BEAM

Relevant Specification of should be followed as above. This concreting should be done in **RCC Plinth Beam / Tie Beam / Ground Beam / Coping etc upto Plinth Level Height** etc. all kind of RCC

structures work levels and shapes. No extra payment will be made towards **Shoring, strutting, Dewatering if require** for the all kind of RCC structures work and except the Concrete Grade & Level. Concrete Grade should be **M-250** for the all kind of RCC structures work for Plinth level at various levels as per BOQ Provision. The minimum cement content for the various mixes shall be **450 Kg/cum** or as per Mix Design whichever is higher and the details regarding proportioning and works control shall be in accordance with IS: 456:2000 The proportion given for a particular grade shall not, however, be placed in higher grade on the ground that the test strength are higher than minimum specified.

The relevant specification shall be followed as per item no 12 except that the work to be carried out in superstructure instead of Foundation and plinth. The rate shall include the cost of scaffolding apart from the. Work above Plinth level at various levels as per BOQ Provision.

Mode of Measurements and Payment:

The consolidated cubical contents of concrete work as specified in item shall be measured. The volume occupied by reinforcement shall not be deducted from RCC work. The rate shall be for a unit of one m3.The rate includes placing the concrete at heights as given in Bill of Quantities,. The rate does not include the cost of reinforcement but incl. cost of form work. No extra payment will be made towards **Shoring, strutting, dewatering if require.** Work above Plinth level at various levels as per BOQ Provision.

ITEM NO. 12

Providing and laying controlled cement concrete M-25 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in Column for Any Height.

Floor height and location of concrete consider as per B.O.Q.

Relevant Specification of should be followed as above. This concreting should be done in **RCC Column below Plinth area** etc. all kind of RCC structures work levels and shapes. No extra payment will be made towards **Shoring, strutting, dewatering if require** for the all kind of RCC structures work and except the Concrete Grade & Level. Concrete Grade should be **M-250** for the all kind of RCC structures work for Plinth level at various levels as per BOQ Provision. The minimum cement content for the various mixes shall be **450 Kg/cum** or as per Mix Design whichever is higher and the details regarding proportioning and works control shall be in accordance with IS: 456:2000 The proportion given for a particular grade shall not, however, be placed in higher grade on the ground that the test strength are higher than minimum specified.

The relevant specification shall be followed as per item no 12 except that the work to be carried out in superstructure instead of Foundation and plinth. The rate shall include the cost of scaffolding apart from the. Work above Plinth level at various levels as per BOQ Provision.

Mode of Measurements and Payment:

The consolidated cubical contents of concrete work as specified in item shall be measured. The volume occupied by reinforcement shall not be deducted from RCC work. The rate shall be for a unit of one m3.The rate includes placing the concrete at heights as given in Bill of Quantities,. The rate does not include the cost of reinforcement but incl. cost of form work. No extra payment will be made towards **Shoring, strutting, dewatering if require.** Work above Plinth level at various levels as per BOQ Provision.

ITEM NO. 13

Providing and laying controlled cement concrete M-25 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in Slab & Beam for Any Height.

Relevant Specification of should be followed as Item No.11. This concreting should be done in **Slab & Beam,** etc. all kind of RCC structures work levels and shapes. Concrete Grade should be **M-250** for the all kind of RCC structures work as per BOQ Provision. The minimum cement content for the various mixes shall be **450 Kg/cum** or as per Mix Design whichever is higher and the details regarding proportioning and works control shall be in accordance with IS: 456:2000 The proportion given for a particular grade shall not, however, be placed in higher grade on the ground that the test strength are higher than minimum specified.

The relevant specification shall be followed as per item no 12 except that the work to be carried out in superstructure instead of Foundation and plinth. The rate shall include the cost of scaffolding apart from the. Work above Plinth level at various levels as per BOQ Provision.

MEASUREMENT:
Dimension shall be measured nearest to a cm. Measurement of length on completion shall be along the axis of pile and shall be measured from top of shoe to the bottom of pile cap. No allowance shall be made for bulking, shrinkage, cut off tolerance, wastage and hiring of tools and equipment for excavating driving etc.

Unit of Measure Shall be as Cubic Meter of Work.

RATE:
The rate includes the cost of materials and labour involved in all the operations described above including pile embedded in pile cap, except soil investigation, reinforcement, pile cap and grade beam.

ITEM NO. 14

Providing and laying controlled cement concrete M-25 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in Sill, Coping & Chhajja for Any Height.

As above Itme No.13

ITEM NO. 15

Providing and laying controlled cement concrete M-25 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in Grade slab.

All kind of RCC structures work levels and shapes. Concrete Grade should be **M-250** for the all kind of RCC structures work as per BOQ Provision. The minimum cement content for the various mixes shall be **450 Kg/cum** or as per Mix Design whichever is higher and the details regarding

proportioning and works control shall be in accordance with IS: 456:2000 The proportion given for a particular grade shall not, however, be placed in higher grade on the ground that the test strength are higher than minimum specified.

MEASUREMENT:
Dimension shall be measured nearest to a cm. Measurement of length on completion shall be along the axis of pile and shall be measured from top of shoe to the bottom of pile cap. No allowance shall be made for bulking, shrinkage, cut off tolerance, wastage and hiring of tools and equipment for excavating driving etc.

Unit of Measure Shall be as Cubic Meter of Work.

RATE:
The rate includes the cost of materials and labour involved in all the operations described above including pile embedded in pile cap, except soil investigation, reinforcement, pile cap and grade beam.

ITEM NO. 16

Providing TMT Bar FE 500D reinforcement for R.C.C. work including bending, binding and placing in position complete upto floor two level

Material:
CPWD Technical Specification clause no 5.1.3 and 5.1.4 and 5.1.5 should be followed.

Steel for Reinforcement:
Steel reinforcement for concrete shall be round/ribbed bars shall be TMT Bar FE 500D (min. Elongation 14.5% as per relevant latest IS standards for manufacturing of reinforcement)unless otherwise specified and equivalent conforming to IS: 1786 for mechanical properties with improved corrosion resistance and bond strength shall be used.Only new steel shall be delivered to the site and shall be free of mill scale, loose rust, grease oil, paint or any other deleterious materials which reduce or destroys bond.

Nominal mass/weight:
The tolerance on mass/ weight for round and square bars shall be the percentage given in IS code of the mass/ weight calculated on the basis that the masses of the bar/wire of nominal diameter and of density 7.85 kg/ cm3 or 0.00785 kg/mm3

Physical Properties:
High strength deformed bars & wires shall conform to IS 1786. The physical properties for all sizes of steel bars are mentioned below for FE -500

Sr.No	Property	Fe500D
1	0.2 Per cent Proof stress/ yield stress, Min, N/mm2	500.0
2	Elongation, per cent, Min. on gauge length 5.65 A, where A is the cross-sectional area of the test piece.	16.0

3	Tensile strength, Min	10 Per cent more than the actual 0.2 per cent proof stress/ yield stress but not less than 565.0 N/mm2
4	Total elongation at maximum force, percent, Min on gaugelength 5.65 A , where A is the cross-sectional area of the test piece.	5
5	Bend- Re bend Test	This shall be done as per IS 1786

Chemical composition of reinforcement bars shall be as per Table follows: -

Sr. No	**Particular**	**Result**
1	Carbon	0.25% max
2	Sulphur (S)	0.040% max
3	Phosphorus (P)	0.040% max
4	S+P	0.075 %max

Thermo Mechanically treated reinforcement bars:

There is no BIS code for TMT bars. The available code BIS 1786 pertains to HSD Bars. Therefore, there should be no stipulation that TMT bars should conform to relevant BIS code.

The TMT bars are being produced under valid license from either of the firms namely Temporal, Thermex Evcon Turbo & Turbo Quench. These firms have acquired patents and are giving licenses to various producers to produce TMT Bars.

The TMT bars shall conform to IS 1786 pertaining to Fe 415 D or Fe 500 D or Fe grade of steel as specified.

Binding Wire:
Binding Wire shall conform to M-21. The reinforcement shall be securely bound wherever bars intersect or wherever required with 16 to18 gauge (1.63mm to 1.22 mm diameter) annealed steel wire conforming to IS: 280-1972. Binding wire shall be free from rust, oil paint, grease, loose mill scale or any other undesirable coating which may prevent adhesion of cement mortar.

Welding electrodes:
Electrodes used for welding of steel bars shall be ordinary mild steel grade 2 electrodes conforming to IS: 814 and shall be the best quality and approved by the Engineer. -In-Charge. The work shall be carried out strictly as per IS: 2751 and IS: 9417.
Welding of reinforcement bars covered in this specification shall be done in accordance with the requirements of IS 2751

Sampling & Testing:
Sampling:
Sampling shall be done in accordance with relevant IS codes. For every 40 MT (Metric Ton) of steel at least one test shall be done. reinforcing bars shall conform to the physical properties of IS: 1786. In addition, when tested for corrosion resistance as per the standard ASTM method such as salt spray test (B.117.90), Potential Dynamic Polarization measurement test (G.5.78), Atmospheric Corrosion test (G.50.76) and Sulphur-di-oxide chamber test (G.87.84) shall exhibit corrosion

resistance index of minimum 1.5. (deformed) bars should either be butt or lap welded as per recommended practice of IS:9417. For best results basic coated electrodes containing copper and/or nickel shall be used.

Testing:

Test certificates from manufacturer, mill certificates and certificates of origin shall be submitted for each consignment. Additional tests required shall be done as recommended by the client/consultant at the contractor's own cost. An accredited laboratory shall carry out testing.

Selection and preparation of Test sample:

All the tests pieces shall be selected by the Engineering-Charge or his authorized representative either-

From cutting of bars Or

If he so desires, from any bar after it has been cut to the required or specified size and the test piece taken from and any part of it.

In neither case, the test pieces shall be detached from the bar or coil except in the presence of the Engineer-in-Charge or his authorized representative. The test pieces obtained in accordance with as above shall be full sections of the bars as rolled and subsequently cold worked and shall be subjected to physical tests without any further modifications. No deduction in size by machining or otherwise shall be permissible. No test piece shall be enacted or otherwise subject to heat treatment. Any straightening which a test piece may require shall be done cold. All tests as shown in IS code shall be carried out.

Causes of Rejection:

Any reinforcement so sampled and tested which fails to comply with the specifications shall be rejected by the client/consultant and the whole batch shall be removed from the site immediately. The contractor shall have no claim for bars mutilated in obtaining test samples. Every bar shall be inspected before assembling on the work and defective, brittle or burnt bar shall be rejected. Cracked ends of bars shall be discarded. The contractor at his own expense shall immediately remove rejected steel from the work site.

Workmanship:

Stacking and Storage:

Steel for reinforcement shall be stored in such a way as to prevent distorting and corrosion. Cares hall be taken to protect the reinforcement from exposure to saline atmosphere during storage, fabrication and use. It may be achieved by treating the surface of reinforcement with cement wash or by suitable methods. Bars of different classifications, sizes and lengths shall be stored separately to facilitate issue in such sizes and lengths to cause minimum wastage in cutting from standard length Steel conforming to above for reinforcement shall be clear and free from loose mill scales, dust loose rust, coats of paints, oil or other coating which may destroy or reduce bond. It shall be stored in such a way as to avoid distortion and to prevent deterioration and corrosion. Prior to assembly of reinforcement on no account any oily substance shall be used for removing the rust. Bar bending schedule shall be made by the contractor before starting the work. The payment shall be done based on quantity worked out in bar bending schedule. The bar bending schedule shall be prepared as per SP 34.

Assembly of Reinforcement:

Bars shall be bent correctly and accurately to the size and shape as shown in the detailed drawing or as directed by Engineer-in-Charge. Preferably bars of full length shall be used. Necessary cutting and straightening is also included. Overlapping of bars, where necessary shall be done as directed by the Engineer-in-Charge. The overlapping bars shall not touch each other and these shall be

kept apart with concrete between them by 25mm or 11/4 times the maximum size of the coarse aggregate whichever is greater. But where this is not possible, the overlapping bars shall be bound together at intervals not exceedingly twice the dia. of such bars with two strands annealed steel wire of 0.90 mm to 1.6 mm twisted tight. The overlaps/ splices shall be staggered as per directions of the Engineer-in-Charge. But in no case the overlapping shall be provided in more than 50% of cross-sectional area at one section.

Bonds and Hooks Forming End Anchorages:
Reinforcement shall be bent and fixed in accordance with procedure specified in IS 2502, code of practice of bending and fixing of bars for concrete reinforcement. The details of bends and hooks are shown below for guidance.
U-Type Hook
In case of mild steel plain bars standard U type hook shall be provided by bending ends of rod into semicircular hooks having clear diameter equal to four times the diameter of the bar.
Note: In case of work in seismic zone, the size of hooks at the end of the rod shall be Eighth times the diameter of bar or as given in the structural drawings.
Bends
Bend forming anchorage to a M.S. plain bar shall be bent with and internal radius equal to two times the diameter of the bar with a minimum length beyond the bend equal to four times the diameter of the bar.

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

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

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

Welding of Bars:
Wherever facility for electric arc welding or gas pressure welding is available, welding of bars shallbe done in lieu of overlap. The location and type of welding shall be got approved by the Engineer-in-Charge. Welding shall be as per IS 2751 and 9417.When permitted or specified on the drawings, joints of reinforcement bars shall be welded with appropriate welding rod as per the instructions given by Structural Engineer. The type of welding, size of fillet etc shall be as approved by Structural Engineer. Welded joints shall preferably be located at points when steel will not be subject to more than 75 % of the maximum permissible stresses and welds so staggered that any one section not more than 20 % of the rods are welded. Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done in 2 or 3 stages, previous
Mechanical splices:

Whenever indicated on the drawings or desired by the Architect and Engineer-in-charge, bars shall be joined by couplings which shall have a cross section sufficient to transmit the full stresses of bars. The ends of the bars that are joined by coupling shall be upset for sufficient length so that the effective cross sectional the base of threads is not less than normal cross section of the bar. Threads shall be standard threads. Steel coupling shall conform to IS: 226. Mechanical connections for splicing reinforcement bars in congested locations shall be used only with the approval of consultant/Engineer.-In-Charge. Patented couplers as manufactured by Usha Martin Industries Ltd. (CCL bar grips) and BBR India Ltd. (BBR SWIF) shall be used wherever mentioned in the drawings or as per instruction of Structural Engineer. The couplers shall be attached to the reinforcement bars by forging, hydraulic pressing or screw couplers in special circumstances may be permitted. All operations relating to reinforcement coupling shall be done using supplier's patented machine / equipment and in the presence of the supplier's representative. The contractor shall submit relevant trade literature, mil certificates, certificate of origin and letters of approval for each proposed application. A sample of each type of mechanical coupler shall be submitted for testing and approval prior to the use of any coupler in the works.

Placing in Position:
Fabricated reinforcement bars shall be placed in accurately position as shown in the drawings or as directed by the Engineer-in-charge. The bars crossing one another shall be tied together at every inter section with two strands of annealed steel wire 0.9 to 1.6 mm thickness twisted tight to make the skeleton of the steel work rigid so that the reinforcement does not get displaced during deposition of concrete. Tack welding in crossing bars shall also be permitted in lieu of binding with steel wire if approved by Engineer-in-Charge.

The bars shall be kept in correct position by the following methods:
In case of beam and slab construction pre-cast cover blocks in cement mortar 1:2 (1 cement : 2coarse sand) about 4x4 cm section and of thickness equal to the specified cover shall be placed between the bars and shuttering, so as to secure and maintain the requisite cover of concrete over reinforcements. In case of cantilevered and doubly reinforced beams of slabs, the vertical distance between the horizontal bars shall be maintained by introducing chairs, spacers or support bars of steel at 1.0 meter or at shorter spacing to avoid sagging. In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them: or with clock of cement mortar 1:2 (1 cement: 2coarse sand) of required size suitable tied to the reinforcement to ensure that they are in correct position during concreting. In case of other R.C.C. structure such as arches, domes, shells, storage tanks etc. a combination of cover blocks, spacers and templates shall be used as directed by Engineer-in- Charge.

Tolerance on Placing of Reinforcement:
Unless otherwise specified by the Engineer-in-Charge, reinforcement shall be placed within the following tolerances:
Tolerance in spacing
For effective depth, 200 mm or less +10 mm
For effective depth, more than 200 mm + 15 mm

Bending at Construction Joints:
Where reinforcement bars are bent aside at construction joints and afterwards bent back into their original position care should be taken to ensure that at no time the radius of the bend are less than 4 bar diameters for plain mild steel or 6 bar diameters for deformed bars. Care shall also be taken when bending back bars to ensure that the concrete around the bar is not damaged.

Cover: The minimum nominal cover to meet durability requirements shall be as under: -

Exposure Condition as per IS 456-2000	**Nominal Concrete cover in mm not less than**
Mild	20
Moderate	30
Severe	45
Very severe	50
Extreme	75

Nominal cover to meet specified period of fire resistance shall not be less than as givenin Table 16A of IS 456.

Chairs:
Adequate no. of chairs shall be provided to prevent sagging of reinforcement during concreting.

MODE OF MEASUREMENTS & PAYMENT:
Reinforcement shall be measured in length excluding overlaps for different diameters as actually used in the work. Where welding or coupling is resorted to in place lap joints, such joints shall not be measured for payment as equivalent length of overlap as per design requirement. From the length so measured, the weight of reinforcement shall be calculated in tones/Kgf on the same basis of as per M-18 and relevant IS Code. Reinforcement shall be measured in lengths of bar 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. Authorized overlaps, chairs, splices, spacers and hooks shall not be measured. Rate quoted shall include the cost of welding if specified. Payment shall be made as per reinforcement drawings and with theoretical weights only. Cutting, bending, placing, binding and fixing in position as shown on the drawings and as directed It shall also include all devices for keeping reinforcement in approved position, cost of joining as per approved method and all wastage and spacer bars. The rate shall be for a unit of One Kg.

ITEM NO. 17

'Providing and Laying Brick work using common burnt clay building bricks having crushing strength not less than 35kg/Sqcm. in foundation and plinth. In cement mortar 1:5 (1 cement : 5 fine sand) (B) Conventional

GENERAL:
Providing and laying Brick Work using common burnt clay conventional building bricks conforming to IS 1077-1992 having compressive strength not less than 35 Kg/ cm2 in any width, any shape and all depth including curing, scaffolding, racking / flush jointing etc. as per drawing, specification and approved by architect and as directed by engineer-in-charge for all civil, plumbing, electrical & Infrastructure works.
a) CM 1:5 in foundation and up to plinth level.

Materials:
Water shall confirm to M-1. Cement confirm to M-3. Sand confirm to M-5. Brick confirm to M-15. And Cement mortar confirm to M-11.

Workmanship:
Proportion:
The proportion of the Cement Mortar shall be as mentioned in the item description (cement: coarsesand), by volume.

Soaking of bricks:
The bricks required for masonry shall be thoroughly wetted with clean water forabout 24 hours before use or as directed. The cessation of bubbles, when the bricks are wetted with water is an indication of thorough wetting of bricks.

Laying:
Bricks shall be laid in English bond unless directed otherwise. Half or cut bricks shall not be used except when necessary to complete the bond; closer and in such case it shall be cut to required size and used near the ends of walls. A layer of mortar shall be spread on full width for suitable length of the lower course. Each brick shall first be properly bedded and set home by gently tapping with the handle of the trowel or wooden mallet. Its inside face shall be flushed with mortar before the next brick is laid and pressed against it. On completion of the course, the vertical joints shall be fully filled from the top, with mortar. The walls shall be taken up truly in plumb. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. Vertical joints in alternate courses shall generally be in one vertical plane. The thickness of brick course shall be kept uniform. The bricks shall be laid with the frog facing upwards. A set of tools comprising of wooden straight edges, Manson's spirit level, square half meter rub (right angle), pins, string, level pipe and plumb shall be kept on the site of work for frequent checking during the progress of work. Both the faces of walls, having thickness greater than 23 cm. shall be kept in proper plumb. All the connected brick work shall be kept not more than 1 m. over the rest of the work. Where this is not possible, the work shall be raked back according to bond (and not left toothed) at an angle not steeper than 45O. In a day brick work shall not be laid more than 1m or 10 courses in height. All the fixtures, pipe outlets of water, etc. which are required to be built in the wall shall be embedded in CM, as per the drawings or as directed. The frames of doors, windows, cupboards, etc. shall be housed into the brick work at the correct location and level, as directed. The heavy steel doors, windows frames, etc. shall be built in with brick work, but for ordinary steel doors and windows, required opening for frames, hold-fasts, etc. shall be left in the wall and frames shall be embedded later on in order to avoid damage to the frames. Necessary scaffolding shall be provided by the Contractor. The supports of the scaffolding shall be sound and strong, tied together with horizontal pieces over which the scaffolding planks shall be fixed. Normally simple scaffolding only shall be allowed. In this case horizontal pieces of the scaffolding shall rest in the holes, made in the header course only. The Contractor is responsible for providing and maintaining sufficiently strong scaffolding so as to withstand all loads likely to come upon it .No through holes shall be left in brickwork to support the scaffolding. Only double scaffolding shall be erected. In case the holes are left in the brickwork, it shall be filled with 1:4:8 PCC.

Joints:
Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exceed 12 mm. The face joints shall be raked out as directed by raking tools daily, during the progress of work, when the mortar is still green so as to provide key for plaster or pointing to be done, subsequently. The face of bricks shall be cleaned every day on which the brick work is laid and all mortar dropping shall be removed. At the end of day's work or on holidays the top of unfinished masonry shall be kept wet. If the mortar becomes dry, white or powdery, for want of
curing, work shall be pulled down and re-built at Contractor's expense.

Curing:
Fresh work shall be protected from rain suitably. Masonry work shall be kept moist on all the faces for minimum period of 7 days. The top of masonry work shall be kept well wetted at the end of the day's work.

Preparation of foundation bed:
If the foundation is to be laid directly on the excavated bed, the bedshall be levelled, cleared off of all loose materials, cleaned and wetted before starting masonry work. If masonry is to be laid on concrete footing, the top of concrete shall be roughened,
cleaned and moistened. The Contractor shall obtain approval of the Engineer-in-charge for the foundation bed, before foundation masonry is started. When pucca flooring is to be provided flush with the top of the plinth, the inside of the plinth wall shall be lowered down having an offset of the same thickness of the flooring with respect to the outside plinth wall top or as directed.

MODE OF MEASUREMENTS AND PAYMENT:
The measurement of this item shall be taken for the brick masonry fully completed in foundation up to plinth for all levels, heights, shapes and locations as per the item description.. The limiting dimensions not exceeding those shown on the drawings or as directed shall be final. Battered, tapered and curved portions shall be measured net. No deduction shall be made from the quantity of brick work, nor shall any extra payment be made for embedding in masonry or making holes in respect of following items: End of joists beams, posts, girders, rafters, purlins, trusses, corbel, steps etc. where cross sectional area does not exceed 500 cm2. Architectural openings in walls, parapet and compound walls, not exceeding 1.0 m2. Area. Wall plates and bed plates, bearing of slabs, chhajjas and the like whose thickness does not exceed 10 cm. and the bearing does not extend to the full thickness of wall. Drainage holes, recesses for cement concrete blocks to embed hold fasts for doors, windows etc., forming toothings, grooves etc. and providing cramps for holding stone lining. Iron fixtures, pipes up to 300 mm. dia.; holdfasts and doors and windows built into masonry and sanitary and water supply pipes, etc., for concealed electrical wiring and any other fixtures or inserts. Forming chases of section not exceeding 350 cm2. in masonry. Apertures for fire places shall not be deducted nor shall extra labour required to make splaying of jambs, throating and making arches over the aperture be paid for separately. The rate shall include for work of any shape e.g. pillars of any size and shape, curved or tapered walls, drip courses, projections, parapets, load bearing walls, sills, ottas, steps, tank walls, platforms and counter walls, ducts, channels and architectural mouldings like corbelling, pattas, etc. Work above Plinth level at various levels as per BOQ Provision.
The rate shall be for a unit of one m3

ITEM NO. 18

Half brick masonry in common brunt clay building bricks having crushing strength not less than 35 Kg/Sq.Cm. in Cement mortar 1:4 (1- Cement : 4 -coarse sand) in foundation and plinth (B) Conventional

Brick work in half brick walls shall be done in the same manner as described except that the bricks shall be laid in stretcher bond. When the half brick work is to be reinforced, 2 Nos. M.S. bars of 6 mm dia., shall be embedded in every third course as given in the item (the dia of bars shall not exceed 8 mm). These shall be securely anchored at their end where the partitions end. The free ends of the reinforcement shall be keyed into the mortar of the main brick work to which the half

brick work is joined. The mortar used for reinforced brick work shall be rich dense cement mortar of mix 1:4 (1 cement: 4 coarse sand). Lime mortar shall not be used. Over laps in reinforcement, if any shall not be less than 30 cm. The mortar interposed between the reinforcement bars and the brick shall not be less than 5 mm. The mortar covering in the direction of joints shall not be less than 15 mm.

All material specification shall be read as item no 17 and R & B Booklet specified. However, payment shall be made as Sq. Mtr Unit for work executed.

ITEM NO. 19

Providing 10 mm thick cement plaster by using Ready Mix Mortar for plaster in single coat on brick/ concrete walls for interior plastering upto floor two level and finished even and smooth in Cement mortar 1:4 (1 Cement : 4 sand)

A) Any Floor.

Preparation of back-ground:
The surface shall be cleaned of all dust, loose mortar droppings, traces of algae, efflorescence and other foreign matter by water or by brushing. Smooth surface shall be roughened by wire brushing if it is not hard and by racking if it is hard. In case of concrete surface, if a chemical retarder has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the retarders is left on the surface. Trimming of projections on brick/concrete surface where necessary shall be carried out to get an even surface.
Raking of joints in case of masonry where necessary shall -be allowed to dry out for sufficient period before carrying out the plaster work. The work shall not be soaked but only damped evenly before applying the plaster. If the surface becomes dry such area shall be moistened again. For external plaster, the plastering operation shall be started from top floor and carried downwards. For internal plaster, the plastering operations may be started wherever the building frame and cladding work arc ready and the temporary supporting ceiling resting on the wall of the floor have been removed. Ceiling plaster shall be completed before starting plaster to walls.

Applications of plaster:
The plaster about 15 x 15 cms. shall be first applied horizontally and vertically al not more than 2 metres intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly inplane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideways movement at a time. Finally, the surface shall be finished off true with a trowel or wooden float according as a smooth or a sandy granular texture is required. Excessive trowelling or overworking the float shall be avoided. All comers, arrises, angles and junctions be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, arrises junctions etc. shall be carried out with proper templates to the size requried.

Cement plaster shall be used within half an hour after addition of water. Any mortar or plaster which is partially set shall be rejected and removed forthwith from the site. In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and

vertically. When recommending the plaster, the edges of the old work shall be scraped clean and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of the wall arid nearer than 15 cm. to any corners or arrises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invaiiably lead to leakage. No portion of the surface shall be left out initially to be packed up later on. Each coat shall be kept damp continuously rill the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by handing mattings or gunny bags on the outside of the plaster and keeping them wet

.

Mode of Measurement

The rate shall include the cost of all materials, labour and scaffolding etc. involved in the operations described under workmanship. All plastering shall be measured in square metres unless, otherwise specified. Length, breadth or height shall be measured correct to a centimeter. Thickness of the plaster shall be exclusive of (he thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 10mm. at any point on this surface. This item includes plastering upto floor two level.

The measurement of wall plastering shall be taken between the walls or partition (dimensions before plastering being taken) for length and from the top of floor or skirting to ceiling for height. Depth of cover of cornices if any shall be deducted.

Soffits of stairs shall be measured as plastering on ceilings. Flowing soffits shall be measured separately.

For jambs, soffits, sills etc. for openings not exceeding 0.5 sq. ml. each in area for ends of joits, beams, posts, girders, steps, etc. not exceeding 0.5 sq. mt. each in area and for openings exceeding 0.5 sq. mt. and not exceeding 3.00 sq. mt. in each area deductions and additions shall be made in the following manner:

No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 sq. mt. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these opening for finish to plaster around ends of joints, beams posts etc.

Deduction for openings exceeding 0.5 sq. mt. but not exceeding 3 sq. mt. each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings. When both faces of all wall are plastered with same plaster, deduction shall be made for one face only. When two faces of wall are plastered with different types of plasters or if one, faces is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, window etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from area of plaster and/or pointing as the case maybe.

For openings having door frames equal to projecting beyond the thickness of wall, full deduction for opening shall be made from each plastered face of the wall. In case of openings of area above 3 sq. mt. each, deduction shall be made for opening but jambs, soffits and sills shall be measured. The rate shall be for a unit of one sq. metre.

ITEM NO. 20

Providing 15 mm thick cement plaster by using Ready Mix Mortar for plaster in single coat on rough (similar) side of single or half brick walls for interior plastering upto floor two level and finished even and smooth in Cement mortar 1:4 (1 Cement :4 sand)

The relevant specification of item no. 19 shall be followed but for First floor as per B. O. Q. Provision

MODE OF MEASUREMENT & PAYMENT:
The Rate shall include the cost of material, labor, scaffolding curing etc. involved in the operations described under workmanship. Thickness of plaster shall be exclusive of the thickness of the key i. e. grooves or open joints in brick work. Thickness of plaster shall be average thickness with minimum 15mm or otherwise specified at any point on the surface. The measurements of plastering on wall shall be taken between for length and from the top of floor or skirting for height. Mode of measurements and deductions for payment shall be carried out as mention as per General Technical Specification for Building Works.

Work for First Floor levels as per BOQ Provision. The measurement shall be taken on the Sq. Meter basis as per I.S. 1200-XII- 1976 or as revised from time to time so far as applicable. The contract rate shall be for a unit of one Sq. Meter of plastering of specified thickness.

ITEM NO. 21

Providing & laying 20 mm thick double coat sand face/mala cement plaster for all floor all height with use of Ready Mix mortar on interior/exterior Block, brick/ concrete work for plastering comprising of base coat of 12 mm thick cement plaster in cement mortar (1 cement: 4 coarse sand) in rough finishing and 8 mm thick top coat of cement mortar 1:2 (1 cement : 2 coarse sand) finished with trovel including scaffolding curing etc. complete. Including Water cement Compound.

Scaffolding:
For all exposed brick work or tile work double scaffolding independent of the work having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding planks shall be fixed.

For all other work in buildings, single scaffolding shall be permitted. In such cases the inner end of the horizontal scaffolding pole shall rest in a hole provided only in the header course for the purpose. Only one header for each pole shall be left out. Such holes for scaffolding shall, however, not be allowed in pillars/columns less than one metre in width or immediately near the skew backs of arches. The holes left in masonry works for scaffolding purposes shall be filled and made good before plastering.

Note : In case of special type of brick work, scaffolding shall be got approved from Engineer-incharge in advance.

Preparation of Surface:
The joints shall be raked out properly. Dust and loose mortar shall be brushed out. Efflorescence if any shall be removed by brushing and scrapping. The surface shall then be thoroughly washed with water, cleaned and kept wet before plastering is commenced.

In case of concrete surface if a chemical retarder has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the retarders is left on the surface

Mortar:
The mortar of the specified mix using the type of sand described in the item shall be used. It shall be as specified in Subhead 3.0. For external work and under coat work, the fine aggregate shall conform to grading IV. For finishing coat work the fine aggregate conforming to grading zone V shall be used.

Application of Plaster:
Ceiling plaster shall be completed before commencement of wall plaster.
Plastering shall be started from the top and worked down towards the floor. All putlog holes shall be properly filled in advance of the plastering as the scaffolding is being taken down. To ensure even thickness and a true surface, plaster about 15 × 15 cm shall be first applied, horizontally and vertically, at not more than 2 metres intervals over the entire surface to serve as gauges. The surfaces of these gauged areas shall be truly in the plane of the finished plaster surface. The mortar shall then be laid on the wall, between the gauges with trowel. The mortar shall be applied in a uniform surface slightly more than the specified thickness. This shall be brought to a true surface, by working a wooden straight edge reaching across the gauges, with small upward and side ways movements at a time. Finally the surface shall be finished off true with trowel or wooden float according as a smooth or a sandy granular texture is required. Excessive troweling or over working the float shall be avoided.

All corners, arrises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, arrises, provision of grooves at junctions etc. where required shall be done without any extra payment. Such rounding, chamfering or grooving shall be carried out with proper templates or battens to the sizes required.

When suspending work at the end of the day, the plaster shall be left, cut clean to line both horizontally and vertically. When recommencing the plastering, the edge of the old work shall be scrapped cleaned and wetted with cement slurry before plaster is applied to the adjacent areas, to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of wall and not nearer than 15 cm to any corners or arrises. It shall not be closed on the body of the features such as plasters, bands and cornices, nor at the corners of arrises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakages. The plastering and finishing shall be completed within half an hour of adding water to the dry mortar.
No portion of the surface shall be left out initially to be patched up later on. The plastering and finishing shall be completed within half an hour of adding water to the dry mortar.

Thickness:
Where the thickness required as per description of the item is 20 mm the average thickness of the plaster shall not be less than 20 mm whether the wall treated is of brick or stone. In the case

of brick work, the minimum thickness over any portion of the surface shall be not less than 15 mm while in case of stone work the minimum thickness over the bushings shall be not less than 12 mm.

Curing:
Curing shall be started as soon as the plaster has hardened sufficiently not to be damaged when watered.
The plaster shall be kept wet for a period of at least 7 days. During this period, it shall be suitably protected from all damages at the contractor's expense by such means as the Engineer-in-Charge may approve. The dates on which the plastering is done shall be legibly marked on the various sections plastered so that curing for the specified period thereafter can be watched.

Finish:
The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness as required. The work shall be tested frequently as the work proceeds with a true straight edge not less than 2.5 m long and with plumb bobs. All horizontal lines and surfaces shall be tested with a level and all jambs and corners with a plumb bob as the work proceeds.

PRECAUTION:
Any cracks which appear in the surface and all portions which sound hollow when tapped, or are found to be soft or otherwise defective, shall be cut out in rectangular shape and redone as directed by the Engineer-in-Charge.
When ceiling plaster is done, it shall be finished to chamfered edge at an angle at its junction with a suitable tool when plaster is being done. Similarly, when the wall plaster is being done, it shall be kept separate from the ceiling plaster by a thin straight groove not deeper than 6 mm drawn with any suitable method with the wall while the plaster is green.
To prevent surface cracks appearing between junctions of column/beam and walls, 150 mm wide chicken wire mesh should be fixed with U nails 150 mm centre to centre before plastering the junction. The plastering of walls and beam/column in one vertical plane should be carried out in one go. For providing and fixing chicken wire mesh with U nails payment shall be made separately.

MEASUREMENTS:
13.1.9.1 Length and breadth shall be measured correct to a cm and its area shall be calculated in square metres correct to two places of decimal.
Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves, or open joints in brick work.
The measurement of wall plaster shall be taken between the walls or partitions (the dimensions before the plaster shall be taken) for the length and from the top of the floor or skirting to the ceiling for the height. Depth of coves or cornices if any shall be deducted.
The following shall be measured separately from wall plaster.

- Plaster bands 30 cm wide and under
- Cornice beadings and architraves or architraves molded wholly in plaster.
- Circular work not exceeding 6 m in radius.
- Plaster over masonry pilasters will be measured and paid for as plaster only.
- A coefficient of 1.63 shall be adopted for the measurement of one side plastering on honey comb work having 6 x 10 cm. opening.
- Moulded cornices and coves.
- Length shall be measured at the centre of the girth.
- Moulded cornices and coves shall be given in square metres the area being arrived at by

multiplying length by the girth.

- Flat or weathered top to cornices when exceeding 15 cm in width shall not be included in the girth but measured with the general plaster work.
- Cornices which are curved in their length shall be measured separately.

Exterior plastering at a height greater than 10 m from average ground level shall be measured separately in each storey height. Patch plastering (in repairs) shall be measured as plastering new work, where the patch exceed 2.5 sqm. extra payment being made for preparing old wall, such as dismantling old plaster, raking out the joints and cleaning the surface. Where the patch does not exceed 2.5 sqm in area it shall be measured under the appropriate item under sub head 'Repairs to Buildings.'

Deductions in measurements, for opening etc. will be regulated as follows:

No deduction will be made for openings or ends of joists, beams, posts, girders, steps etc. upto 0.5 sqm in area and no additions shall be made either, for the jambs, soffits and sills of such openings. The above procedure will apply to both faces of wall.

Deduction for opening exceeding 0.5 sqm but not exceeding 3 sqm each shall be made for reveals, jambs, soffits sills, sills, etc. of these openings.

When both faces of walls are plastered with same plaster, deductions shall be made for one face only.

When two faces of walls are plastered with different types of plaster or if one face is plastered and other is pointed or one face is plastered and other is unplastered, deduction shall be made from the plaster or pointing on the side of the frame for the doors, windows etc. on which width of reveals is less than that on the other side but no deduction shall be made on the other side.

Where width of reveals on both faces of wall are equal, deduction of 50% of area of opening on each face shall be made from area of plaster and/or pointing as the case may be.

For opening having door frame equal to or projecting beyond thickness of wall, full deduction for opening shall be made from each plastered face of wall.

For opening exceeding 3 sqm in area, deduction will be made in the measurements for the full opening of the wall treatment on both faces, while at the same time, jambs, sills and soffits will be measured for payment.

In measuring jambs, sills and soffits, deduction shall not be made for the area in contact with the frame of doors, windows etc.

RATE:

The rate shall include the cost of all labour and materials involved in all the operations described above.

ITEM NO. 22

Providing and applying Wall painting (three coats) with asian paint Royal or Equivivalent paint of approved brand and manufacture including 2 coat of putty & 2 coat of Primar on wall surface to give and even shade including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand paper smooth on new work to give an even shade. For all height

Materials:

Water shall be conform to M-I. The plastic emulsion shall conform to I.S. 5411-1969 (part-I).

WORKMANSHIP:

Scaffolding: The relevant specifications of item No. 18.11 para 2.1. shall be followed.

Preparation of surface: The relevant specifications of item No. 18.44 para 2.2. shall be followed.

Preparation of Mix: This shall be done as per manufacturer's instructions. The thinning of emulsion is to be done with water and not with turpentine. The quantity of thinner to be added shall be as per manufacturer instructions

Applications:

Before pouring into small containers for use, the paint shall be stirred thoroughly in its container. When applying also, the paint shall be continuously stirred in the smaller container, so that its consistency is kept uniform.

The paint shall be laid on evenly and smoothly by meant of crossing and laying off the crossing and laying off consist of covering the area over with paint, brushing the surface hard for the first lime over and then brushing alternately in opposite direction two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of mouldings, etc. shall be left on the work. The full process of crossing and laying off will constitute one coat.

The paint shall be applied with brush or rollers. For undecorated surfaces, the surface shall be treated with minimum two coats of cement water proofing paint. The second or subsequent coat shall not be started until the preceeding coat has become sufficiently hard to resist marking by brush being used.

The surface on finishing shall present a flat velvety smooth finish. It shall be even and uniform in shade without patches, brush marks, paint drops etc.

Precautions:

Old brushes if they are to be used with emulsion paints, shall be completely dried of turpentine oil paint by washing in warm soap wafer.

Brushes shall be quickly washed in water immediately after use and kept immersed in water during break periods to prevent the paint from hardening on the brush.

In the preparation of wall for plastic emulsion painting, no oil base putties shall be used in filling cracks, holes etc.

Splashes on floors etc. shall bi cleaned out without delay as they will be difficult to remove after hardening.

Washing of surfaces treated with emulsion paint shall not be done within 3 to 4 weeks of application.

Protective measures: 2.6.1. The relevant specifications of item No. 18.17. para 2.3. shall be followed:

MODE OF MEASUREMENT & PAYMENT:

The rate shall for unit of Sq. meter.

ITEM NO. 23

Finishing wall with weather proof low velocity ultima exterior emulsion paint on wall surface (two coats) Including 2 coat primer and 2 Cost Putty (If required) on wall surface to give an required shape even shade after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials. Etc complete for all height

Materials:
The water shall conform to M-l. Cement water proofing shall conform to l.S. 5410-1969.

WORKMANSHIP:
Scaffolding:
The relevant specifications of item No. 18.11 shall be followed.
Preparation of surface: The relevant specifications of item No. 18.11 shall he followed except that the word white wash colour wash shall be substituted with water proofing cement paint. The surface shall be thoroughly wetted with clean water before cement water proofing paint is applied.
Preparation of paint: Portland cement shall be prepared by adding paint powder to water and stirring to obtain a thick paste, which shall then be diluted to a brushable consistency. Generally, equal volumes of paint powder and water make a satisfactory paint. In all cases, the manufacture‘s instructions shall be followed. The paint shall be mixed in such quantities as can used up within an hour of mixing as otherwise the mixture will set and thickness, affecting flowing and finish. The libs
of cement paint drums shall be kept tightly when not in use.
Application of Paint:
No painting shall be done when the paint is likely to be exposed to a temperature of below 7°C within 48 hours after application.
When weather conditions are such as to cause damage the work shall be carried out in the shadow as far as possible. This helps the proper hardening of the paint film by keeping the surface moist for a longer period.
To maintain the uniform mixture and to prevent segregation, the paint shall be stirred frequently in the bucket.
For undercoated surfaces, the surfaces shall be treated with minimum two coats of water proof cement paint. Not less than 24 hours shall be allowed between two coats. Next coat shall not be started untill the proceeding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the proceeding coat shall be allowed between two coats. Next coat shall not be started untill the proceeding coal has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the proceeding coat shall be slightly moistened before applying the subsequent coat.
The finished surface shall be even and uniform in shade, without patches, brush masks, paint drops etc.
2.4.6 The cement paint shall be applied with a brush with reletively short stiff hog or fibre bristles. The paint .shall be brushed in uniform thickness .and shall be free from excessive heavy brush marks. Ths lamps shall be well brushed out.
2.4.7. Water proof cement paint shall not be applied on surfaces already treated with white wash colour wash, distemper dry or oil bound varnishes, paint etc. It shall not be applied on gypsum, wood and metal surfaces.
Curing :
Painted surfaces shall be sprinkled with water two or three times a day. This shall be done between coats and
for atleast two days following the final coat. The curing shall be started as soon as the paint has hardened so as not to be damaged by me sprinkling of water say about 12 hours after the application.
Protection measures shall be taken as per item No. 18.11 para 2.6.

MODE OF MEASUREMENTS & PAYMENT:
The relevant specifications of item No. 18.11 shall be followed.
The rate shall be for a unit of one sq. metre.

ITEM NO. 24

'Providing throating or plaster drip and moulding to R.C.C. Chhajja.

Mode of Measurement and Payment:
The rate shall be for a unit of one running meter.

ITEM NO. 25

Providing cement vata (10cm. x 10 cm. size) quarter round in cement mortar 1:1 including neat cement finishing, watering etc. complete.

Mode of Measurement and Payment:
The rate shall be for a unit of one running meter.

ITEM NO. 26

Providing and laying water proofing treatment on terrace including applying neat cement slurry 2.75 Kg./ Sqmt. On cement admixed with water proofing component after cleaning the surface, laying cement concrete with brick bat 75 mm to 100 mm thick with 50% of C.M. 1:5 admixed with water proofing component over 20 mm thick layer of C.M. 1:5 to required slope including ramming at junction of wall and slab, after two days of proper curing applying a second coat of cement slurry, finished the surface with 20 mm thick C.M. 1:4 china mosaic flooring and finally finished surface with white cement slurry, after finishing with terrace shall be filled with water for a period of two week.

Preparing the Surface
The surface of the slab should be roughened by scrapping when the slab concrete is still green, however, the surface need not be hacked. In case the slab is already cast and surface fairly finished, the same shall be cleaned neatly of all mortar droppings, loose materials etc with brooms/cloth.

Providing and Laying of Slurry under Base Coat
The quantity of water required to prepare the slurry with 2.75 kg. of blended cement to be painted over an area of 1 sqm. shall be calculated exactly as described in clause 22.5.3. Depending upon the area of surface that has to be covered, the required quantity of slurry should be prepared using 2.75 kg. blended cement + water per sqm. area to be covered, taking particular care to see that only that much quantity of slurry shall be prepared which can be used within half an hour of preparation i.e. before the initial setting time of cement. The prepared slurry shall be applied over the dampened surface with brushes very carefully, including the joints between the floor slab and the parapet wall, holes on the surfaces, joints of pipes, masonry/concrete etc. The application of the slurry should continue upto a height of 300 mm on the parapet wall and also the groove as shown in Fig. 22.6. The slurry should also be applied upto a height of 150 mm over pipe projections etc.

Laying Base Coat 20 mm thick

Immediately after the application of slurry and when the application is still green, 20 mm thick cement plaster as base coat with cement mortar 1:5 (1 blended cement: 5 coarse sand) shall be evenly applied over the concrete surface taking particular care to see that all the corners and joints are properly packed and the application of the base coat shall be continued up to a height of 300 mm over the parapet wall.

Laying Brick Bat Coba

Brick bat of size 25 mm to 115 mm out of well burnt bricks shall be used for the purpose of brick bat coba. The brick bats shall be properly dampened for six hours before laying. Brick bats shall be laid to required slope/gradient over the base coat of mortar leaving 15-25 mm gap between two bats. Cement mortar 1:5 (1 blended cement: 5 coarse sand) shall be poured over the brick bats and joints filled properly. Under no circumstances dry brick bats should be laid over the base coat. The haunches/gola at the junction of parapet wall and the roof shall be formed only with brick bat coba as shown in Fig. 22.6.

In case the brick bat coba is laid on the base coat immediately on initial set there will be no necessity of applying cement slurry over the base coat before laying the brick bat coba. However, if the brick bat coba is to be laid on the subsequent day, cement slurry prepared as described in clause 22.7.3 shall be applied over the top surface of the base coat, then only the brick bat coba shall be laid.

Application of Slurry over Brick Bat Coba

After two days of curing of brick bat coba cement slurry prepared as per clause 22.7.3 shall be applied on the surface of brick bat coba The application of slurry shall be the same as described in clause 22.5.3 which should cover the haunches/gola, and the remaining small portion of parapet wall and also inside the groove as shown in the figure.

Laying Finishing Layer (Protective Coat)

Immediately on applying the cement slurry over the surface of the brick bat coba and when the slurry applied is still green, the fibre glass cloth as specified in clause 22.6.4 shall be spread evenly on the surface without any kink & pressed to see that no air spaces exist. The fibre glass cloth shall be taken up to a height of 300 mm on parapet walls & tucked in the groove specially prepared at that height. 20mm thick layer of cement plaster, without leaving any joints shall be applied with cement mortar 1:4 (1 blended cement: 4 coarse sand) over the entire fibre glass cloth including the haunches/gola and the small portion on the parapet wall. The groove in the parapet wall over the haunches shall also be filled neatly packing the mortar firmly in the groove.

The surface of the finishing layer (protective coat) shall be neatly finished with cement slurry prepared as per clause 22.7.3. The finished surface shall be allowed to dry for a while and then pattern of 300 mm x 300 mm groove, 8 mm deep shall be made over the entire surface.

Curing and Testing the Treatment

The entire surface thus treated shall be flooded with water by making kiaries with weak cement mortar, for a minimum period of two weeks.

Measurement

The measurement shall be taken along the finished surface of treatment including the rounded and tapered portion at junction of parapet wall. Length and breadth shall be measured correct to a cm and area shall be worked out to nearest 0.01 sqm. No deduction in measurement shall be made for openings or recesses or chimney stacks, roof lights or khurras of area upto 0.40 sqm.,

nor anything extra shall be paid for making such openings, recesses etc. For areas exceeding 0.40 sqm., deduction will be made in the measurements for the full openings and nothing extra shall be paid for making such openings.

China Mosaic Laying
"C" class glaze ceramic tiles to be laid on prepared base of coba treated surface into smaller size of 2"x2" max size on cement slarry made of 1:6 ration of cement – water shall be applied. Water proofing compound shall be added as per manufacturer details. After fixing tiles, whole surface to be acide wash to make sure no marks of excess cement slurry on finished surface.

Mode of Measurement
Work will be measured in unit of Sq.Mtr & paid in same unit.

ITEM NO. 27

Providing and fixing factory made single extruded WPC (Wood Polymer Composite) solid door/window/Ceosetory windows & other Frames/Chowkhat comprising of virgin PVC polymer of K value 58- 60 (Suspension Grade), calcium carbonate and natural fibers (wood powder/ rice husk/wheat husk) and non toxic additives (maximum oxicity index of 12 for 100 gms) fabricated with miter joints after star headed SS screws having minimum frame density of 750 kg/ cum, screw withdrawal strength of 2200 N (Face) & 1100 N (Edge),minimum compressive strength of 58 N/mm2, modulus of elasticity 900 N/mm2 and resistance to spread of flame of Class A category with property of being termite/borer proof, water/moisture proof and fire retardant and fixed in position with M.S hold fast/lugs/SS dash fasteners of required dia and length complete as per direction of Engineer-In- Charge. Note: For WPC solid door/window frames, minus 5mm tolerance in dimensions i.e depth and width of profile shall be acceptable. Variation in profile dimensions on plus side shall be acceptable but no extra payment on this account shall be made. applying PVC solvent cement and screwed with full body threadedComplete as per direction of Engineer-in-Charge.
1) Frame size 50 x 100 mm

MODE OF MEASUREMENTS & PAYMENT:
The rate shall be for a unit of one running meter. No wastage should be paid extra. Work at all floors/ any levels/ any heights/ all shapes. Contractor shall provide guarantee for water tightness

ITEM NO. 28

Providing and fixing factory made single extruded WPC (Wood Polymer Composite) solid plain flush door shutter of required size comprising of virgin polymer of K value 58-60 (Suspension Grade), calcium carbonate and natural fibers (wood powder/ rice husk/wheat husk) and non toxic additives (maximum toxicity index of 12 for 100 gms) having minimum density of 650 kg/cum and screw withdrawal strength of 1800 N (Face) & 900 N (Edge), minimum compressive strength 50 N/mm2, modulus of elasticity 850 N/mm2 and resistance to spread of flame of Class A category with property of being termite/ borer proof, water/moisture proof and fire retardant and including stainless steel butt hinges of required size with necessary full body threaded star headed counter sunk S.S screws, Handles, Stopper, Door closer, Tower bolt, Baby Latch & Mortise Lock all as per direction of Engineer-In- Charge, Material test certificate and authentication should be compulsory provided by the manufacturing company 1) 30 mm thick

Material and workmanship

42mm thick flush door shutters in single/Double leaf with teakwood leaping of factory-made solid core in continuous gapless section with butt joints tightly factory bonded with phenolformaldehyde adhesive of brand as approved with anti-termite treated FIRESAFE IS: 5509 Century

Plywood finished with **1mm thk. Laminate sheet of approved colour / shade on the both side of 35mm flush door**. The teak wood (Ghana or equivalent) shall be of good quality as required for the item to be executed. Teak wood (Ghana or equivalent) generally free from large, loose, dead or cluster knots, flaws, shakes, warps, twists bends, or any other defects. It shall generally be uniform in substance and of straight fibers as far as possible. It shall be free form rot, decay, harmful fungi and other defects of harmful nature which affect the strength durability of its usefulness for purpose for which it is required. The colour shall be uniform as far as possible. Any effort like painting, using any adhesive or resin materials made to hide the 14 defects shall render the pieces liable to rejection by the Clerk- Of- Work or Engineer-in- Charge All Scantlings, planks etc. shall be sawn in straight lines and planes in the direction of grains and of uniform thickness. The tolerances in the dimensions shall be allowed at the rate of 1.00mm per face to be planed. Second class teak wood shall have no individual hard and sound knots shallbe more than 15 sq. cms. In size and aggregate area of such knots shall not exceed 2 % of the area of piece

Mode of Measurement & Payment:

The doors shall be measured in sqmt. Rate shall include providing and fixing shutter. Rate shall be inclusive of all major/minor civil & repair work required to be carried out in order to execute the aforesaid item to the satisfaction of the consultant/ EIC. Rate includes all material and labour to complete the item as per instruction of Engineer in-charge. Dimensions are computed in square meter, rounded to two places of decimal.

ITEM NO. 29

Providing and fixing ISI marked flush door shutters conforming to IS : 2202 (Part I) decorative type, core of block board construction with frame of 1st class hard wood and well matched teak 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters. 35 mm thick including ISI marked Stainless Steel butt hinges with necessary screws, Also Vision Panel for 6 mm Clear Glass with Polish bidding patti to fix it, all materials and labour etc. complete as per detail drawing and instruction of engineer-in charge and consultant.

●Specification the work of Indian teakwood shall be carried out as per item no. 10.1 {A} p.58 of general technical specification booklet for building works.

●The shutter work shall be. Carried out as per item no. 10.30, P.63 of General Technical Specifications for building work, 35mm thick shutter shall be used. The Veneers sheet of best quality shall be fixed to shutter to both side & triangular beading of size 30x30 mm shall be fixed around the door frames.

●The lacquer polishing to be carried out on exposed surfaces. The decorative stainless-steel fixtures & fastenings are to be fixed as per detail drawing & directed by engineer in charge.

MODE OF MEASUREMENTS & PAYMENT:

The rate shall be for a unit of one square meter.

ITEM NO. 30

Providing and fixing standared extruded of alluminium section of size 63mm x 38.10mm x 1.2mm (Jindal Section: 2434, @Wt.0.643Kg/mt) withcolour anodized alluminium frame for ventilation with 5mm thick frosted glass as details etc complete for Ventilation

The rate shall be for a unit of one square meter. Mode of measurement shall be till false ceiling level.

MATERIAL

Aluminum standard section The aluminum shall conform to M-31, aluminum material shall conform to as specified above and should of procured from reputed approved manufacturers Main outer frame of rectangular tube Frame shall be of size 50 x 50mm and 1.6mm thick

Aluminum alloy used in the manufacture of extruded Window section shall confirm to I S designation HEAWP of I S 733-1975 and also Designation WVG –WP of I S 1285-1975 section shall be as specified in the drawing and design Size of the rectangular tube for outer frame shall be as described in item of schedule B of the tender

All sections shall be Free from any scratches or holes or any damages on surface.
All section shall have finished luster surface on all sides 4/5/8 mm thick colour tinted/Clear/Plain glass
The Transparent glass shall conform to M-38, Thickness of glass shall be of thickness 5 mm and shall be Colour Tinted Glass shall be of approved brand as approved by Engineer in charge The glass shall be clear and free form scratches and cracks The glass shall be fitted in partition as directed mm thick Practical Board panel mm thick Bison panel shall confirm Specification No M - 40 of specification booklet for building works except board shall be Particle board Particle board panel shall be of 12 mm thick of approved brand and quality

The particle shall conform to I.S. 3087-1965 "Specification for plywood board for general purpose. The size and the thickness shall be as indicated For execution of this item specification of material as per item M- 40 shall be followed for booklet of Building specifications Particle board shall be of best quality and free from any defect and shall be undamaged in carriage and handling either by rubbing off of lamination or surface or otherwise. And free from all defects such as Scratches cracks, holes, deformities chipped edges or otherwise damaged.

The bison Board panels used for face panels shall be best quality free from any defects. The Laminated Particle Board shall be made with phenol formaldehyde adhesive. The Laminated Particle Board shall conform to I.S. 3087- 1965 "Specification for wood particle board for general purpose. " The size and the thickness shall be indicated

Rubber Gasket

Rubber gasket shall be of approved make, shall be Free from any scratches or holes or any damages on surface. and shall have finished luster surface on all sides

WORKMANSHIP

The Work of aluminum Partition shall be done with extreme finishing. The partial bison board shall be fixed in the bottom panel and glass shall be fitted on top panel as directed by Engineer in charge using glazing clips and rubber gaskets as required All the fixtures and fastenings shall be fitted at right place and as directed by Engineer in charge.

Mode of Measurement & Payment:
The payment will be made on square Meter basis of the finished work. All necessary labour materials
Equipment tools and plant, conveyance including loading and unloading etc. shall be provided by the Contractor as directed by the Engineer in charge The item shall be measured for its length & width limiting dimensions to those specified on plan or as directed.

ITEM NO. 31

Providing & Laying 24" x 24" vitrified 8 mm thick tile flooring over 20 mm (average) base of cement mortar 1:6 (1 cement: 6 coarse sand) on new surface or fixing on existing flooring by adhesive material including dismentaling of existing flooring and jointed with color cement slurry including finised with flush pointing & cleaning the surface etc. complete for Dark & Light shade

Providing and laying 8 to 10mm thick, double charged Antiskid Vitrified tiles of size upto 24" x 24" and 15mm thick tactile full body Vitrified tiles (for vision impaired person as per standard laid down) of required finish as approved by Architect/ EIC for all floors/ any height/ any levels etc. with on floors, residue of approved make and brand as per make list of tender as per design drawings over 20 mm (average) base of cement mortar 1:6 (1 cement : 6 coarse sand) new surface and jointed with colour cement slurry including finishing shall be done with flush pointing with white cement and matching pigment, including curing, cleaning with mild oxalic acid, maintaining till handling over by covering the joints with abrotaps, plastic sheet & plaster of paris, curing, etc complete as directed by Engineer-in-charge. (Dark and Light shade) (work for all floors)

Material:
Water shall confirm to M – 1, cement shall confirm to M - 3 sand shall confirm to M – 6. Instead of Kota Stone (M-49) it should be 600mm x 600mm Glossy double charged Vitrified 8 to 10 mm thick and 15mm thick tactile full body Vitrified tiles (for vision impaired person as per standard laid down)

Workmanship:
Bedding for the 8 to 10mm thick, double charged Vitrified tiles shall be cement Mortar 1:6 (mortar mix specified) of Av. Thickness 20mm as given in the description of the item. Sub grade shall be cleaned, wetted and mopped. The Tile shall be washed clean before laying. It shall be top pressed, tapped gently to bring it in level with other tile spread on an area sufficient to receive one 8 to 10mm thick, double charged Vitrified tiles (full body). It shall then be lifted and laid aside. Top surface of the mortar shall then be corrected by adding fresh mortar at hollow depressions. Over this surface, cement slurry of honey like consistency shall be applied. The tile shall be gently placed in position and tapped with wooden mallet till it is properly padded in level with and close to the adjoining slab. The joint shall be as fine as possible. The tile fixed in the floor adjoining the wall shall enter not less than 10mm under the plaster, skirting or dado. The junction between the wall floors shall be finished neatly. The finished surface shall be true to levels and slopes as directed.The floor shall be kept wet for a minimum period of 7 days.. Curing, daily moping with water & kerosene as directed for at least 15 days after final polishing etc. complete upto the satisfaction of the Architect or Engineer-in-charge.

Mode of measurement and payment:
Work includes cost of material and labour. Measurement shall be taken between finished face of skirting, dado or wall plaster - visible top for 600mm x 600mm Glossy double charged Vitrified 8 to 10 mm thick and 15mm thick tactile full body Vitrified tiles (for vision impaired person as per standard laid down) only in length and width. Mode of Payment will be on smt. basis of finished work. No deduction shall be made for any opening in the floor of area 0.10 sq. mt. Rate shall be paid for a unit of 1 sq. meter basis.

ITEM NO. 32

Providing & Laying 24" x 24" vitrified 8 mm thick tile flooring over 20 mm (average) base of cement mortar 1:6 (1 cement: 6 coarse sand) on new surface or fixing on existing flooring by adhesive material including dismentaling of existing flooring and jointed with color cement slurry including finised with flush pointing & cleaning the surface etc. complete for antiskit

Same as Item No.31

ITEM NO. 33

Providing and laying coloured glazed tiles of the size 300 mm x 200 mm x 8 mm / 300 mm x 450 mm x 8 mm in skirting, risers of steps and dedo on 10 mm. thick cement plaster 1:3 (1 cement : 3 coarse sand) & jointed with white cement slurry.

ITEM NO. 34

Providing and laying Granite slab (18 mm thick) one side Mirror polish, Acid Wash finish flooring, skirting, risers of steps, dado, Sill Jems cladding over 20 mm (average) base of cement mortar 1:6 (1cement : 6 coarse sand) or L.M 1:1.5 laid and jointed with grey cement slurry including rubbing and polishing complete as per drawing & directed by EIC/Architect. including making edge moulding & making grooves (any nos.) as per pattern of Architectural Drawing etc. complete as required

Mode of Measurement & Payment:
Bedding for the 18mm thick mirror finished granite stone shall be cement Mortar 1:3 (mortar mix specified) of Av. Thickness up to 65 mm as given in the description of the item. Sub grade shall be cleaned, wetted and mopped. The slab shall be washed clean before laying. It shall be top pressed, tapped gently to bring it in level with other slab spread on an area sufficient to receive one **18mm thick mirror finished granite** slab. It shall then be lifted and laid aside. Top surface of the mortar shall then be corrected by adding fresh mortar at hollow depressions. Over this surface, cement slurry of honey like consistency shall be applied. The stone shall be gently placed in position and tapped with wooden mallet till it is properly padded in level with and close to the adjoining slab. The joint shall be as fine as possible. The slab fixed in the floor adjoining the wall shall enter not less than 10mm under the plaster, skirting or dado. The junction between the wall floors shall be finished neatly. The finished surface shall be true to levels and slopes as directed. The floor shall be kept wet for a minimum period of 7 days.. Curing, daily moping with water & kerosene as directed for at least 15 days after final polishing etc. complete upto the satisfaction of the Architect or Engineer-in-charge.

Mode of Measurement & Payment:
Work includes cost of material and labour with polishing complete. Measurement shall be taken between finished face of skirting, dado or wall plaster - visible top Granite stone only in length and width. Mode of Payment will be on smt. basis of finished work. No deduction shall be made for any opening in the floor of area 0.10 sq. mt. Rate shall be paid for a unit of 1 sq. meter basis.

ITEM NO. 35

Providing and laying average 25 mm thick mirror polished kotah stone of approved quality, selected and sorted for uniform colour in floor, otta, platform, etc. of required sizes upto 600 x 600 mm fix size (No Variation) as per design in normal pattern (straight or staggered joint with square or rectangular shaped stone) and residue as per drawing including 1:6 (1 cement : 6 sand) cement mortar bedding of average 20 mm thickness jointed with grey cement and colour pigment in proportion to match the shade of kota stone. Rubbing and polishing to be done with 2 coats of 60, 120 grades of emery, balckchapadi and gutka for special polish after it polishing to be done with 220, 320, 400, 600 grades of emery till mirror finish is achieved. Curing, daily moping with water & kerosene as directed for at least 15 days after final polishing etc. complete upto the satisfaction of the Architect or Engineer-in-charge. (NO WAXING WILL BE PERMITTED).

Material:
1 –600 mm x 600mm size and 25mm thick Kota Stone shall confirm to M-49
2 – Cement Mortar shall confirm to M-11 as per attached Specification of Materials
Water shall confirm M-1 as per attached Specification of Materials All relevant specification along with workmanship shall be read as per mentioned into item no 200.
Mode of Measurements and Payment:
The rate shall be for a unit of one square meter

ITEM NO. 36

Toilet : Urinal Partition _ Granite
Providing and laying machine cut free edges machine double polished granite for urinal partition walls in single piece 18mm thick.ncluding cutting moulding in walls and fixing the stone with neat cement slurry in true line and level as directed etc. complete as per directed by EIC.

ITEM NO. 37

Providing and fixing pre-cast Rubber Dye / steel Dye inter locking concrete block 60mm thick with grade of concrete M300 pnumatic compressed / vibrated mechanically and as per approved design Confirming to IS 15658 : 2006 including 35 mm Sand layer for levelling and filling the joint with sand in proper line and level as per guidlines of IRC : SP 63- 2018 etc. Complete.

Material:
High strength high finish on higher Vibropress Type machne inter locking concrete Block 80 mm thick with grade of concrete M-400 pnumatic compressed by automation mechanically pressed and as per approved design Water shall confirm to toM-1, (2) Cement shall conform to M-3, (3) Sand shall conform to M-6, (4) Mortar shall conform to M-11, (5) Aggregates shall conform to M-12, (6) Shuttering shall conform to M-26.

Workmanship:
Laying should be done on 75 mm Thick Sand completed Bed. This work shall be carried out in the central median and/or along the footpaths in conformity with the lines, levels and dimensions as specified in the drawings.

Paver Block:
The paver blocks should be High strength high finish on higher Vibropress Type machne inter locking concrete Block 60 mm thick with grade of concrete M-250 pnumatic compressed by automation mechanically pressed and as per approved design at appropriate plant having facility for applying high pressure and controlled vibration.

ITEM NO. 38

Providing and fixing pre-cast concrete kerb stone of gray cement based concrete block 30cm length,30cm height and 15cm thick of M250 grade concret as per approved design and including excavation for fixing in proper line and level,filling the joint with C:M 1:3 (1cement:3fine sand) etc complete.

Materials:
Precast C.C. Block: (1) Water shall confirm to toM-1, (2) Cement shall conform to M-3, (3) Sand shall conform to M-6, (4) Mortar shall conform to M-11, (5) Aggregates shall conform to M-12, (6) Shuttering shall conform to M-26.

Construction of Precast C.C. Block:
Precast C.C blocks shall be made from M-25 grade of cement concrete. The concrete shall conform to relevant IS code and the size shall be as specified in drawing and the surface shall have fair finish. The strength of the C.C. Block shall have compressive strength of 25N/mm2 after 28 days. It shall fix on road surface/on ground with necessary excavation and shall be joined in C.M.1:3 to required line and level. The shape of blocks shall be of any shape / shapes approved by Engineer-in-charge. Cement concrete block of approved design of size 300 x 300 x 150 mm of the make approved by engineer-in-charge.

Clearing the site:
The site cm which the structure is to be built, shall be cleared and all obstructions, loose stone, materials and rubbish of all kind, bush, wood and trees shall be removed as directed. The materials so obtained shall be property of the Government and be conveyed and stacked as directed within 50 M. lead. The roots of the trees coming in the sides shall be cut and coated with hot asphalt. The rate of site clearance is damaged be included in the rate of earthwork for which no extra will be paid.

Setting out:
After clearing the site, the center lines will be given by the Engineer-in charge. The contractor shall assume full responsibility for alignment, elevation and dimension of each and all parts of the tractor shall assume full responsibility for alignment elevation and dimension of each and all parts of the work. Contractor shall supply laborer's, materials., etc. required for setting out the reference marks and bench marks and shall maintain them as long as required and directed.

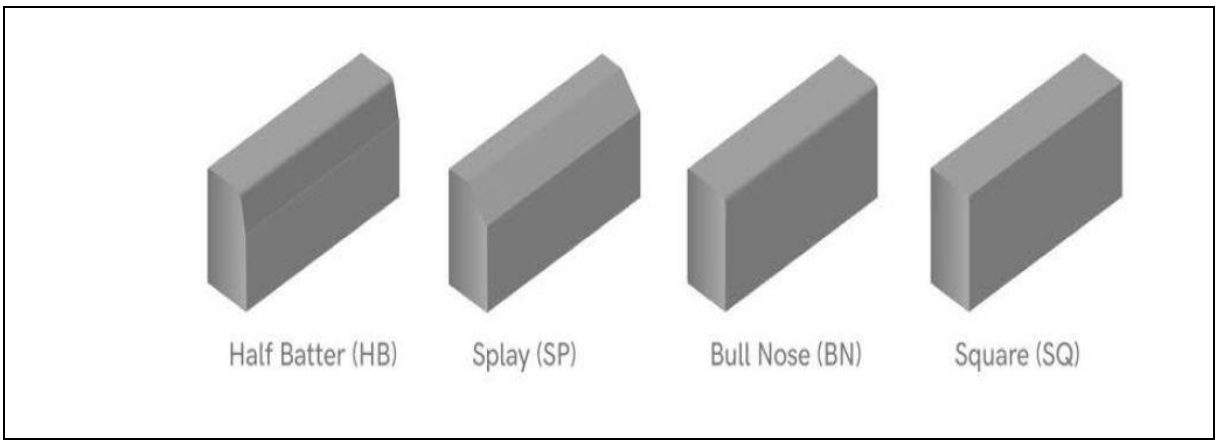
Excavation:
The excavation, in foundation shall be carried out in true line and level and shall have the width and depth as shown in the drawings or as directed. The contractor shall do the necessary shoring and strutting or providing necessary slopes to a safe angle, at his own cost. The payment for such precautionary measures shall be paid separately if not specified. The bottom of the excavated area shall be 1evelled both longitudinally and transversely as directed by removing and watering as required. No earth filling will be allowed for bringing it to level, if by mistake or any other reason excavation is made deeper or wider that shown on the plan or directed, The extra depth or width shall be made up with concrete of same proportion as specified for the foundation concrete at the cost of the contractor. The excavation up to 1.5 m. depth shall be measured under this item.

Disposal of the excavated stuff:
The excavated stuff of the selected type shall be used in filling the trenches and plinth or leveling the ground in layers including ramming and watering etc. The balance of the excavated quantity shall be removed by the contractor from the site of work to a place as directed with lead up to 50 M. and all lift.

Fixing of Blocks:
Cement concrete blocks of approved shape shall be fixed in line & level. The alignment of C.C blocks shall be got approved before fixing at site of work. Blocks should be laid commencing from one end of the edge strip and proceed towards the other end. The blocks can be placed to different bonds or patterns as directed by Engineer in Charge. With the help of gauges, the joint width specification (2 to 4mm) should be checked in the first few meters, where it should be ensured that the block alignment is correct. To start with, full blocks should be used; only subsequently, cutting and in filling at edges be permitted. Under no Circumstances should the blocks be forced or hammered into the bedding at this stage of lying. For cutting paving blocks, hydraulic or mechanical block cutters, or power saws are used. Cut units less than 50mm minimum dimension should not be used. Where space does not permit use of a larger segment, use premixed concrete or sand – cement mortar instead.

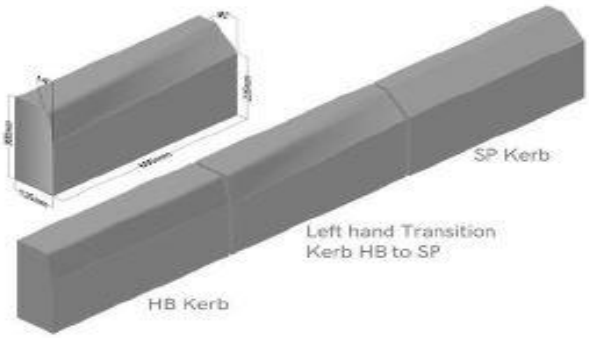
The blocks shall be laid in line and level and to required gradient. The block shall be jointed with cement mortar 1:1 (1 cement: 1 coarse sand) as directed by Engineer-in-charge.

Reference Image for proposed Kerb Stone under Item No. 46/47



Transition Kerbs

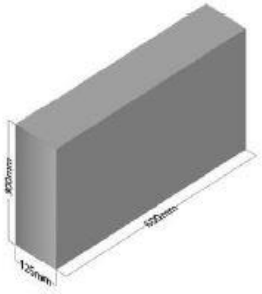
The straight Transition Kerb helps transition from Half Batter to Splay profiles and vice versa. Though a very small quantity of these kerbs are used, they form an important detailing element, and add to the site.



Profile	Length (mm)	Height (mm)	Thickness (mm)
HB to SP (LH/RH)	600	300	150/125/100

Square (SQ)

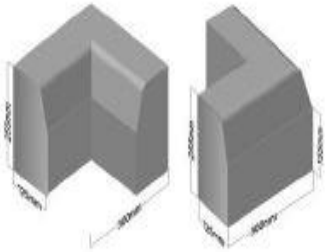
The Square profile is typically used as flush kerbing, embedded completely in the ground, with only the top surface visible. These kerbs help provide restraints for both the footpath as well as the carriage way, and are useful in very low traffic areas, where the sidewalk is intended as a mixed use space to occasionally allow parking of vehicles.



Profile	Length (mm)	Height (mm)	Thickness (mm)
Square (SQ)	600/500	450/375/300	150/125/100
Square (SQ)	600	350/200	125

Angle Kerbs

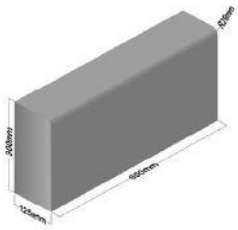
provide kerbing treatment details for several road viders, pedestrian safety bays, parking spaces and



Length (mm)	Height (mm)	Thickness (mm)
300	255	125

Bull Nose (BN)

Bull Nose profile kerbs provide access to vehicles from carriageways to a private driveway or an access point across pedestrian footpath crossing. These allow for vehicles and wheel chairs to cross over very easily.

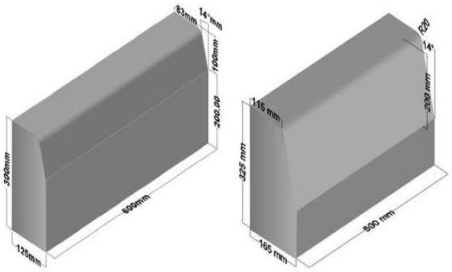


Profile	Length (mm)	Height (mm)	Thickness (mm)
Bull Nose (BN)	600/500	450/375/300	150/125

Quadrant Kerbs

Quadrant Kerbs are used when a neat finish on a curved edging is needed. They can be used stand-alone or in combination with straight kerbs.

Profile	Length (mm)	Height (mm)	Thickness (mm)
HB	300	255	-



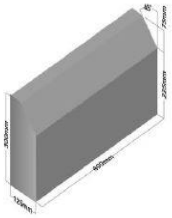
Half Batter A Half Batter B

Profile	Length (mm)	Height (mm)	Thickness (mm)
Half Batter (HB) A	600/500	450/375/300	150/125/100
Half Batter (HB) A	300	600	150/125/100
Half Batter (HB) B	500	325	165/150

Splay (SP)

The purpose of the Splay profile kerbs is to allow access to vehicular traffic over them. These are typically used to give access to demarcated parking spaces, or where vehicles may need to climb on to verges in case of emergencies.

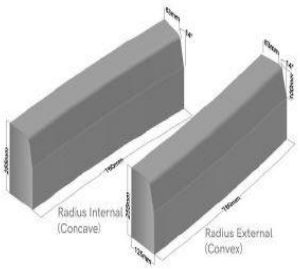
For safety reasons, these are not used when a footpath is present.



Profile	Length (mm)	Height (mm)	Thickness (mm)
Splay (SP)	600/500	450/375/300	150/125/100

Radius Kerbs

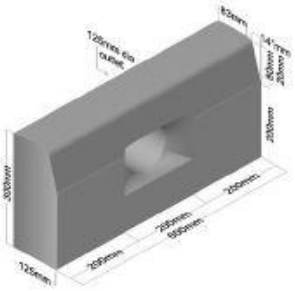
Radius Kerbs are available in various radii in concave and co
with a half batter profile and a similar pimple finish to mat
road kerbs.



Profile	Length (mm)	Height (mm)	Thickness (mm)	Rad
HB Internal	780	255	125	
HB External	780	255	125	1/2/4

Offlet Kerbs

Offlet Kerbs allow standing water to drain away from carriageways to other landscape features. We offer a standard offlet kerb and some core cut options of 100 mm or 125 mm diameter for customized locations of apertures.



Profile	Length (mm)	Height (mm)	Thickness (mm)
HB	600	300	150/125/100

MODE OF MEASUREMENTS AND PAYMENT:

Measurement should be in Running Meter (Rmt) up to two decimals. The rate should be including all above activity and incidental activity to be carried out to complete the work in all respect. No extra payment for transportation, loading, unloading from stock yard should be paid.

ITEM NO. 39

Providing, fabricating, assembling, hoisting/ erecting and fixing in position at any heights/ any levels/ all floors/ all shapes & sizes with all leads & lifts using MS Rolled Steel Sections, Hollow sections, Tubular Sections, MS Plates, Chequered Plates, MS Pipes, Perforated Sheet, Flats, Bright Bars, Angles, MS Sheet, Girder, Beam. threaded J bolts, insert plate, support plate etc as per drawing. all confirming to latest relevant IS codes for the work of steel structures like staircases, railings, handrail, jali, gates, grills, bracings, platforms, brackets, monkey ladder, cattle trap, grill door, pipe rack, rungs, false ceiling frame work, framing for facade, Roof canopy, fencing posts, M.S. Screen & fencing jali frame work etc. including straightening, cutting, bending, bolting and welding the members all as per structural drawings and as per detailed specifications (for materials & workmanship) including necessary scaffolding/ staging etc. complete in the situations described hereinafter and comprising of : i) Profile Cutting of components to required length/ width and shape/profile; ii) Smooth grinding/ machining of edges/ faces/ all welding joints; iii) Necessary welding (electric arc welding) for required weld lengths and sizes. Fabrication shall be in a perfect architectural workmanship manner and as provided in section V & VI of IS 800 & IS 7215. Welding shall be carried out by qualified welders/ fabricators. The procedure, selection, test and inspection shall confirm to provisions in IS 816, IS 818, IS 822, & IS 823. Erection/ hoisting shall commence only after passing of fabricated parts by Architect/ Engineer. Rate shall be inclusive of cutting, wastage, welding, bending (shop at site), bolting wherever necessary, grinding, finishing edges, filling & finishing the welded spots & gaps with "Bombay Masala" & "Steel Putty" etc. complete. It should also include the cost of necessary scaffolding/ staging, zinc coated nut-bolt as required for safety, anchore fastner of approved make (Hilti Fisher or equivalent) structural stability of all works at site and for fixing with RCC element. Including, Providing and applying minimum two coats of enamel paint (2 coats of zinc chromate yellow primer and 2 coats of enamel paint) of approved make on all type of MS sections, new steel and other metal surfaces & including preparing the surface to give an even shade & finish at any heights, any levels etc. complete as per satisfaction of engineer-in-charge. (Only standard measurements will be paid for as actual cut length used at site)

Mode of Measurement and Payment:
The rate shall be for a unit of one kilo gram.

ITEM NO. 40

Providing and fixing precoated galvanised iron profile sheets (size, shape and pitch of corrugation as approved by Engineer-in-Charge) of total coated thickness 0.50mm (base metal of minimum 0.45mm thickness with total coating thickness of 0.05mm) with zinc coating 120 grams per sqm as per IS: 277, in 240 mpa steel grade, 5-7 microns epoxy primer on both side of the sheet and polyester top coat 15-18 microns. Sheet should have protective guard film of 25 microns minimum to avoid scratches during transportation and should be supplied in single length upto 12 metre or as desired by Engineer-in-charge. The sheet shall be fixed using self drilling /self tapping screws of size (5.5x 55 mm) with EPDM seal, complete upto any pitch in horizontal/ vertical or curved surfaces, excluding the cost of purlins, rafters and trusses and including cutting to size and shape wherever required.

Mode of Measurement and Payment:
The rate shall be for a unit of square meter.

ITEM NO. 41

Providing and fixing precoated galvanised steel sheet roofing accessories of total coated thickness 0.50mm (base metal of minimum 0.45mm thickness with total coating thickness of 0.05mm) with Zinc coating 120 grams per sqm as per IS: 277, in 240 mpa steel grade, 5-7 microns epoxy primer on both side of the sheet and polyester top coat 15-18 microns using self drilling/ self tapping screws complete : Gutter (600 mm over all girth)

Mode of Measurement and Payment:
The rate shall be for a unit of running meter.

ITEM NO. 42

wall - mounted magnetic whiteboards - Providing and placing on wall - mounted magnetic whiteboards including centre H channel with aluminium anodized frame in width of 5/8" the dry erase boards shall be of thickness 1/2", life time guranted non staining dry erase surface. and shall be permanent marker resistant. smooth & glossy surface permits easy writing and erasing. and easy to fix on wall with concealed hook. fixing screw and anchor plugs. approved model and make, Item to include all fixing accessories, all material and lift to 20 mts., including keeping in packaged condition till handover, cleaned complete. complete and all as per manufacturer's specification and as directed by the EIC / Architect. wall - mounted magnetic whiteboards size: 4' x 6'

Mode of Measurement and Payment:
The rate shall be for a unit of number.

ITEM NO. 43

50mm Thick Insulated Wall Panel : Supply of Kingspan Jindal/ Suchi Foam Make 50 mm thick Wall Panel, both side 0.35 mm PPGI Sheet, 120GSM, RAL- 9002, manufactured in continuous line of process with density of 40kg/m3 (+/- 2kg/m3).

Mode of Measurement and Payment:
The rate shall be for a unit of square meter.

ITEM NO. 44

50 mm Thick. Insulated Roof Sheet: Supply Kingspan Jindal/ Suchi Foam Make 50 mm thick Roof Panel, both side 0.35 mm PPGI Sheet, 120GSM, RAL – 9002, manufactured in continuous line of process with density of 40kg/m3 (+/- 2kg/m3).

Mode of Measurement and Payment:
The rate shall be for a unit of square meter.

ITEM NO. 45

Wall Ancillaries like 'C' Chanel, 'F' Chanel, 'L' Angle etc to be made from 0.9mm thick GI Sheet duly powder coated from both side.

Mode of Measurement and Payment:
The rate shall be for a unit of square meter.

ITEM NO. 46

Roof Ancillaries like End Cap, Rake Trim, External Crimped Ridge, Internal Ridge etc to be made from 0.5mm thick GL Sheet duly powder coated from both side.

Mode of Measurement and Payment:
The rate shall be for a unit of square meter.

ITEM NO. 47

Aluminum Windows
Providing and fixing Anodized/powder coated aluminum works for sliding or openeble windows (2 Track & 3 Track) with extruded built up standard tubular and other section of approved make confirming to IS 733 and IS 1285 , fixed with rawl plug abd screws or fixing clips ,or with expansion hold fasteners including necessary filling up of gaps at junctions, at top ,bottom and sides with required PVC/ Neoprene felt, glass of approved make etc. Aluminum sections shall be smooth, rust free ,straight.mitred and jointed mechanically wherever required including cleat angles aluminum snap beading for glazing /paneling, CP Brass/ Stainless steel screws, Stoppers all complete as per architectural drawings and the direction of Engineer in Charge. rate incl. all type of alumnium secions for windows with tinted / plain glass with or without frosted film as per the detail Architectural dwg.

MATERIAL
Aluminum standard section The aluminum shall conform to M-31, aluminum material shall conform to as specified above and should of procured from reputed approved manufacturers Main outer frame of rectangular tube Frame shall be of size 50 x 50mm and 1.6mm thick

Aluminum alloy used in the manufacture of extruded Window section shall confirm to I S designation HEAWP of I S 733-1975 and also Designation WVG –WP of I S 1285-1975 section shall be as specified in the drawing and design Size of the rectangular tube for outer frame shall be as described in item of schedule B of the tender

All sections shall be Free from any scratches or holes or any damages on surface.
All section shall have finished luster surface on all sides 4/5/8 mm thick colour tinted/Clear/Plain glass
The Transparent glass shall conform to M-38, Thickness of glass shall be of thickness 5 mm and shall be Colour Tinted Glass shall be of approved brand as approved by Engineer in charge The glass shall be clear and free form scratches and cracks The glass shall be fitted in partition as directed mm thick Practical Board panel mm thick Bison panel shall confirm Specification No M - 40 of specification booklet for building works except board shall be Particle board Particle board panel shall be of 12 mm thick of approved brand and quality

The particle shall conform to I.S. 3087-1965 "Specification for plywood board for general purpose. The size and the thickness shall be as indicated For execution of this item specification of material as per item M- 40 shall be followed for booklet of Building specifications Particle board shall be of best quality and free from any defect and shall be undamaged in carriage and handling either by rubbing off of lamination or surface or otherwise. And free from all defects such as Scratches cracks, holes, deformities chipped edges or otherwise damaged.

The bison Board panels used for face panels shall be best quality free from any defects. The Laminated Particle Board shall be made with phenol formaldehyde adhesive. The Laminated Particle Board shall conform to I.S. 3087- 1965 "Specification for wood particle board for general purpose. " The size and the thickness shall be indicated

Rubber Gasket
Rubber gasket shall be of approved make, shall be Free from any scratches or holes or any damages on surface. and shall have finished luster surface on all sides

WORKMANSHIP
The Work of aluminum Partition shall be done with extreme finishing. The partial bison board shall be fixed in the bottom panel and glass shall be fitted on top panel as directed by Engineer in charge using glazing clips and rubber gaskets as required All the fixtures and fastenings shall be fitted at right place and as directed by Engineer in charge.

Mode of Measurement & Payment:
The payment will be made on square Meter basis of the finished work. All necessary labour materials
Equipment tools and plant, conveyance including loading and unloading etc. shall be provided by the Contractor as directed by the Engineer in charge The item shall be measured for its length & width limiting dimensions to those specified on plan or as directed.

The rate shall be for a unit of one square meter. Mode of measurement shall be till false ceiling level.

ITEM NO. 48

Installation charges for PUF Wall & Roof Panel with Ancillaries, silicon sealant, Rivate & SDST Screws.

Mode of Measurement and Payment:
The rate shall be for a unit of square meter.

ITEM NO. 87

'Providing and fixing eco-friendly light weight calcium silicate false ceiling tiles having Tegular edge & 15 mm Thick Densified edges on the Tile Periphery for Extra Strength The Light weight calcium silicate ceiling tiles shall have , light reflection 85% non-combustible as per B.S. 476 part IV, 100% humidity resistance and also having thermal conductivity0.043° w/m KC.for the best thermal Insulation . The Light weight calcium Silicate tile shall be of approved texture Fine fissured/ Spintone/Cosmos / Plain with water based paint Globe having NRC value of 0.75 NRC

or equivalent of size 595 X 595 mm to be laid on true horizontal level suspended inter locking metal grid of hot dipped galvanized steel sections (galvanizing @120 grams per sqm including both side) consisting of main 'T' runner suitably spaced at joints to get required length and size of 24X38mm made from 0.30 mm thick (minimum) sheet, 1200mm centre to centre, and cross 'T' of size 24X28mm made out of 0.33mm (Minimum) sheet spaced 1200mm along spaced between main 'T' at 600mm centre to centre to form agrid of 1200X600mm and secondary cross 'T' of length 600mm and size 24x28mm made of 0.30 mm thick (Minimum) sheet to be interlocked at middle of the 1200X600mm panel to form grid of size 600X600mm resting on periphery walls/partitions on a perimeter wall angle pre-coated steel of size (24X24X3000mm made of 0.40mm thick (minimum) sheet with the help of rawl plugs at 450mm centre to centre with 25mm long dry wall screws @ 230mm interval and laying 15mm thick Densified edges light weight calcium silicate ceiling tiles of approved texture (Fine Fissured/Cosmos/Spintone / Plain) in the grid including, cutting /making opening for services like diffusers, grills, light fittings, fixtures, smoke detectors etc., wherever required, Main 'T' runners to be suspended from ceiling using G.I. slotted cleats of size 25X35X1.6mm fixed to ceiling with 12.5mm dia and 50mm long dash fasteners, 4mm G.I. adjustable rods with galvanized steel level clips of size 85X30X0.8mm, spaced at 1200mm centre to centre long main 'T' bottom exposed with 24mm of all T-sections shall be pre-painted with polyester baked paint, for all heights, as per specifications, drawings and as directed by engineer-in-charge.Note:- Only calcium silicate false ceiling area will be measured from wall to wall. No deduction shall be made for exposed frames/opening (cut outs) having area less than 0.30 sqm. The calcium silicate ceiling tiles shall have NRC. Value of 0.50 (Minimum) for Fine fissured/Spintone/Cosmos and 0.75 NRC for Globe, light reflection 85% non-combustible as per B.S. 476 part IV, 100% humidity resistance and also having thermal conductivity. 0.043° w/m KC.for the best thermal Insulation. (work for all floors)

Mode of Measurement and Payment:
The rate shall be for a unit of square meter.

ITEM NO. 88

Providing and fixing Water proof gypsum board false ceiling consists at G.I perimeter channels of size 0.55 thick having one flange of 20 mm and another flange of 30 mm and web of 27 mm along with perimeter of ceiling, screws fixed to brick work / concrete / partition with help of nylon sleeves and screws at610 mm centre. The suspending G.I. intermediate channels of size 45 mm(0.9 mm thick with 2 flangs at 15mm each from the soffit at 1220 mm centrewith ceiling angles of width 25mm x 10mm x 0.5 mm thick fixed to soffit withG. I cleat and steel expansion fastners ceiling section of .55 thick having kurled web 51.5 mm and 2 flangs at 26 mm each with lip at 10.5 mm are fixed to intermediate channel with help of connecting clips and in direction perpendicular to the intermediate channel at 450mm centre to centre including 12.5 mm tapered edge Gyp board conforming to IS 2095 – 1982 is then screw fixed to ceiling section with 25mm dry wall screws of approved quality and make at 230mm centre, screw fixing is done mechanically with drilling machine with suitable attachment. Finally tapered edges at the cupboard are to be joint and finished so as to have a flush look which includes filling and finishing with jointing compound, paper tape etc. complete. Rate to be included all kinds of profiles, upright , periphery Borders of Other ceiling, curves,cutouts required for light fixtures, speakers, sprinklers, smoke detectors, trap doors, A.C. grill, diffuser etc including additional support if required of duct portion, marking grid on ceiling, including all drops, offsets, curvature small moulding and in desired geometrical pattern, including 2 coats of primer, plaster putty

and minimum 3 coats of plastic Emulsion paint as per manufactures specification, scaffolding. (Same Rate should apply for upto 300 mm Wide Gypsum ceiling Patta)

Components shall be used for grid work (or) as specified in the drawing. Gypsum board M-84, GI Frame work as per Manufacturer and as approved by the Engineer-In- charge, Paint M-44, Fiber glass wool, Nuts and bolts etc.

Workmanship

Material & Workmanship shall be followed as given in BOQ. Gypsum Board of plain series 12.5 mm manufactured by India gypsum or equivalent shall be used. The Gypsum board shall conforms to IS 2095. The longitudinal edge of the Gyp board shall be of tapered/ square edges, so as to have flush joints while fixing. Handling and transporting of Gypsum board shall be done carefully and as recommended by the manufactures. The board should always be kept in a dry and covered place sheltered from rain and to avoid dampness from flow, they should be supported on wooden battens which should not be more than 45cm apart on a flat surface. The material shall be stacked in piles of smaller heights and should not be stacked on edges. Gyp board which have deformed due to poor stacking should not be used. Cutting of board should be made in faced side of the board by means of retractable knife or by using a normal saw and the edges of the boards shall be planned using proper files. The frame work for false ceiling shall be made out of tested specially made from GI of specified gauge as per schedule, accurately formed and die cuts with identical ends in automatic machine with precision tools. All workmanship shall be best quality as followed in a modern sheet metal shops equipped with all machines such as press, dies, spot welding machine, baking oven etc. All materials shall be done by a process approved by the Engineer-in-Charge and in a manner that will not damage the materials. All work shall be accurately formed to the required dimensions, true to line, level and plane in all directions and properly sized to suit the exact dimension within permissible tolerances. Twisted or bent sections shall not be permitted to be used on work. Main runners and cross members shall be of sizes as specified in the schedule/shown in the drawing. The main runners shall be slotted for cross runners and punched for hangers/suspenders cross runners shall have identified die formed ends accurately cut for easy, correct and proper fit assembly. Shearing, cropping shall be clean, reasonably square and free from distortion. Surfaces and joints to be welded shall be free from loose scale, slag, rust, grease, paint and any other foreign materials. The surface shall be wire brushed vigorously. Welding sequence shall be followed to avoid needless distortion and minimize shrinkage stresses. Holes to be made in pressed M.S. sheet shall not be made by flame cutting. The flame cut or unfair holes are not acceptable connection of supported members with erection clearance for all members. Where for practical reasons greater clearance is necessary, suitable designed seating should be provided. Any damages done to the walls/ceiling shall be reinstated to original condition. The contractor shall not be entitled for any extra cost on this account. GI pressed sections grid system shall be of as per manufacturer specification or equivalent approved standard suspended G.I. grid system and as approved by the Engineer In charge. The suspended ceiling grid shall be of self-interlocking for main runners and cross runners of specified section and pattern as required to suit the span as per drawing. The contractor shall take all necessary field measurements before the commencement of the frame work to ensure proper fittings of the work to actual condition of work at site. Particular care should be taken to examine the positions of all recessed lighting, trap doors and other openings indicated on drawings or as directed by the Engineer-in-Charge. The correct panel sizes shall be decided to suit each location. The false ceiling levels shall then be marked on walls. Mark the position of the runners to suit the span of the area. Fix up the wall angles with approved metal fasteners and level then correctly. The position of suspender shall then be marked on the R.C. slab as per the sizes of the panels decided for each

area with due consideration to location of air-conditioning ducts, grills& diffusers etc. Suspenders of type and design fabricated as per drawing and approved by the Engineer-in-Charge, shall then be securely fixed at correct points with approved metal fasteners/expansion bolts of specified dia., as per manufacturers specifications. It shall be ensured that the hanger/suspender shall remain perpendicular and not pulled by the suspension system to any side.

Fix up the runner to the suspenders and lock up the runners at the joints, complete the leveling starting from the fixed points and proceed towards the other end. Fix up the cross tees/channels to every runner joints to have stability while leveling. Approved gypsum board/sheets cut to correct sizes shall then be placed on the runner, starting from the center of the width and work side wards. Connect all cross tees and put on the approved spring type hold down clip/pins as per drawing. Holes if required to be provided in gypsum board sheets shall be drilled and on no account holes shall be punched. Lock the runner tees and tiles with hold down clips/pins as required. Wherever grouting for frame work, suspenders etc. is required to be done in masonry walls columns/beams etc., the same shall be done after the entire frame work is properly leveled.

The contractor shall take into consideration all wastage in the gypsum board. Sheets, grid system frame work/pressed steel frame work, G.I. suspenders, screws, nuts, bolts, washers etc. required for fixing gypsum board. Sheet false ceiling and vertical masking while quoting his rates. Gypsum board sheet false ceiling and vertical masking shall be fixed to pressed steel frame grid system by means of spring clip (brass counter sunk machine screws in case of masking of approved size, make and at approved spacing or as shown in drawing or as instructed. After fixing the gypsum board sheets, all holes of screws etc. shall be filled with approved putty, leveled with the gypsum board sheets and sand papered, so that no sign of screw is visible on the. Sheets. For all the. Sheets false ceiling and vertical masking work, the sheet of required size and shape shall be cut as per approved panel size shown in drawing and fixed on pressed steel frame in the best workman like manner.

Trap doors/lighting recesses/troughs of approved size and shape with approved matching work, shall be provided in the false ceiling and vertical masking at the specified places. Any damage done to the walls/columns/ceilings/plasters/floors etc. shall be made good to the original condition at his own cost. The contractor shall not be entitled for any extra cost on this account. During the execution of this work, the contractor shall take all the precautions to prevent damage to the painted surface, plaster, floor tiles, doors etc. Contractor should specifically note that the area where the false ceiling is required to be provided will be in advance stage of completion with various finishing items such as painting, floor polishing etc. Any damage to these finishes will have to be made good by him at no extra cost to the Department. No person other than workman employed by the false ceiling contractor shall be permitted access to any area over which the sheeting is being laid. The contractor should take protective measures during the progress of work. Cat ladders or roof boards, scaffolding etc. should invariably be used by men working on the roof/false ceiling/masking etc.

Necessary door openings of hinged type of suitable sizes has to be provided with a suitable frame work for control valves and for access above false ceiling / AC duct boxing at no extra cost. Joints at horizontal, vertical and inclined surfaces shall be suitably strengthened with additional G.I. frame work as required. Finally the boards are jointed and finished so as to have a flush look which includes fling and finish gin the tapered and square edges of the board with a jointing compound, paper tape and two coats of primer suitable for gyp board (all as per recommended practices of manufacturer). Then, the finished Gyp board has to be painted with 2 coats of acrylic emulsion matt finish paint of approved color and make. Fiber wool should be used as per requirement. Details of A.C. grills, diffusers, and recessed type electrical fittings to be erected in false ceiling will be as per specifications and as shown in drawings.

Mode of measurement & Payment:

Measurements will be made on flat plan area basis in Sq.m calculated to 3 places of decimal. Length and breadth shall be measured corrected to a cm. No deduction shall be made for cutouts made for A.C. grills, diffusers, electrical fittings, smoke detectors etc.

The rate shall include providing all materials, erecting, suspending, G.I. grid work, jointing the boards, providing required cutouts and open able doors and painting including providing necessary fittings and fixtures etc. complete as per the specifications and all other activities related to the completion of the above job. Also nothing extra shall be payable on account of any strengthening of the supporting suspension system for the false ceiling, around the openings in the false ceiling by using additional hangers, fasteners, runners, cross tees, etc.

Schedule - C (Technical Specification Plumbing)

General Technical Specification for Plumbing Work along with Sanitary & CP Fittings.

1.0 GENERAL

The work shall be carried out in the accordance with the drawings and design as would be issued to the Contractor by the Design Consultant duly signed and stamped by him. The Contractor shall not take cognizance of any drawings, designs, specifications etc. not bearing Design Consultant signature and stamp. Similarly, the Contractor shall not take cognizance of instructions given by any other Authority except the instructions given by the Client's Representative in writing.
The work shall be executed and measured as per metric dimensions given in the Bill of Quantities, drawings etc.
The Contractor shall acquaint himself fully with the partial provisions for supports that may or may not be available in the structure and if are available then utilize them to the extent possible. In any case the Contractor shall provide all the supports regardless of provisions that they have been already made. Nothing extra shall be payable for situations where insert plates (for supports) are not available or are not useful.
Shop coats of paint that may be damaged during shipment or erection shall be cleaned off with mineral spirits, wire brushed and spot primed over the affected areas, then coated with paint to match the finish over the adjoining shop painted surface.
The Contractor shall protect / handle the material carefully and if any damage occurs while handling by the Contractor then the sole responsibility shall be of the Contractor. Such damages shall be rectified / recovered by the Contractor at no extra cost whatsoever.
The Contractor shall, within twenty-one (21) days of receipt of the Notice of Award for the Project, where applicable, complete the submission of shop drawings to the Client's Representative for approval by the Design Consultants in order to conform to the contract schedule.
Measurements: All measurements shall be taken in accordance with relevant IS codes, unless otherwise specified in BOQ

2.0 APPLICABLE CODES AND STANDARDS:

All equipment, supply, erection, testing and commissioning shall comply with the requirements of Indian Standards and code of practice given below as amended up to the date of submission of Tender. All equipment and material being supplied shall meet the requirements of BIS and other relevant standard and codes.
Plumbing Works:

Vitreous Chinaware - IS: 2556 - 1974 (Part - I)

- IS: 2556 - 1981 (Part - II)

- IS: 2556 - 2556 (Part - III)

Ball Valve - IS: 1703 - 1977

Cistern Brackets - IS: 775 - 1970

Toilet Seat Cover - IS: 2548 - 1983

Vitreous China Cistern - IS: 2326 - 1987 Sand Cast Iron Pipes and Fittings - IS: 1729 - 1979
Spun Cast Iron Pipes and Fittings - IS: 3989 - 1984 GI Pipes - IS: 1239 - 1979
Galvanizing for GI Pipes - IS: 4736 – 1986
M.S. pipe - IS: 1239-1979
Pipe Threads - IS: 554 - 1985
Malleable Iron Fittings - IS: 1879 - 1987
Cast Iron Sluice Valves - IS: 780 - 1984
Full Way Valves - IS: 778 - 1984
Brass Ferrule - IS: 2692 - 1978
Stone Ware Gully Trap - IS: 651 - 1980
RCC Pipes - IS: 458 - 1971
Cast Iron Class LA Pipes - IS: 1536 - 1989
Cast (Spun) Iron Fittings - IS: 1538 - 1976
Pig Lead - IS: 782 - 1966
Induction Motors - IS: 4691
Code for Measurements - IS: 1200 UPVC Pipes and Fittings
(SWR Drainage System) - IS: 4985-1983
Specification for Caulking Lead - IS: 782
Code of Practice for lying of concrete - IS: 783 Color Code - IS: 2379
CPVC Pipe upto 50 mm - ASTM D 2846
CPVC Corzan Sch 80 ASTM F441
UPVC ASTM D 1785 / IS 554

Non return valve - IS 554

3.0 QUALITY ASSURANCE AND QUALITY CONTROL:

The work shall conform to high standard of design and workmanship, shall be structurally sound and aesthetically pleasing. Quality standards prescribed shall form the backbone for the quality assurance and quality control system.

At the site, the Contractor shall arrange the materials and their stacking/ storage in appropriate manner to ensure the quality. Contractor shall provide equipment and manpower to test continuously the quality of material, assemblies etc. as directed by the Client's Representative. The test shall be conducted continuously and the result of tests maintained. In addition the Contractor shall keep appropriate tools and equipment for checking alignments, levels, slopes and evenness of surface.

The Client's Representative shall be free to carry out such tests as may be decided by him at this sole direction, from time to time, in addition to those specified in this Document. The Contractor shall provide the samples and labor for collecting the samples. Nothing extra shall be payable to the Contractor for samples or for the collection of the samples.

The test shall be conducted at Standard Laboratory selected by Client's Representative. Contractor shall keep the necessary testing equipment such as hydraulic testing machine, smoke testing machine, gauges and other necessary equipment required.

The Contractor shall transport the samples to the laboratory as per client's instruction.Testing charges shall be borne by the Contractor.

The test results shall be binding on the Contractor.

4.0 SANITARY FIXTURES & C.P. FITTINGS:

Scope

Work under this section shall limited up to receiving, unloading, shifting, testing, safe keeping, storing, installing & commissioning etc. and all labour as necessary as required to completely install all sanitary fixtures, brass and chromium plated fittings and accessories as required by the drawings and specified hereinafter or given in the Bill of Quantities.
All the sanitary fixtures & C.P. fittings shall be check as per the specified / approved catalogue no. of specified manufacturer as per selected.
General Requirements

All fixtures and fittings shall be fixed with all such accessories as are required to complete the item in working condition whether specifically mentioned or not in the Bill of Quantities, specifications, drawings or not.
All fixtures and accessories shall be fixed in accordance with a set pattern matching the tiles or interior finish as per architectural design requirements. Wherever necessary the fittings shall be centered to dimensions and pattern desired.
Fixing screws shall be half round head chromium plated brass / GI with C.P. washers wherever required as per directions of Client's Representative.
All fittings and fixtures shall be fixed in a neat workmanlike manner true to levels and heights shows on the drawings and in accordance with the manufacturer's recommendations. Care shall be taken to fix all inlet and outlet pipes at correct positions. Faulty locations shall be made good and any damage to the finished floor, wall or ceiling surfaces shall be made good at Contractors cost.
All fixtures of the similar materials shall be by the same manufacturers. All fitting shall be of the chromium plated materials.

Without restricting to the generally of the foregoing the sanitary fixtures shall include all sanitary fixtures, C.P. fittings and accessories etc. necessary and required for the building.
Whether specifically mentioned or not all fixtures and appliances shall be provided with approved fixing devices, nuts, bolts, screws, and hangers as required. These supports shall have the necessary adjustment to allow for irregularities in the building area construction.
For the installation of the CP fittings, Teflon tape shall be used.

4.1 EUROPEAN W.C

4.1.1. European W.C. of glazed vitreous China shall be wash down, single or double siphonic

type, floor or wall mounted set (P trap or S Trap), flushed by means of concealed dual flush tank as specified in Bill of Quantities. Flush pipe/bend shall be connected to the W.C. by means of suitable rubber adopter. Wall hung W.C. shall be supported by C.I. floor mounted chair / Anchor Fastener.

4.1.2. Each W.C. quiet close seat cover shall be so fixed that it remains absolutely stationary in vertical position without falling down on the W.C. Seat cover shall be of approved color & type solid plastic, elongated open front with heavy duty hinges. Exposed fixture trims shall be Chrome plated, and trims of similar function shall be by the same manufacturer.

4.1.3.
ual concealed Flush tanks shall be of the best approved quality procurable within built
C.P. control valve and C.P. flush pipe.

4.1.4. The flush pipe/bend shall be connected to the WC by means of a suitable rubber adopter.

4.1.5. Alternatively, if flushing cistern to be used shall confirm to the requirements of IS: 774-1971. High level cisterns shall be of cast iron unless otherwise specified. Low level cistern shall be of the same material as the water closet or as instructed by the Owner/Architect/ Consultant. The cisterns shall be mosquito proof & shall fulfill the requirements of the local Authority.

4.1.6. The levels of the WC should be checked by placing strip level on the W.C. W.C. should be tested on completion of fixing by putting small paper balls and flushing out. If all the paper balls are not flushed out, the fixing will have to be rectified / re-aligned.

4.2 WASH BASINS:

4.2.1. Wash basin shall be of approved color & type vitreous china of best quality manufactured by an approved firm and sizes as specified in the Bill of Quantities.
Wash basin shall be of required size, shape, type as specified in detailed BOQ shall be

4.2.2. supported on a pair of C.I. brackets of approved design.

4.2.3. Wash basin shall be fixed at proper location and height and truly horizontal as shown on drawing or as directed by Client's Representative.

4.3 URINALS:

4.3.1. Half stall wall hung urinals of glazed vitreous china shall be provided with 15mm dia, C.P. brass spreader, 32mm dia C.P. domical waste and C.P. cast brass P Shaped trap (if in built water sealed provision not provided) with pipe and wall flange and shall fixed to wall by one C.I. bracket and two C.I. clips as recommended by manufacturers complete as directed by the Client's Representative.

4.3.2. Urinals shall be flushed by means of "NO-TOUCH" infrared operated flush valves.

4.3.3. Waste pipes for urinals shall be any one of the given material as directed by the Client's Representative:
G.I. Pipes

Rigid PVC/High density polyethylene.

4.3.4. Waste pipes may be exposed on wall or concealed in chase as directed by the Client's Representative.

4.4 KITCHEN /PANTRY/ LAB SINKS:

4.4.1. Sinks shall be of stainless steel or material as specified in the Bill of Quantities/Drawings.

4.4.2. Each sink shall be provided with R. S. brackets and clips and securely fixed. Counter top sinks shall be fixed with suitable angle iron clips or brackets as recommended by the manufacturer. Each sink shall be provided with 40 mm dia Chromium Plated waste with chain and plug or P.V.C. waste with Escutcheon plates. Fixing shall be done as directed by Client's Representative.

4.4.3. Supply fittings for sinks shall be C.P swinging type sink cock. all as specified in the Bill of Quantities/Drawings.

4.4.4. Each sink shall be provided with hot & cold CP mixer with approved type of a neck spout or individual taps, if specified in the detailed B.O.Q.

4.5 FLUSH TANK

4.5.1. Low level flushing cistern (exposed or concealed) shall be providing for WC in specified toilets.

4.5.2. Contractor shall install cistern in accordance to the manufacturer's specification to the satisfaction of the Owner Site Representative.

4.6 ANGLE COCK

1.1.1. C.P. Angle cock with C.P. wall flange with 15mm C.P. connector pipes for wash hand basin as described in Bill of quantity.

4.7 WASH BASIN MIXER/ PILLAR COCK

1.1.1. Wash basin shall be provided with C.P. Single Lever Basin Mixer / single lever prismatic type

auto stop pillar cock with rubber plug.

1.1.2. C.P. Angle cock with C.P. wall flange with 15mm C.P. connector pipes for wash hand basin as described in Bill of quantity.

4.8 SHOWER SET

1.1.1. Shower set shall comprise of two CP brass concealed stop cocks, four/five way auto-diverter, adjustable type over-head shower with CP shower arm , all with CP wall flangesof approved quality all as specified in the Schedule of Quantities.

1.1.2. Bath spout, hand showers and pop up wastes shall also be provided wherever, specified.

1.1.3. Wall flanges shall be kept clear off the finished wall. Wall flanges embedded in the

finishing shall not be accepted.

4.9 BIB COCK

1.1.1. C.P. Bib cock long or short with C.P. wall flange with 15mm C.P. connector pipes for wash Area as described in Bill of quantity.

4.10 2-WAY BIB COCK

1.1.1. C.P. 2-Way Bib cock long or short with C.P. wall flange with 15mm C.P. connector pipes for Connecting Health Faucet as described in Bill of quantity.

4.11 TOILET PAPER HOLDER

1.1.1. Toilet paper holder shall be Indian make of size, shape and type as mentioned in Bill of Quantities.
1.1.2. Indian make paper holder shall be fixed in wall and set in cement mortar 1:2 (1 cement: 2 Coarse Sand) and fixed as per location given by the Architect in their tile pattern.

4.12 STOP COCK

1.1.1. C.P. Stop cock with C.P. wall flange with 15mm as described in Bill of quantity.

1.1.2. Wall flanges shall be kept clear off the finished wall. Wall flanges embedded in the finishing shall not be accepted.

4.13 TOILET REQUIESTS
1.1.1. All toilets requests i.e. C.P. brass toilet paper, C.P. brass tower rail, C.P. brass twin coat hook, C.P. brass liquid soap container, C.P. brass air purifier, C.P. brass towel ring, SS soap dish, Grab bars, C.P. brass towel racks, Bib cock & health faucets, angle valve, Long body bib cock etc.
1.1.2. All C.P. accessories shall be fixed with C.P. brass half round head screws and cup washers using raw plugs only as directed.
1.1.3. Rate for providing and fixing of sanitary fixtures, accessories, urinal partitions shall include all items and operations stated in the respective specifications and Bill of Quantities, andnothing extra is payable.
1.1.4. Rates for all items under specifications para above shall be inclusive of cutting holes and chases and making good the same, C.P. screws, nuts, bolts and any fixing arrangement required.

5.0 INTERNAL WATER SUPPLY:

Scope

Work under this section consists of furnishing all labor, materials equipment and appliances necessary and required to completely install the water supply system as required by the drawings, specified hereinafter and given in the bill of quantities.

Without restricting to the generality of the foregoing, the water supply system shall include the following:-
Pipe protection & painting. (For naming and flow direction).Connections to all plumbing fixtures, tanks, pump etc.

Providing hot water pipe lines and supply point with isolation valves, wherever required.Control valves, masonry chambers & other appurtenances.

Connections to all plumbing fixtures, tanks and appliances. Excavation & refilling of the pipe trenches, whenever necessary.

Internal water supply piping inside the toilets shaft/plant room/terrace.Testing all line and fixtures as specified.

General Requirements
All materials shall be new of the best quality and shall be furnished, delivered, erected, connected and finished in every detail conforming to specifications and subject to the approval of Client's Representative.
Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner.
Short or long bends shall be used on all main pipe lines as far as possible. Use of elbows shall be restricted for short connections.
As far as possible all bends shall be formed by means of hydraulic pipe bending machine for pipes up to 65mm dia.
Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc. and shall be selected and arranged so as to fit properly into the allocated building space.
Pipes shall be securely fixed to walls by suitable clamps at intervals specified.
Valves and other appurtenances shall be located to provide easy accessibility for operation, maintenance and repairs.
Connection between dissimilar materials. (E.g., GI to CPVC pipe joint)All G.I. pipes jointing shall be with Teflon tap wrapping.

Drawings illustrating block out and penetration of pipes in the wall/floor/slab.

Unions: Contractor shall provide adequate no. of unions on all pipes to enable dismantling later and for servicing. Union shall be provided near each gunmetal valve.

1.0 CPVC Pipe

1.1.1. Pipes & Fittings Internal concealed plumbing-

The pipe & fittings shall confirm to ASTM D 2846. All the pipes & fittings shall be joined by the solvent cement confirming to ASTM F 493

Exposed Plumbing-

The pipe & fittings shall confirm to ASTM D 1785. All the pipes & fittings shall be joined by the solvent cement confirming to ASTM D 2564.

1.1.2. Cutting & Jointing

The pipes shall be inspected at site before use to ascertain that they confirm the specification. The defective pipes shall be rejected. Proper jointing shall be done measuring the pipe length accurately & make a small mark. Ensure that the pipe & fittings are size compatible. Pipe shall be easily cut with a wheel type plastic pipe cutter or hacksaw blade. Optimal bonding area within a joint shall be provided for cutting tubing as squarely as possible.

Pipe & fittings shall be free from burrs for proper contact between tube & fittings duringassembly. Deburring tool, pocket knife or file is suitable for this. A slight bevel on the end of the tubing shall be provided for easy entry of the tubing into the fitting socket.

Fittings sockets & tubing end shall be free from wipe dirt & moisture. The tubing should make contact with the socket wall 1/3 to 2/3 of the way into the fitting socket.

The CPVC cement or an all-purpose cement shall confirm to ASTM F 493. In jointing a pipe, apply optimum, even coat of cement to the pipe end. Use the same applicator without additional cement to apply a thin coat inside the filling socket.

Immediately insert the tubing the fitting socket, rotate the tube ¼ to ½ turn while inserting. This motion ensures & even distribution of cement within the joint. Hold the assembly for proper joint set up. Care should be taken that all pipes & fittings are properly aligned & jointed so as to make the joints completely water tight and pipes are kept at all times free dust and dirt during the fixing.

Jointing assembly shall be left for optimum time 10 to 20 minutes according to the environmental temperature & relative humidity.

Numbers of joints per liter of cement by pipe size

Dia. of Pipe		App. Nos of joints
(In.)	(mm)	
½”	15	1200
¾”	20	750
1”	25	500
1 ¼”	32	450
s1 ½”	40	325
2”	50	225

1.1.1. Installation

Tender drawings indicate schematically the size and location of pipes. The Contractor on the award of the work, shall prepare detailed coordinated with other trades working drawings, showing the cross- section, longitudinal sections, details of fittings, locations of isolating and control valves, drain valves and all pipe support, structural supports. He must keep in view the specific openings in buildings and other structures through which pipes are designed to pass.
Safety precautions shall be taken.

Systems shall be installed in a good & workmanlike manner consistent with normal industry standards & in conformance with all local plumbing & building code requirements. Failure to proper installation practices, procedures or techniques can result in system failure, property damage or personal injury.
Pipes & fittings shall be used for their intended purpose as defined by local plumbing & building codes & the applicable ASTM standards.

1.1.2. Testing

Completed piping shall be checked with hydraulic pressure test at a pressure equivalent to 1.5 times of maximum working pressure.

1.1.3. Measurements

The length above ground shall be measured in running meter correct to a cm for the finished work, which shall include CPVC pipe and CPVC fittings such as bends, tees, elbows, reducers, crosses, plugs, sockets, nipples and nuts, unions etc. Deductions for length of valves shall be made. Rate quoted shall be inclusive of all fittings, clamps, cutting holes chased and making good the same and all items mentioned in the specifications and Bill of Quantities.
Quantity shall be of the dia (nominal bore) specified in the description of the item. Galvanizing shall confirm to IS:4736.
The pipes shall be clearly finished, well galvanized in and out and free from cracks, surface flow, laminations and other defects. All screw threads shall be clean and well cut. The ends shall be cut cleanly and square with axis of the tube.
All screw tubes shall have pipe threads conforming to the requirements of IS:544-1955 (or revised).

2.0 Insulation on pipes

Insulation material for Pipe insulation shall be closed cell cross linked polyurethane foam. Thermal conductivity shall not exceed 0.020 W/moK at an average temperature of 10oC.
Density of material shall not be less than 36 kg/m3.

The product shall have temperature range of –110 oC to 110oC.

The insulation shall have fire performance such that it passes minimum CLASS 1 as per BS476 part 7 for surface spread of flame. Water absorption shall not exceed 1.9% of volume as per Standard reference DIN 52615.
Thickness of the insulation shall be as specified for the individual application. Each lot of insulation material delivered at site shall be accompanied with manufacturer test certificate for thermal conductivity values as per the standards and specifications. Samples of insulation material from each lot delivered at site may be selected by Engineer in charge and got tested for thermal conductivity and density at Contractor's cost in a reputed laboratory, if required. All joints shall be sealed properly with adhesive, which shall provide similar vapor barrier as the original insulating material.
All hot water piping shall be insulated in the manner specified herein. Before applying insulation, all pipe shall be brushed and cleaned.
Thermal insulation shall be applied as specified in drawings or schedule of quantity

3.0 VALVES:

1.1.1. Ball Valve:

The three-piece ball valve shall be of high-pressure class and shall be confirm to IS:1703 of sizes as specified. The nominal size of a ball valve shall be that corresponding to the size of the pipe to which it is fixed. The ball shall be of brass or gun metal as specified and the float shall be of copper sheet.

1.1.2. Ball float Valve:

The minimum gauge of copper sheet used for making the float shall be 0.45mm for float up to 115mm dia and 0.55mm for float exceeding 115mm dia and shall be special in shape. The valve shall be constructed to permit replacing without console of the valve body from the valve line and the system shall not blow out under pressure.
The jointing of the float shall be made by efficiently burnished, lapped and soldered seam or by bracing. Plastic float may also be used if specified. The body of ball valve when assembled in working conditions with the float immersed to not more than half of its volume shall remain closed against a test pressure of 10.5 Kg/Sq.cm. All ball valves shall be capable of withstanding a pressure of 5 Kg/Sq.cm.
The ball valve shall generally conform to IS specifications No. 1703-1962.

1.1.3. Butterfly Valves:

All the isolation valve 50mm and above on the equipment and water lines, where specified or shown on drawings shall be wafer type butterfly valves. They shall be designed to fit without gaskets, the water tight seal being obtained by EPDM seat projection at the faces compressed between the flanges. The valves shall be supplied inclusive of M.S. pipe flanges and high tensile steel bolts of dimensions recommended by suppliers of valves. The valves shall comply with following specifications:

a) Test Pressure : Body 24 Bar, Seat 16 Bar
b) Valve Component : Material of Construction
i) Disc: Delrin or Epoxy powder coated high duty iron, ASTM A536
ii) Stem : Stainless Steel or carbon steel – IS:1570, Part-II.
iii) Seat: EPDM
iv) Hand Lever : Cast Iron IS2062 (Mechanical Memory Stop)
v) Bearings : PTFE
vi) Primary Seal : Reinforced PTEE slide bearings
vii) Temperature : 80 Degree C (max.)Installation:

Valve shall be installed in a manner that allows future removal and service of the valve.Packing and gasket shall not contain asbestos.

The valve shall be of the same size as the pipe to which they are install.

Valve above 150mm diameter shall be self- locking warm gear type water proof and protory lubricated.

Provide chain operators with chain cleats for all valves more than 2.4 meter above floor.Check valves / Non-Return Valves:

All non-returnvalves shall be provided as shown in the drawings conforming to relevant IS554 and in accordance with the followingspecifications. :

Size	Construction	Ends
Upto 50 mm.	Gun metal	Screwed
65 mm and above	Gun metal/Brass	Flanged

Non-return valves shall be of approved make. Swinging type non-return valve shall be used and tested to 20Kg/Sq.cm pressure as per specified in BOQ.

1.1.5. Pressure reducing valve

Pressure reducing and regulating valve with balanced seat, outlet setting from 10 kg/cm2. Auto break up type PRV to be used. Which works in case of of pipe line burst, then PRV will shut off automatically. Valve should have facility of pressure gauge fixing and setting pressure as required.

1.1.6. Strainer:

"Y" strainers up to 50mm shall be of gunmetal and above 50mm shall be of cast iron body. Strainers shall incorporate a removable bronze screen with 3.175mm (1/8") perforations and a

permanent magnet. Strainers shall be provided with flanges at both inlet and outlet. They shall be designed to enable blowing out of accumulated dirt and facilitate dirt and facilitate removal and replacement of the screen without disconnection of the main pipe.
All strainers shall be provided with equal size isolating "Slim Seal" butterfly valves of approved brands as shown in drawings so that the strainer may be cleaned without draining the system

1.1.7. Flexible Coupling:

Flexible coupling shall be made up of EPC rubber with necessary flange. It shall sustain the pressure upto 16 kg/sq.cm. & maximum pressure of 95º.

1.1.8. Air release valve

Automatic Air release valves shall be provided in all high points in the system to prevent air locks as shown on the drawings or directed by Client's Representatives.
Testing:

All valves shall be tested while installed in pipe by hydrostatic pressure of 1.5 time of the working pressure 7.5 Kg/Sq.cm whichever is more.

1.1.9. Water meter

Water meter assembly will include following items
BMS integrated compatible Cold and Hot water flow measuring meter.
Flow water should measure in KL, (At particular area water should measure flow in Ltr).Ball valve

to isolate water meter.

Accessories like, Union, Flanges, pressure gauge etc.

1.1.10. Non-contact water level sensor.

Ceiling mounted water level sensor based on Radar frequency to measure water levels of tanks. Water level sensor should be complete water proof, Non-contact, Maintenance free, most precise reading and able to work in ambient temperatures.
Water level sensor shall be capable to integrate with Building Management system (BMS) to measure water levels of tanks.
Following technical are technical details

Water levels sensor shall be installing and set up until proper result achieve will be in contractor scope. Minimum 3 years warranty of product should be of sensor.

1.1.11. Measurements:

All valves as mentioned in Bill of Quantities shall be measured by numbers and shall include all items mentioned in the Bill of Quantities.

6.0 SOIL, WASTE, VENT AND RAIN WATER PIPES

Work under this section shall consist of furnishing all labor, materials, equipment and appliances necessary and required to completely install all soil, waste, vent and rainwater pipes as required by the drawings, specified hereinafter and given in the Bill of Quantities.
Without restricting to the generality of the foregoing, the soil, waste, vent and rainwater pipes system shall include the followings: -
UPVC vertical and horizontal soil, waste and vent pipes, rainwater pipes and fittings, joints clamps and connections to fixtures.
Floor traps, floor drain clean out plugs, inlet fittings and rainwater roof drain, area/local drains, trench drain.

Waste pipes connections from all fixtures e.g. Wash basins, sinks, kitchen equipment.Testing of all pipes.

Connection of main. General Requirements

All materials shall be new of the best quality conforming to specifications and subject to the approval of Client's Representative.
Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner.
Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.
Pipes shall be securely fixed to walls by suitable clamps at intervals specified.

Access doors for fittings and cleanouts shall be so located that they are easily accessible for repair and maintenance.
All works shall be executed as directed by Client's Representative.

1.1.1. uPVC SWR Pipes

The pipes shall be round and shall be supplied in straight lengths with socket ends. The internal and external surfaces of pipes shall be smooth, clean, and free from grooving and other defects. The ends shall be cleanly cut and square with the axis of the pipe. The pipes shall be designated by external diameter and shall conform to IS:4985-1981.

Outer Dia	Pressure	Inner Dia	Weight/Mt
(mm)	(Kg/cm2)	(mm)	(Kg.)
110	4	104.5	1.315
125	4	118.7	1.712
140	4	133.0	2.131
160	4	152.0	2.783
180	4	175.9	3.560
200	2	190.1	4.526
225	4	213.8	5.480

- uPVC SWR Fittings:

Fittings shall be of the same make as that of pipes, injection molded and shall conform to Indian Standard.

Laying and Jointing

The pipes shall be laid and clamped to wooden plugs fixed above the surface of the wall. Alternatively plastic clamps of suitable designs shall be preferred. Provision shall be made for the effect of thermal movement by not gripping or disturbing the pipe at supports between the anchors for suspended pipes. The supports shall allow the repeated movements to take place without abrasion.

Jointing for UPVC pipes shall be made by means of solvent cement for horizontal lines and `O' rubber ring for vertical line. The type of joint shall be used as per site conditions/direction of the Client's Representative. Where UPVC pipes are to be used for rain water pipes, the pipe shall be finished with G.I. adopter for insertion in the R.C.C. slab for a water proof joint complete as directed by Client's Representative.

Supports

UPVC pipes require supports at close intervals. Recommended support spacing for unplasticised PVC pipes is 1400 mm for pipes 50 mm dia and above. Pipes shall be aligned properly before fixing them on the wooden plugs with clamps. Even if the wooden plugs are fixed using a plumb line, pipe shall also be checked for its alignment before clamping, piping shall be properly supported on, or suspended from clamps, hangers as specified and as required. The Contractor shall adequately design all the brackets, saddles, anchors, clamps and hangers and be responsible for their structural sufficiency. Pipe supports shall be primer coated with rustpreventive paint.

Repairs

While temporary or emergency repairs may be made to the damaged pipes, permanent repairs should be made by replacement of the damaged section. If any split or chip out occurs in the wall of the pipe, a short piece of pipe of sufficient length to cover the damaged portion of the pipe is cut. The sleeve is cut longitudinally and heated sufficiently to soften it so that it may be slipped over the damaged hard pipe.

Testing

All lengths of PVC rain water pipes shall be fully tested for water tightness by means of water test maintained for not less than 30 minutes. All pipes shall be subjected to a test pressure of at least 1.5-meter head of water head. The test pressure shall, however, not exceed 6-meter head atany point. The pipes shall be plugged preferably with standard design plugs with rubber plugs on both ends. The upper end shall, however, be connected to a pipe for filling with water and getting the required head.

The pipes shall be confirmed to IS 13592 with latest amendment.

Nominal Diameter	Mean Outside Diameter of the Pipe		Outside Diameter of the pipe at any Point		Wall Thickness	
	Min	Max	Min	Max	Min	Max
75 A	75.00	75.30	74.10	75.90	1.80	2.20
75 B	75.00	75.30	74.10	75.90	3.20	3.80
90 A	90.00	90.30	88.90	91.20	1.90	2.30
90 B	90.00	90.30	88.90	91.20	3.20	3.80
110 A	110.00	110.40	108.60	111.40	2.20	2.70
110 B	110. 00	110.40	108.60	111.40	3.20	3.80
160 A	160.00	160.50	158.00	162.00	3.20	3.80
160 B	160.00	160.50	158.00	162.00	4.20	4.80

Laying and Jointing:

The pipes shall be laid and clamped to wooden plugs fixed above the surface of the wall. Alternatively, plastic clamps of suitable designs shall be preferred. Provision shall be made for the effect of thermal movement by not gripping or disturbing the pipe at supports between the anchors for suspended pipes. The supports shall allow the repeated movements to take place without abrasion.
Jointing for uPVC SWR pipes shall be made by

i. Using solvent cement for horizontal lines –

The pipes shall be inspected at site before use to ascertain that they confirm the specification. The defective pipes shall be rejected. Proper jointing shall be done by applying solvent cement on plain end of the pipe & immediately insert the pipe into the other self-socket end for high degree of accurate diameters.
Pipe & fittings shall be free from burrs for proper contact between tube & fittings duringassembly. Fittings sockets & tubing end shall be free from wipe dirt & moisture.

ii. ‘O’ rubber (EPDM) ring for vertical line. –

The pipes shall be inspected at site before use to ascertain that they confirm the specification. The defective pipes shall be rejected. Proper jointing shall be done by inserting pipe into the socket without seal ring in place & mark pipe when it is fully inserted.

Place the seal ring in groove of socket ensuring that seal is correct way round. Proper measures shall be taken to enable easy fitting. Apply jointing lubricant to the chamfer & the end of the spigot of the pipe of fitting only.
Care should be taken that all pipes & fittings are properly aligned & jointed so as to make the joints completely water tight and pipes are kept at all times free dust and dirt during the fixing.
Where uPVC SWR pipes are to be used for drainage, the pipe shall be finished with G.I. adopter for insertion in the R.C.C. slab for a water proof joint complete in all respect.
Installation:

uPVC SWR exposed/concealed pipes require supports at close intervals. Recommended support spacing for uPVC SWR pipes is 1400 mm for pipes 50 mm dia and above. Pipes shall be aligned properly before fixing them on the wooden plugs with clamps. Even if the wooden plugs are fixed using a plumb line, pipe shall also be checked for its alignment before clamping, piping shall be properly supported on, or suspended from clamps, hangers as specified and as required. The Contractor shall adequately design all the brackets, saddles, anchors, clamps and hangers and be responsible for their structural sufficiency. Pipe supports shall be primer coated with rust preventive paint.

For installation of pipe in sunken / raised floor concrete support on floor, full concrete incasing in M15 grade shall be provided. Care shall be taken for proper alignment.
While temporary or emergency repairs may be made to the damaged pipes, permanent repairs should be made by replacement of the damaged section. If any split or chip out occurs in the wall of the pipe, a short piece of pipe of sufficient length to cover the damaged portion of the pipe is cut. The sleeve is cut longitudinally and heated sufficiently to soften it so that it may be slipped over the damaged hard pipe.
Testing:
All lengths of uPVC SWR pipes shall be fully tested for water tightness by means of water test maintained for not less than 30 minutes. All pipes shall be subjected to a test pressure of at least 1.5 times of water head. The test pressure shall, however, not exceed 6 meter head at any point. The pipes shall be plugged preferably with standard design plugs with rubber plugs on both ends. The upper end shall, however, be connected to a pipe for filling with water and getting the required head.

1.1.2. Waste Pipe from Appliances:

Waste pipe from appliances e.g. wash basins, sinks, urinals, chrome plate where seen water coolers shall be of PVC Pipe 6 Kg/cm2.
All pipes shall be fixed in gradient towards the outfalls of drains. Pipes inside a toilet room shall be in chase unless otherwise shown on drawings. Where required pipes may be run at ceiling level in suitable gradient and supported on structural clamps. Spacing for clamps for such pipes shall be as as per manufacture recommendation
Painting / Cleaning:

Soil, waste vent and rainwater pipes in exposed location, in shafts and pipe spaces shall be thoroughly cleaned to remove dirt, rust and other contamination, and painted with two or more coats of synthetic enamel paint to give an even shade.
Paint shall be of approved quality and shade, where directed pipes shall be painted in accordance with approved pipe color code.
Waste pipes in chase shall be thoroughly cleaned to remove dirt, rust and other contamination, and painted with two coats of bitumen paint, covered with polythene tape and a final coat of bitumen paint. Exposed pipes shall be painted with two or more coats of synthetic enamel paint.
C.I. soil and waste pipes below ground and covered in cement concrete shall not be painted.

1.1.4. Measurements:

C.I./ UPVC/ G.I. waste/soil, waste, vent and rain water pipes shall be measured over all along the centre line correct to a centimeter including all fittings along its length. The rate for these pipes shall be inclusive of all fittings, holder bat clamps, lead caulked joint for C.I. and cement joints for UPVC and all other items described in the Bill or Quantities. The portion of the pipe within the collar for C.I/UPVC pipe at the joint shall not be included in the length of the pipe work.

1.1.5. Painting / Cleaning:

Acid waste pipes in exposed location, in shafts and pipe spaces shall be thoroughly cleaned to remove dirt, rust and other contamination, and painted with two or more coats of synthetic enamel paint to give an even shade.
Paint shall be of approved quality and shade, where directed pipes shall be painted in accordance with approved pipe color code.
Waste pipes in chase shall be thoroughly cleaned to remove dirt, rust and other contamination, and painted with two coats of bitumen paint, covered with polythene tape and a final coat of bitumen paint. Exposed pipes shall be painted with two or more coats of synthetic enamel paint.
C.I. soil and waste pipes below ground and covered in cement concrete shall not be painted.

1.1.6. Measurements:

C.I./ UPVC/ G.I. waste/soil, waste, vent and rain water pipes shall be measured over all along the center line correct to a centimeter including all fittings along its length. The rate for these pipes shall be inclusive of all fittings, holder bat clamps, lead caulked joint for C.I. and cement joints for UPVC and all other items described in the Bill or Quantities. The portion of the pipe within the collar for C.I/UPVC pipe at the joint shall not be included in the length of the pipe work.

1.1.7. TRAPS:

- Nahani Trap or Floor Traps:

Nahani traps or floor traps shall be cast iron, deep seal with an effective seal of 50 mm. The trap and waste pipes shall be set in cement concrete blocks firmly supported on the structural floor. The blocks shall be in 1:2:3 mix (1 cement: 2 coarse sand: 4 stone aggregate 20 mm nominal size) mixed with water proof compound and extended to 40 mm below finished floor level. Contractor shall provide all necessary shuttering and centering for the blocks. Size of the block shall be 30 x

30 cms of the required depth. The trap shall be installed at lowest point ensure no pounding occurs at perimeters of the drain.

- Floor Trap Inlet

Toilet traps and connections shall ensure free and silent flow of discharging water. Where specified, the Contractor shall provide a special type galvanized iron inlet fitting without or with one, two or three inlet sockets to receive the waste pipe. Joint between waste and fitting shall be connected to a C.I 'P' or 'S' trap with at least 50mm seal (Hopper and traps shall be paid for separately). Floor trap inlet fittings and the trap shall be set in cement concrete blocks.

- Stainless Steel Cockroaches Trap:

Floor and Urinal traps shall be provided with square or round Stainless steel cockroaches trap grating as approved by Client's Representative with rim, of approved design and shape.

- P trap:

CP cast brass P shaped trap with pipe and wall flange to be fix below Wash basin, Sink and Urinal. Trap should fix exact perpendicular to wall and drain outlet.

1.1.8. Cleanout Plugs:

Contractor shall provide cast brass cleanout plugs in all horizontal run more than 15 mtr length required one cleanout plugs shall be threaded and provided with key holes for opening. Cleanout plugs shall be fixed to the pipe by a G.I. socket and lead caulked joint.

1.1.9. Pipe Sleeves:

Pipe sleeves 50mm larger diameter than pipes shall be provided wherever pipes pass through walls and slabs and annular space filled with fire proof materials like putty, fire seal etc. Allpipes shall be accurately cut to the required sizes in accordance with relevant BIS codes and burs removed before laying. Open ends of the pipe shall be closed as the pipe is installed toavoid entrance of foreign matters. Vertical sleeve shall finish 50mm above finish floor level.

1.1.10. Air Admittance Valve (AAV):

General:

An Air Admittance Valve shall be used as a vent termination for any individual vent, common vent, circuit vent, loop vent, island fixture vent, vent stack or stack vent that is provided to prevent siphonage of a fixture trap. An Air Admittance Valve (AAV) can be used as an alternative to extending a vent through roof (or sidewall) to the open atmosphere.

Location:

The AAV should be located a minimum of 4" above the weir of the fixture trap for single fixture and branch venting & 6" above the flood level of the highest fixture for stack venting.

Each valve should be installed in an accessible location.Installation:

The Valve should be connected to the piping in accordance with the manufacturer's installation instructions.
The valve should be installed in the vertical, upright position after rough-in and pressure testing of the DWV system.
A minimum of one vent shall be extend to the open atmosphere for every building drainage system.
The valve should not be installed as a vent terminal for any special (chemical) waste system or in supply and return air plenums.
The valve may be installed on sewer ejectors, if installed according to engineer design and prior local code approval.
For installation in areas with temperature ranges between -40ºF and +150 ºF.Materials:

Styrofoam cover

ABS (acrylonitrile butadiene styrene) valve with electrometric membrane.

C. Rubber connector.

1.1.11. Roof Drain:

Description:

Roof drain shall be of cast iron body with clamps, sump receiver, aluminum ring & aluminum dome with stainless steel screws. All cast iron parts shall be bitumen coated & end clamp as per standard detail drawing.
Installation:

Install components in accordance with manufacturer's instruction.Set plumb level and rigid.

1.1.12. Side Wall Parapet Drain (Scupper Drain):

Description:

Scupper drain shall be of cast iron body with painted aluminum grates for stainless steelscrews & clamp as per standard detail drawing.
Installation:

Install components in accordance with manufacturer's instruction.Set plumb level and rigid.

7.0 EXTERNAL DRAINAGE (SEWERAGE & STORM WATER) & WATER SUPPLY SCOPE

Work under this section shall consist of furnishing all labor, materials, equipment and appliances necessary and required to completely install the drainage system as required by the drawings and specified hereinafter or given in the Bill of Quantities.
Without restricting to the generality of the foregoing, the drainage system shall include:

Sewer lines including excavations, pipe lines, man holes, drop connections, underground storm water drains, including pipes, man holes, catch basins and open drains, thrust blocks.
General Requirements:

All materials shall be new of the best quality conforming to specifications and subject to the approval of the Client's Representatives.
Drainage lines shall be laid to the required gradients and profiles.

All drainage work shall be done in accordance with the local municipal bye-laws.

Contractor shall obtain necessary & statuary approvals and permission for the drainage system from the municipal or any other competent authority and also existing invert levels required to enter sanitary system.
Location of all manholes, catch basins, etc. shall be confirmed by the Client's Representatives before the actual execution of work at site.
All excavation, trenches etc shall be barricaded as per instruction of the Client's Representatives.
All works shall be executed as directed by the Client's Representatives.TRENCHES FOR PIPE &

DRAINS:

Alignment and Grade:

The drains are to be laid to alignment and gradients in continuous shown on the drawings but subject to such modifications, as shall be ordered by the Client's Representative from time to time to meet the requirements of the works. No deviations from the line, depths of cutting or gradients of sewers shown in the plans and sections shall be permitted except by the express direction in writing of the Client's Representative.
Opening out Trenches:

In excavating the trenches at the road metaling, pavement curbing etc. are to be placed on one side and preserved for rein statement when the trench or other excavation shall be filled-up.
Before any road metal is replaced, it shall be carefully shifted. The surface of all trenches and holes shall be restored and maintained to the satisfaction of the Client's Representative. The Contractor shall not cut or break down any live fence or trees in the line of the proposed works but shall tunnel under them unless the Client's Representative shall order to the contrary.
Trench to be excavated to alignment + depth required. Trench to be properly dressed and de-watered. Trench shall be kept free of water at all time. Discharge of water shall be into nearest drainage channel not on the road.
All underground pipe to be laid open in trench. Pipes to be laid and maintained at required levels and grade during course of work. All joints to be aligned and complete.

Trench shall be of 450mm wide than pipe. Concrete anchors at change in direction for C.I. pipe shall be provided. Pipe shall be rest on cushion in the trench.

The Contractor shall scrub up and clear the surface over the trenches and other excavations of all stumps, roots and all other encumbrances affecting execution of the work and shall remove them from the site to the approval of the Client's Representative.
Excavation to be taken to Proper Depth:

The trenches shall be excavated to such depth and width that the sewers pipe shall rest on cushion so that the inverts may be at the levels given on the section/plan. In bad ground the Client's Representative may order the Contractor to excavate to a greater depth than that shownon the drawings and to fill up the excavation to the level of the sewer with such materials as decided by consultant drawing.
Refilling:
The filling shall be done in layers not exceeding 15mm in depth. Each layer shall be watered, rammed and consolidated. Ramming shall be done with iron rammers where possible and with blunt end of the crow brass where rammers cannot be used. Special care shall be taken to ensure that no damage is caused to the pipes, drains, masonry or concrete in the trenches.
Filling in trenches shall be commenced soon after the joints of pipes, cables; conduits etc. have been checked and approved by Client's Representative. The space around the pipes shall be cleared of all debris where the trenches are excavated in hard/soft soil. The filling shall be done with earth on the sides and tops of pipes in layers not exceeding 15mm in depth. Each layer shall be watered rammed and consolidated. The clods and lumps of earth exceeding 8cm in any direction shall be broken or removed before the excavated earth is used for filling. Generally no test is done to determine the diversity of filled earth but on the discretion of Client's Representative the 95 proctor's compaction test may be done to ensure the in situ density after filling. Consolidation is removal of water from the pores and compaction is the explosion of air from the pores. In case of refilling consolidation places most important role as the watering of the each layer is being done properly. If required by the Client's Representative proctors needle may also be used for the proper checking of the refilling items of in situ density.
Contractor Shall Restore Settlement and Damages:

The Contractor shall at his own cost make good promptly during the whole period the works are in hand, any settlements that may occur in the surfaces or roads, beams, footpaths, gardens, open spaces etc. Whether public or private caused by his trenches or by his other excavations due to not using the method of compaction and he shall be liable for any accidents caused thereby.
He shall also at his own expense and charges, repair and make good any damage done to the building and other properties.

Disposal of Surplus Soil:

The Contractor shall at his own cost and charge, dispose of from the site all surplus excavated material not required to be used on the works.

The width of excavated trench shall be as per table given below:

Excavation upto	Upto 100 mm dia pipe	Upto 150 mm dia pipe
90 cms depth	33 cms	33 cms
90 - 150 cms depth	60 cms	60 cms
150 - 300 cms depth	75 cms	75 cms
300 - 500 cms depth	90 cms	100 cms

Protection of Existing Services:

All pipes, water mains, cables etc encountered in the course of excavation shall be carefully protected and supported. In case of any damage caused the same shall be made good at no extra cost failing which necessary works will be carried out by the Clients Representative and contract charged to the Contractor.

1.1.2. RCC PIPES:

All underground storm water drainage pipes and sewer lines where specified (other than those specified cast iron) shall be centrifugally spun RCC pipes NP3 where road crossing. Pipes shall be true and straight with uniform bore throughout. Cracked, warped pipes shall not be used on the work. All pipes shall be tested by the manufacturer and the Contractor shall produce, prior to use on site, a certificate to that effect from the manufacturer.

The pipes shall be with or without reinforcement as required and of the class as specified. These shall conform to IS:458 - 1971. The reinforced cement concrete pipes shall be manufactured by centrifugal (or spun) process.

All pipes shall be true to shape, straight, perfectly sound and free from cracks and flaws. The external and internal surface of the pipes shall be smooth and hard. The pipes shall be free from defects resulting from imperfect grading of the aggregate mixing or moulding. The pipes shall be R.C.C. light duty, NP2 and NP3 type.

Laying:

R.C.C. spun pipes shall be laid on cement concrete bed or cradles as specified and shown on the detailed drawings. The cradles may be pre-cast and sufficiently cured to prevent cracks and breakage in handling. The invert of the cradles shall be left 12mm below the invert level of the pipe and properly placed on the soil to prevent any disturbance. The pipe shall then be placed on the bed concrete or cradles and set for the line and gradient by means of sight rails and boning rods, etc. Cradles or concrete bed may be omitted, if directed by the Client's Representatives.

Jointing:

(Rigid Spigot and Socket Joint):

Hemp rope soaked in neat cement wash shall be passed round the joint and inserted in it by means of caulking tool. More skein of yarn shall be added and rammed home. Cement mortar with one part of cement and one part of sand and with minimum water content but on no account soft or sloppy,
shall be carefully inserted, punched and caulked into the joint and more cement mortar added until the space of the joint has been filled completely with tightly caulked mortar. The joint shall then be finished off neatly outside the socket at an angle of 45 degree.

The joint shall be cured for at least seven days.Cement Concrete for Pipe Supports:

Unless otherwise directed by the Client's Representative cement concrete for bed, all round or in haunches shall be laid as follows:

	Upto 1.5m	Upto 3m	Beyond 3m
	depth (5')	depth (10')	depth (10')
Pipes in open ground (no sub	all round	in haunches	all round
soil water)	(1:5:10)	(1:3:6)	(1:5:10)
RCC/C.I pipes in sub soil water	all round	in haunches	in haunches
	(1:3:6)	(1:3:6)	(1:3:6)
RCC/C.I. pipes (in all conditions)	all round	in haunches	in haunches
	(1:3:6)	(1:3:6)	(1:3:6)
RCC/C.I pipes under road or	all round	all round	all round
Building	(1:3:6)	(1:3:6)	(1:3:6)

RCC pipes or CI pipes may be supported on brick masonry or pre-cast RCC or in situ cradles. Cradles shall be as shown on the drawings.
Pipes in loose soil or above ground shall be supported on brick or stone masonry pillars as shown on the drawings.

Testing:
All lengths of the sewer and drain shall be fully tested for water tightness by means of water head maintained for not less than 30 minutes. Testing shall be carried out from manhole to manhole. All pipes shall be subjected to a test pressure of at least 1.5 meters head of water at the highest point of the section under test. The pipes shall be plugged preferably with standard drain plugs

(with rubber rings) on both ends. The upper end shall, however, be connected to a pipe for filling with water and getting the required head.
There should not be any pressure drop in pipe.Measurement:

Excavation: Measurement for excavation of pipes trenches shall be made per linear meter.

Trenches shall be measurement between outside walls of manholes at top and the depth shall be the average depth between the two ends to the nearest cm. The rate quoted shall be for a depth upto 1.5 meter or as given in the Bill of Quantities.
Payment for trenches more than 1.5 m in depth shall be made for extra depth as given in the Bill of Quantities and above the rate for depth upto 1.5 m.
RCC pipes shall be measured for the length of the pipe line per linear meter i.e.:

Length between manholes shall be recorded from inside of one manhole to inside of other manhole. Length between gully trap and manhole shall be recorded between socket of pipe near gullytrap and inside of manhole.

1.1.3. Sewer Appurtenances:

Inspection Chambers and Manholes:

Size of Chambers/Manholes:

The size given in Bill of Quantities and drawings shall be internal finished size of chamber. The work shall be done strictly as per standard drawing and following specifications.
Bed Concrete: Shall be in 1:4:8 cement concrete 200 mm thick.Brick Work:
Brick work shall be with best quality bricks in 1:4 cement mortar.Plaster:

Inside of the walls of chamber/manhole shall be plastered with 12/15 mm thick cement plaster 1:3 (1 cement: 3 coarse sand) and finished smooth with a floating coat of neat cement. Manholes shall be plastered from outside as above but with rough plaster.
Water proofing compound as approved by the Client's Representative shall be added in the cement sand mortar ratio as specified by manufacturer.
Benching:
Channel and benching shall be done in cement concrete 1:2:4 rendered smooth with neat cement. The following depth of channel and benching shall be adopted:

Size OF Drain	Too of channel at the center above bend cond.	Depth of benching at side walls above bed conc.
10 cm	15 cm	20 cm
15 cm	20 cm	30 cm
20 cm	25 cm	35 cm
25 cm	30 cm	40 cm

30 cm	35 cm	45 cm

Manhole Covers and Frames:

The covers and frames shall conform to EN124 and shall be of the following grades and types:

Heavy Duty:

These shall be denoted by the letters 'HD' circular or rectangular solid type for use under heavy vehicular traffic conditions total weight of cover & frame to be not less than 182 kg. fixed in cement concrete 1:2:4 as per specified in BOQ.
Medium Duty:

These shall be denoted by the letter 'MD' circular or rectangular solid type for use under light traffic conditions such as foot paths, carriage drives and cycle tracks.

Light Duty:

These shall be denoted by the letters 'LD' or rectangular size for use in domestic premises of where they are not subjected to wheeled traffic loads.
The covers shall be capable of easy opening and closing and it shall be fitted in the frame in workmanship like manner. The cover shall be gas tight and water tight.
The size of covers specified shall be taken as the clear internal dimensions of the frame.

The frame of manhole cover shall be firmly embedded to correct alignment and levels in RCC slab or plain concrete, as the case may be on the top of the masonry.

1.1.4. Measurement:

Manhole shall be measured in numbers as indicated in the Bill of Quantity. The depth of manhole shall be measured from invert of channel to the top of manhole cover. Quoted rateshall cover the range of
± 0.24 meter on the depth specified in schedule and also the cost of items specified in the Bill of Quantities and Specifications viz.
Manhole with depth greater than specified under the main item shall be paid for under "Extra Depth" and shall include all items as given for manholes depth will be measured to the nearest cm. Depth of the manholes shall be measured from top of the manhole cover to bottom of channel.
Bed concrete.

Brick work.

Plastering.
R.C.C. top slab, benching and channeling including drop connections.

Supply and fix M.S. foot rests.
Keeping holes and embedding pipes for all the connections.

Excavation, refilling, necessary dewatering and disposing off surplus soil to a place as directed by Client's Representative.
Curing.

Cost of frame and precast cover including reinforcement, angle frame and embedding the frame in concrete bed.
Testing.

De-watering of chambers.Gully Trap:

Gully traps shall be fixed in cement concrete 1:5:10 mix and a brick masonry chamber 30 x 30cms C.I. sealed cover and frame weighting not less than 7.3 Kgs to be constructed as per standard drawings. Where necessary, sealed cover shall be replaced with C.I. grating of the samesize (1 cement: 5 coarse sand: 10 stone aggregate: 40mm nominal size).
1.1.1. Sewer Trap:

Sewer traps shall be fixed in last chamber, with facility of cleaning eye minimum 150x 150mm size.. Trap shall be 1st class quality, salt glazed stoneware.
Measurements:

Gully traps shall be measured by the number and rate which shall include all excavation, foundation, concrete, brick masonry, cement plaster inside and outside, CI grating and sealed cover and frame.

Schedule - D (Technical Specification Electrical)

A. DISTRIBUTION BOARDS:

1.0 SPECIFICATIONS

Distribution boards shall be fabricated from 18-gauge M.S. sheet or shall be readymade as specified in the make of material list. It shall be of double door type with hinged (lockable if required) door suitable for recessed mounting in wall. Distribution boards shall be powder coated with 7-tank process application.

The distribution boards shall be provided with phase barriers, wiring channels to accommodate wires and individual per phase neutral links. There shall be separate or individual earth link as per requirement. Proper arrangement shall be made for mounting of MCB's and other accessories.

Distribution boards shall meet with the requirements of IS 2675 and marking arrangement of bus bars shall be in accordance with I.S. standards.

Bus bars shall be suitable for the incoming switch rating and sized for a temperature rise of 35° C over the ambient. Each board shall have two separate earthing terminals. Circuit diagram indicating the load distribution shall be pasted on the inside of the DB as instructed. One earthing terminal for single phase and two terminals for 3 phase DB's shall be provided with an earth strip connecting the studs and the outgoing ECU earth bar.

The top and the bottom faces of the D.B. shall be provided for conduit entry of minimum 1" dia. The faces if asked shall be kept detachable.

All outgoing feeders shall terminate on a terminal strip which in turn is interconnected to the MCB/Fuse base by means of insulated single conductor copper wires as follows

Up to 15 A	2.5 sq.mm.	40 A	10 sq.mm.
25 A	4.0 sq.mm.	63 A	16 sq.mm.
32 A	6.0 sq.mm.		

Each DB shall have indicating lamps preferably neon type denoting power availability in the board after the switch indicating lamps shall be complete with fuses.

MINIATURE CIRCUIT BREAKERS (MCB):

MCB's shall have quick make and break non-welding self-wiping silver alloy contacts for 10 KA short circuit both on the manual and automatic operation. Each pole of the breaker shall be provided with inverse time thermal over load and instantaneous over current tripping elements, with trip-free mechanism. In case of multi-pole breakers, the tripping must be on all the poles and operating handle shall be common. Breakers must conform to BS 3871 with facility for locking in OFF position. Pressure clamp terminals for stranded/solid conductor insertion are acceptable up

to 4 sq.mm. aluminium or 2.5 sq.mm. copper and for higher ratings, the terminals shall be suitably shrouded. Wherever MCB isolators are specified they are without the tripping elements.

RCCB / ELCB

The RCCB should suffices all the requirements of IS as per code IS - 12640 - 1988. The RCA should be current operated and not on line voltage.

The RCCB should ensure mainly the following functions:

1. Measurement of the fault current value.
2. Comparison of the fault current with a reference value.
3. The RCCB should have a torroidal transformer which has the main conductors of primary (P - N) which check the sum of the current close to zero.
4. All metal parts should be inherently resistant to corrosion and treated to make them corrosion resistant.
5. It should be truly current operated.
6. It should operate on core balance torroidal transformer.
7. Its accuracy should be ± 5 %.
8. It should operate even in case of neutral failure.
9. It should trip at a present leakage current within 100 mA
10. Its enclosure should be as per IP 30.
11. Its mechanical operation life should be more than 20,000 operations.
12. It should provide full protection as envisaged by IE rules - 61-A, 71 - ee, 73 - ee, 1985 and also rule 50 of IE rule1956.
13. It should conform to all national and international standards like IS: 8828-1993, IS: 12640-1988, BS 4293 - 1983, CEE 27 (International commission Rules for the approved of electrical equipment).

1.1WORKMANSHIP

The D.B. shall be properly grouted in the wall in concealed manner taking care that the powder coating is not scratched and dents are not formed on the D.B. The MCBs and ELCBs. In the distribution boards shall be fixed as per the circuit details provided. All the wires terminating in the MCBs and the ELCBs shall be lugged for proper contact and ferrules depicting the circuit nos shall be provided. D.B.s mounted in concealed manner shall have a groove around it so as to save the finish of the plaster and colour during future opening of the door. The distribution boards shall have circuit chart tagged on the door for future maintenance. Danger notice plates shall be fitted to the distribution boards with screws and not stuck so as to assure its presence for a longer duration.

1.2MODE OF MEASUREMENT

The distribution boards shall be measured in nos and the MCBs and ELCBs shall be measured in numbers separately.

Note:

All material and workmanship have to be as per latest IS / International standards.

B. 1.1 KV GRADE L.T. CABLES AND CABLE TERMINATION:

1.0 SPECIFICATIONS

L. T. XLPE CABLE*:*

GENERAL:

The medium voltage cables shall be supplied, laid, connected, tested and commissioned in accordance with the drawings, specifications, relevant Indian Standards specifications, manufacturer's instructions. The cables shall be delivered at site in the original drums with manufacturer's name, size and type clearly written on the drums.

All cables shall be adequately protected against any risk of mechanical damage to which they may be liable in normal conditions of handling during transportation, loading, unloading etc.

The cable shall be supplied in single length i.e. without any intermediate joint or cut unless specifically approved by the client.

The cable ends shall be suitably sealed against entry of moisture, dust, water etc. with cable compound as per standard practice.

CONDUCTOR:

Uncoated, annealed copper / aluminium, of high conductivity, upto 4 mm^2 size the conductor shall be solid and above 4 mm^2 the conductors shall be concentrically stranded as per IEC: 228.

INSULATION:

Cross link polyethylene (XLPE) extruded insulation rated at 70°c.

CORE INDENTIFICATION:

Two cores	:	Red and Black
Three cores	:	Red, Yellow and Blue
Four cores	:	Red, Yellow, Blue and Black
Single core	:	Green, Yellow for earthing.

Black shall always be used for neutral.

ASSEMBLY:

Two, three or four insulated conductors shall be laid up, filled with non-hygroscopic material and covered with an additional layer of thermoplastic material.

ARMOUR:

Galvanized steel flat strip / round strips applied helically in single layers complete with covering the assembly of cores.

For cable size upto 10 sq mm : Armour of 1.4 mm dia G.I. round wire

For cable size above 10 sq mm : Armour of 4 mm wide 0.8 mm thick GI strip

SHEATH:

ST -2 PVC along with polypropylene fillers to be provided.

Inner sheath shall be extruded type and shall be compatible with the insulation provided for the cables.

Outer sheath shall be of an extruded type layer of suitable PVC material compatible with the specified ambient temp. of 50^{o}c and operating temperature of cables. The sheath shall be resistant to water, ultra violet radiation, fungus, termite and rodent attacks. The colour of outer sheath shall be black.

Sequential length marking along with size and other standard parameters shall be required at every 1.0 mtr on the outer sheath.

TESTING:

Finished cable tests at manufacturers works: The finished cables shall be tested at manufacturer's works for all the routine tests for all the length and size of cables to be delivered at site and the certificate for the same shall be furnished to client. If required the cables shall be tested in presence of the client's representative.

Voltage test: Each core of cable shall be tested at room temperature at 3 KV A.C. R.M.S. for duration of 5 minutes.

Conductor resistance test: The D.C. resistance of each conductor shall be measured at room temperature and the results shall be corrected to 20^{o}c to check the compliance with the values specified in the Is 8130 – 1976.

Cable tests before and after laying cables at site:

Insulation resistance test between phases, phase to neutral and phase to earth.

Continuity test of all the phases, neutral and earth continuity conductor.

Earth resistance test of all the phases and neutral.

All the tests shall be carried out in accordance with the relevant IS code of practice and Indian Electricity Rules. The bidder shall provide necessary instruments, equipments and labour for conducting the above tests and shall bear all the expenses in connection with such tests. All tests shall be carried out in the presence of client and the results shall be prescribed in forms and submitted.

CABLE MARKING:

The outer sheath shall be legibly embossed at every meter with following legend:

ELECTRIC CABLE: 1100 V, SIZE: ___C X ____ MM^2 with Manufacturers name, year of manufacturing and ISI symbol.

SEALING DRUMMING AND PACKING:

After tests at manufacturer's woks, both ends of the cables shall be sealed to prevent the ingress of moisture during transportation and storage.

Cable shall be supplied in length of 500 mtrs or as required in non-returnable drums of sufficiently sturdy construction.

Cables of more than 250 meters shall also be supplied in non-returnable drums.

The spindle hole shall be minimum 110 mm in diameter.

Each drum shall bear on the outside flange, legibly and indelibly in the Englist literature, a distinguishing number, the manufacturer's name and particulars of the cable i.e. voltage grade, length, conductor size, cable type, insulation type, and gross weight shall also be clearly visible. The direction for rolling shall be indicated by an arrow. The drum flange shall also be marked with manufacturer's name and year of manufacturing etc.

CABLE TERMINATION:

Cable terminations shall be made with aluminium crimped type solder less lugs for all aluminium cables and stud type terminals. For copper cables copper crimped solder less lugs shall be used.
Crimping shall be done with the help of hydraulically operated crimping tool.
For joints where by cable is with aluminium conductor and busbars are aluminium, bimetallic lugs shall be used with compound. CUPAL type of washers shall be used.
Crimping tool shall be used for crimping any size of cable.

CABLE GLANDS*:*

Cable glands shall be of brass single compression type. Generally single compression type cable glands shall be used for indoor protected locations and double compression type shall be used for outdoor locations.

FERRULES:

Ferrules shall be of self-sticking type and shall be employed to designate the various cores of the control cable by the terminal numbers to which the cores are connected, for ease in identification and maintenance.

CABLE JOINTS:

Kit type joint shall be done and filled with insulating compound. The joint should be for 1.1 KV grade insulation.

1.1 WORKMANSHIP

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 drawings and also on the site and obtain the approval of the CLIENT AND/OR ITS ARCHITECT before laying the cable. Procurement of cables shall be on the basis of actual site measurements and the quantities shown in the schedule of work shall be regarded as a guide only.

Cables shall be laid on walls, cable trays, inside shafts or trenches. Saddling or support for the cable shall not be more than 500 mm apart. Plastic identification tags shall be provided at every 30 m.

Cables shall be bent to a radius not less than 12 (twelve) times the overall diameter of the cable or in accordance with the manufacturer's recommendations whichever is higher.

In the case of cables buried directly in ground, the cable route shall be parallel or perpendicular to roadways, walls etc unless marked on drawing by architect / consultant. Cables shall be laid on an excavated, graded trench, over a sand or soft earth cushion to provide protection against abrasion. Cables shall be protected with brick or cement tiles on all the three sides as shown on drawings. Width of excavated trenches shall be as per drawings. Back fill over buried cables shall be with a minimum earth cover of 750 mm to 1000 mm. The cables shall be provided with cables markers at every 10 meters and at all loop points.

All cables shall be full runs from panel to panel without any joints or splices. Cables shall be identified at end termination indicating the feeder number and the Panel/Distribution board from where it is being laid. Cable termination for conductors up to 4 sq.mm. may be insertion type and all higher sizes shall have compression type lugs. Cable termination shall have necessary brass glands. The end termination shall be insulated with a minimum of six half-lapped layers of PVC tape. Cable armouring shall be earthed at both ends.

In case of cables entering the buildings. It would be done duly only through pipes. The pipes shall be laid in slant position, so that no rainwater may enter the building. After the cables are tested the pipes shall be sealed with M. seal & then tarpaulin, shall be wrapped around the cable for making the entry watertight.

Testing: MV cables shall be tested upon installation with a 500 V Meggar and the following readings established:

Continuity on all phases.

Insulation Resistance.

between conductors.

all conductors and ground.

All test readings shall be recorded and shall form part of the completion documentation.

Cable joints shall be done as per regular practice and check shall be carried out for loose connections and leakages. Insulation cutting shall be done properly taking care that no area of the conductor remains exposed. Crimping shall be done with the help of hydraulic tool. Proper insulation tape shall be applied at the cable and lug joint.

Format for cable testing certificate:

a. Drum no. from which cable is taken :

b. Cable from _____ to _____

c. Length of run of this cable _____ mtr

d. Insulation resistance test

Between core 1 to earth _____mega-ohm
Between core 2 to earth _____mega-ohm
Between core 3 to earth _____mega-ohm
Between core 1 to core 2 _____mega-ohm
Between core 2 to core 3 _____mega-ohm
Between core 1 to core 3 _____mega-ohm
Duration used:

e. High voltage test: Voltage Duration
Between core and earth Between individual cores

Note:

All material and workmanship have to be as per latest IS / International standards.

C. INTERNAL WIRING

1.0 SPECIFICATIONS

RIGID PVC AND FLEXIBLE PVC FRLS LHSFT CONDUITS:

All conduits shall be rigid PVC alloy low in halogens pipe having minimum wall thickness of medium gauge 1.6 to 2.0 approved by F.I.A. & I.S.I. and shall confirm to IS 9537 part 3 and complying with fire safety standards classification V-0. The temperature stability shall be from – 20^{o}c - +80^{o}c and also shall be uV stabilized.

Up to 38 mm diameter in slab - minimum 1.8 mm. wall thickness.

Up to 38 mm diameter in floor - minimum 2.0 mm. wall thickness.

Above 40 mm. diameter - minimum 2.2 mm. wall thickness.

Flexible conduits shall be formed from a continuous length of spirally wound interlocked steel strip with a fused zinc coating on both sides. The conduit shall be terminated in brass adapters.

ACCESSORIES:

PVC conduit fittings such as bends, elbows, reducers, chase nipples, split couplings, plugs etc. shall be specifically designed and manufactured for their particular application. All conduit fittings shall conform to IS: 2667-1964 and IS: 3857-1966. All fitting associated with galvanized conduit shall also be galvanized.

WIRES:

All wires shall be single core multi-strand/ flexible copper or single strand Copper (if specified in BOQ), PVC insulated **HFFR** grade as per IS: 694 and shall be 660 V\1100 V.

All wires shall be colour coded as follows:

Phase	**Colour of wire**
R	Red
Y	Yellow
B	Blue
N	Black
Earth	Green (insulated)
Control (If any)	Grey
All off wires	Same as Phase wire

SWITCHES & SOCKETS:

Switches shall be modular type with silver-coated contacts. Sockets shall be 5 pins with switch and plate type cover. Combination of multiple switch units and sockets should be used to minimize the switch boxes.

For heavy duty, metal clad sockets with M.C.B / Isolator mounted in a galvanized steel box shall be provided.

SWITCH PLATE AND BOX:

Plates of the same make, as that of switches shall be used with the modular range. Also M.S.

boxes shall be taken as switch boxes.

1.1 WORKMANSHIP

The size of conduit shall be selected in accordance with the number of wires permitted under table given below. The minimum size of the conduit shall be 25 mm diameter unless otherwise indicated or approved. Size of wires shall not be less than 1.0 sq.mm. Copper or 2.5 sq.mm. Aluminium.

Nominal Dia of wires (mm)	Nominal Cross sec. Area (mm^2)	20 mm		25 mm		32 mm		38 mm	
		S	B	S	B	S	B	S	B
1/2.40	1.50	4	3	8	6	15	9	--	--
1/1.80	2.50	4	2	6	4	10	8	--	--
1/2.24	4.00	2	2	4	3	8	6	--	--
1/2.80	6.00	1	--	4	3	6	6	--	--
1/3.55	10.00	1	--	3	2	5	4	6	5

S - runs of conduits which have distance not exceeding 4.25 m. between draw boxes & which do not deflect from the straight by an angle more than 15 degree.

B - runs of conduits, which deflect, from the straight by more than 15°.

Conduits shall be kept at a minimum distance of 100 mm. from the pipes of other non-electrical services. And maintain minimum 300 mm distance between telephones, TV & Computer piping.

Separate conduits/raceways shall be used for:

Normal lights and 5 A 3 pin sockets on lighting circuit.

Separate conduit shall be laid from D.B. to switch board.

Power outlets - 15 A 3 pin 20 A/30 A, 2 pin scraping earth metal clad sockets.

Emergency lighting.

Telephones.

Fire alarm system.

Public address system & Music system.

For all other voltages higher or lower than 230 V.

T.V. Antenna.

Water level guard.

Computer Wiring

Wiring for short extensions to outlets in hung ceiling or to vibrating equipments, motors etc., shall be installed in flexible conduits. Otherwise rigid conduits shall be used. No flexible extension shall exceed 1.25 m.

Conduits run on surfaces shall be supported on metal 12 mm. thick G.I. pressure saddles which in turn are properly screwed to the wall or ceiling. Saddles shall be at intervals of not more than 500 mm. Fixing screws shall be with round or cheese head and of rust-proof materials. Exposed conduits shall be neatly run parallel or at right angles to the walls of the building. Unseemly conduit bends and offsets shall be avoided by using fabricated mild steel junction/pull through boxes for better appearances. No cross-over of conduits shall be allowed unless it is necessary and entire conduit installation shall be clean and neat in appearance.

Conduits embedded into the walls shall be fixed by means of staples at not more than 500 mm. intervals. Chases in the walls shall be neatly made and refilled after laying the conduit and brought to the finish of the wall but the building Contractor will do final finish.

Conduits buried in concrete structure shall be put in position and securely fastened to the reinforcement and got approved by the CLIENT AND/OR ITS ARCHITECT, before the concrete is poured. Proper care shall be taken to ensure that the conduits are neither dislocated nor choked at the time of pouring the concrete suitable fish wires shall be drawn in all conduits before they are embedded.

Where conduit passes through expansion joints in the building, adequate expansion fittings shall be used to take care of any relative movement.

Inspection boxes shall be provided for periodical inspection to facilitate withdrawal and removal of wires. Such inspection boxes shall be flush with the wall or ceiling in the case of concealed conduits. Inspection boxes shall be spaced at not more than 12 meters apart or two 90° solid bends or equal. All junction and switch boxes shall be covered by 6 mm clear plate. These junction boxes shall form part of point wiring or conduit wiring as the case may be including the cost of removing the cover for painting and re-fixing. No separate charges shall be allowed except where specially mentioned.

Conduits shall be free from sharp edges and burrs and the threading free from grease or oil. The entire system of conduits must be completely installed and rendered electrically continuous before the conductors are pulled in. Conduits should terminate in junction boxes of not less than 32 mm. deep.

An insulated earth wire of copper rated capacity shall be run in each conduit.

Power Wiring:

All final branch circuits for lighting and appliances shall be single conductor/ stranded/ flexible wires run inside conduits. The conduit shall be properly connected or jointed into sockets, bends, and junction boxes.

Branch circuit conductor sizes shall be as shown in the schedule of quantities and or drawings.

All circuits shall preferably be kept in a separate conduit up to the Distribution Board. No other wiring shall be bunched in the same conduit except those belonging to the same phase. Each lighting branch circuit shall not have more than ten outlets or 800 watts whichever is lower. Each conduit shall not hold more than three branch circuits.

Flexible cords for connection to appliances, fans and pendants shall be 650/1100 V grade (three or four cores i.e. with insulated neutral wire of same size) with tinned stranded copper wires, insulated, twisted and sheathed with strengthening cord. Colour of sheath shall be subject to the CLIENT AND/OR ITS 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 connectors. No such joints shall be made unless the length of the sub-circuit, sub-main or main is more than the length of the standard coil.

Control switches shall be connected in the phase conductors only and shall be `ON' when knob is down. Switches shall be fixed in 3 mm. thick painted or galvanized steel boxes with cover plates as specified. Cadmium plated brass screws shall be used.

Power wiring shall be distinctly separate from lighting wiring. Conduits not less than 25 mm. and wires not less than 2.5 sq.mm. copper shall be used.

Every conductor shall be provided with identification ferrules at both ends matching the drawings.

Testing: the entire installation shall be tested for :

Insulation resistance.

Earth continuity.

Polarity of single pole switches.

General: All the wiring switch board, outlet points shall be done in a concealed manner in wall & slab in PVC conduit of minimum 25 mm dia. (medium gauge) & with 650v / 1100v grade PVC

insulated flexible copper conductor wire. The switches should be modular with moulded cover plates, blank plates for outlet boxes. The accessories, connectors, sockets, should be fixed with brass chrome / cadmium plated machine screw. For fan points the rates should be with hum -free type 300 W regulators as required to complete the point wiring. The wiring shall be as per IS: 732 and IS: 4648. The wiring shall be done in a looping manner so as to avoid junction boxes at any place. All the looping shall be done only in the switchboard and outlet points. The size of the wire shall be as per the specification. Colour code shall be strictly followed.

The size of wires shall as follow:

25-32 Amp. metal clad points:

Phase / Neutral 4.0 mm^2

Earth 2.5.0 m m^2

20 Amp. out let points:

Phase / Neutral 4.0 m m^2

Earth 2.5 m m^2

Two nos. of 15 Amps. socket out let connected in parallel

from DB to first outlet

Phase / Neutral 4.0 m m^2

Earth 2.5 m m^2

from first outlet to second outlet.

Phase / Neutral 2.5 m m^2

Earth 2.5 m m^2

Light, fans, exhaust fan, 5 Amp. On board plug point, two way light points, bell point etc from switch to outlet.

Phase / Neutral 1.5 m m^2

Earth 1.0 m m^2

From D.B. to switch board – lighting / 5 A socket etc – i.e. circuit mains part of point wiring

Phase / Neutral 2.5 m m^2

Earth 1.5 m m^2

15/20 Amps. Socket outlet for AC (Single Phase/Three Phase) / Geyser

Phase / Neutral 2.5 m m^2

Earth 1.5 m m^2

15/20 Amps. Socket outlet for appliances or looped from sockets with 4 sq mm ckt.

Phase / Neutral 2.5 m m^2

Earth 2.5 m m^2

Separate pipes shall be laid for off wires and circuit mains.

Circuit mains of same phase shall be drawn in one pipe with prior permission/discussion with the consultant.

Separate phase, neutral and earthing wire of sizes recommended by consultant shall be drawn for each and every circuit mains.

Mains for lighting and on board plug points shall be of one-size higher wires than those used in off.

The point definition shall be conduiting and wiring from D.B. to S.B. and there from to final outlet point including switches and accessories, junction boxes, fan boxes, zarri work with cement –sand etc of approved make.

Note:

All material and workmanship has to be as per latest IS / International standards.

D. LED LIGHT FIXTURES

1.0 SPECIFICATIONS

General Purpose Led Luminaries suitable for Office /Industry / Street Light applications. The Fixtures should be Operational for 220-240 V Single Phase 50 HZ AC, and operational from 170-280 V without significant drop in output. The LED modules should be from Cree/Nichia/Philips Lumi Leds Only with efficiency of a min 130 lm/watt and efficacy of fixtures should be greater than 80 lm/w for both indoor and outdoor fixtures, built with Integral driver. The Min degree of Protection for Indoor Fixtures should be IP20 and IP65 for Outdoor/ Semi Indoor Fixtures. The THD of Fixtures should be strictly <10 % and drivers should be compulsarily provided with miswiring/ overload and short circuit protections. For Indoor applications the housing should be made of die cast/ Metal Housing and diffusers should be polycarbonate only, outdoor fixtures should be with die aluminum / extruded aluminum housing only. The Fixtures should be prewired upto the terminal block and easy to mount and Install and maintain if necessary. The fixture should comply LM79-08 certification criteria and also module should be backed with LM80-08 Certificate from the OEM. The fixtures should be warranted for a period of 3yrs from the date of

Installation. The fixtures should have some kind of embossing/ engraving to identify the brand name. The manufactures should provide all kind of test report, technical details as and when called for. The fixture may be tested from govt approved Lab for Claimed parameters by the manufacturer.

1.1 WORKMANSHIP

The fixture shall be installed on wall / ceiling as directed and as per manufacturer's instruction, with necessary accessories for surface, concealed, suspended from ceiling, bracket mounting etc. The job also includes connection of fixture with respective outlet point with heat resistant wires through heat resistance sleeve and PVC connector. The exhaust fan shall be installed complete with M.S. angle iron mounting frame/ ring, G.I. louvers, wire mesh and plug at the end of the cord including wiring & earthing etc. Proper earthing shall be provided to the fixtures.

1.2 MODE OF MEASUREMENT

The unit rate shall be considered for fitting one fixture. The rate shall include following
All fixing accessories, mounting bracket, ballast condensers and control gear wherever applicable.
Supplying and fixing Ball and socket joints wherever required.
Earthing of fittings.
Electrical connections to fittings/fans from the junction box/ceiling rose.
Installation and interconnection of electronic regulators for ceiling fans.
Supplying and fixing 300 mm. GI down rod for ceiling fans.

Note:

All material and workmanship has to be as per latest IS / International standards.

E. EARTHING

1.0 SPECIFICATION

EARTH ELECTRODES

The earth electrode is the main component of the earthing system, which is in direct contact with the ground and, thus provides a means of releasing or collecting any earth leakage currents. In earthed systems, it will normally be required to carry quite a large current for a short period and so will need to have adequate mechanical and electrical properties to continue to meet the demands on them over a relatively long period, during which actual testing or inspection is difficult. The material should have good electrical conductivity and should not corrode in a wide range of soil conditions.

Galvanized steel, Copper, and Stainless steel are generally the preferred material. Aluminum is sometimes used for above ground bonding, but most of the standards forbid its use as an earthing

electrode, due to the risk of accelerated corrosion. The corrosive product which is the oxide layer on the electrode is non-conductive in nature, so could reduce the effectiveness of the earthing.

The heavy flat strip is placed inside the bigger dia. pipe and the annular space between the two is filled with a special type of conductive, non-corrosive Backfill Compound. The completed Earth Electrode is heavily electroplated externally as per UL standards to enhance the life of the Electrode susceptible to corrosion (depends on the soil conditions). The water is used once during installation and fitting, and then the moisture is retained by the compound, throughout its life eliminating the use of water in regular intervals.

PROPER INSTALLATION METHOD: The Earthing Electrode can be installed by any one of the following methods depending on the soil condition.

Normal Soil:

Make a bore of 8" to 10" in diameter manually up to the electrode length (2 Mtr or 3 Mtr). Put a little quantity of Back Fill Compound (a layer of min. 3 to 4 inch) inside the pit and drop the electrode exactly in the center of the pit. Now mix the soil that has been dug out with the B.F.C. (conductive and non corrosive mixture) eliminating the stones, rocks and other bigger shapes. Now pour the above mixture in small quantity in to the pit followed by water and remove the trapped air inside the pit by poking a rod in to the mixture repeatedly. Repeat the above exercise till the pit is completely filled up. Pour sufficient water so that mixture is in paste /mud form. Al low the pit to stand for 24 hrs. and absorb the water and becomes compact. Test the earth pit and connect to the electrical circuit. Avoid excess watering. **Do not hammer the earth electrode.**

Sandy Soil:

Make a big pit of 06' x 06' and 11' deep; fill the entire pit with black cotton soil or normal soil, pour enough water so that pit is full with water, leave it for three days so that soil soaks up the water. You will notice that soil level has gone down and again top up the pit with soil & fill the water. Now after two or three days this pit is ready for earthing purpose and our earthing can be installed there by above-described normal method, that will definitely give you a very good earth resistivity value. However, if the pit is filled with BFC mix soil then that will show better earth resistance value. These types of installations may needs regular watering after certain intervals that depends on the characteristics of the soil described in the "Factors determining the soil resistivity". It is to be noted that more than one earth electrode may be required to be installed and connected in parallel to bring down the earth resistance value with in safe limits.

Semi-Rocky Soil:

If enough soil is there then earthing can be done by normal method otherwise that can be done by making a big pit as in case of sandy soil. Ours is a corrosion resistant, long life and almost maintenance free earthing system in normal soil conditions & if installed properly it will give better earth resistivity value than conventional earthing system throughout their life. It is a Fit & Forget earthing system. However, these types of installations may needs regular watering after certain intervals that depends on the characteristics of the soil described in the "Factors determining the soil resistivity". It is to be noted that more than one earth electrode may be

required to be installed and connected in parallel to bring down the earth resistance value with in safe limits when done on ROCKY SOIL.

BACK FILL COMPOUND (BFC)

In all cases, the backfill medium should be conductive but non-corrosive in nature, be of a relatively small particle size and should, help to retain moisture for a considerable period of time. More often than not the previous excavated soil is suitable as a backfill, but should be sieved to remove any large stones and rubbles and placed around the electrode, taking care to ensure that it is well compacted. The soil should maintain a pH value between 6.0 (acidic) to 10.0 (alkaline). Normal stiff clay is not a suitable backfill material as, if heavily compacted; it may become almost impervious to water and could remain relatively dry. It may also form large lumps, which do not consolidate around the electrode avoiding to make good contact with soil to the electrode itself.

BFC, (back fill compound) is a specially developed compound, which is capable of absorbing and retaining the moisture for a long time, it reduces the soil resistivity, it helps in faster dissipation of fault current, least fluctuation of Ohmic value and it eliminates the use of Salt, Charcoal etc. around the Earthing Electrode. It has low solubility, hence is not easily washed away, and has a low resistivity (approximately 5-10 Ohm-meters in a saturated solution). It is virtually neutral, having a pH value of between 6.2 and 6.9. should not generally cause environmental difficulties in use.

1.1 WORKMANSHIP

Following points shall be followed strictly.

The masonry chamber shall be provided with a Cast Iron hinged cover resting over the Cast Iron frame, which shall be embedded in the block masonry.

Construction of the earthing station shall in general be as shown in the drawing and shall conform to the requirement on earth electrodes mentioned in the latest edition of Indian Standard IS: 3043, Code of Practice for Earthing Installation.

The earth conductors (Hot dip G.I. strips) inside the building shall properly be clamped / supported on the wall with Galvanized Iron clamps and Mild Steel Zinc Passivated screws / bolts. The conductors outside the building shall be laid at least 600 mm. below the finished ground level.

The earth conductors shall either terminate on earthing socket provided on the equipment or shall be fastened to the foundation bolt and / or on frames of the equipment. The earthing connection to equipment body shall be done after removing paint and other oily substances from the body and then properly be finished.

Over lapping of earth conductors during straight through in joints, where required, shall be of minimum 75mm. long.

The earth conductors shall be in one length between the earthing grid and the equipment to be earthed.

Additional equipment earthing shall be done with Cu strip / Bare Cu Wire as per size indicated in drawing.

Lightening arrestors shall be installed at topmost point of the building. The quantity for the same shall be designed & specification in BOQ to cover total building area. Finial type arrestor shall be used with Cu pipe & Cu base plate. The arrestor / base plate shall be connected to separate earth pit with Cu Strip.

Following tests shall be carried out:

The entire earthing installation shall be tested as per requirements of Indian Standard Specification IS: 3043.

The following earth resistance values shall be measured with an approved earth megger and recorded.

Each earthing station

Earthing system as a whole

Earth continuity conductor

Earth conductor resistance for each earthed equipment shall be measured which shall not exceed 5 Ohm in each case.

Measurements of earth resistance shall be carried out before earth connections are made between the earth and the object to be earthed.

1.2 MODE OF MEASUREMENT

Earthing stations shall be measured in units whereas earthing strips and wires shall be measured in rmt.

Note:

All material and workmanship has to be as per latest IS / International standards.

F. UPS Technical Specifications

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, and other applicable specification sections in the Project Manual apply to the work specified in this Section.

1.2. SUMMARY

A. Scope: Provide design and engineering, labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for a solid-state uninterruptible power supply (UPS) as required for the complete performance of the work, and as shown on the Drawings and as herein specified.

B. Section Includes: The work specified in this Section includes, but shall not be limited to, a three-phase, on-line, double conversion, solid state UPS. The UPS shall operate in conjunction with the existing building electrical system to provide high quality power conditioning, back-up power protection, and distribution for electronic equipment loads. The system shall consist of a transformer-based solid state IGBT rectifier/inverter, power factor corrected rectifier, a 100 percent rated for continuous duty static switch, battery plant, LCD plus Synoptic status/control panel, possibility to parallel connection for Power and Redundancy and synchronizing circuitry as described herein.

1.3. REFERENCES

A. General:
The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.

B. International Organization for Standardization (ISO):
ISO 9001, "Quality Management Systems - Requirements."

C. European UPS Standards:
EN 62040-1:2008/A1:2013, Uninterruptible Power Systems, Part 1: General and safety requirmentsCE/EN
EN 62040-2:2006, Uninterruptible Power Systems, Part 2: EMC requirements
EN 62040-3 Uninterruptible power systems (UPS). Method of specifying the performance and test requirements
PEP certifications
Govt Accredited labs like NABL/SAMEER/ERTL/IIT or equivalent certified Type test certificate for UPS

Following the provisions of the Directives:
2014/35/EU february 26, 2014 "LOW VOLTAGE"2006/95/CE
2014/30/EU february 26, 2014 "ELECTROMAGNETIC COMPATIBILITY"

1.4. UPS DEFINITIONS

A. Purpose: The purpose of this specification is to define the design, manufacture and testing characteristics required in view of supplying, putting into operation and maintaining an Uninterruptible Power Supply system (referred to as a UPS in the rest of this document).

The UPS system shall be designed to supply dependable electric power to:

1. The Single-UPS unit with static bypass shall be designed to supply dependable electric power

B. Brief description:

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1. The UPS system shall be made up of identical connected single-UPS units (same power rating), operating in double-conversion mode (also called on-line mode); it shall be a VFI-type UPS (as per standard IEC 62040-3).

2. UPS unit shall have a unit rating of 20 kVA and shall comprise the following components, described below in this specification:

a) PFC rectifier
b) Battery charger
c) Inverter
d) Battery 12V VRLA
e) User and communications interface
f) All other devices required for safe operation and maintenance, including circuit breakers, switches, etc.

a) Static bypass (via a static switch) for each UPS unit
b) Manual maintenance bypass for each UPS unit

C. System Aim:

The UPS shall ensure continuity of electric power to the load within the specified tolerances, without interruption upon failure or deterioration of the normal AC source (utility power) for a maximum protection time determined by the capacity of the backup batteries installed.

1.5. OPERATING PRINCIPLES

A. System Typology:

Each single-UPS unit shall operate in double-conversion mode (also called on-line mode); it shall be a VFI-type UPS (as per standard IEC 62040-3), made up of the following components, described in detail in this specification.

B. Normal operation (normal AC source available):

The rectifier supplies the inverter with DC current while the charger simultaneously floats charges the battery. The load is continuously supplied with dependable electrical power by the inverter.

C. Operation on battery power (normal AC source not available or outside tolerances):

Upon failure or excessive deterioration of the normal AC source, the inverter shall continue to supply the load from battery power without interruption or disturbance, within the limits imposed by the specified battery backup time.

D. Battery recharge (normal AC source restored):
When the normal AC source is restored, the rectifier shall again power the inverter, without interruption or disturbance to the load, while the charger automatically recharges the battery. The UPS system shall ensure equal sharing of the total load between the various parallel-connected units.
1. Recharge characteristic: Intermittent charging with prevailing state of complete rest and control of the battery status IU (DIN 41773)

E. UPS Operation

Transfer to bypass AC source:

1. In the event of an overload exceeding system capabilities (short-circuits, heavy inrush cur-rents, etc.) the load shall be automatically transferred, instantaneously and without interruption, to the bypass AC source, on the condition that bypass power is available and within tolerances.
2. To that end, synchronization of each inverter in phase and frequency with the bypass source shall be automatic. Transfer of the load back to the UPS-unit outputs shall be automatic or manual. During transfer, the load shall not suffer an outage or disturbance in the supply of power.
3. To ensure transfer in complete safety, the system shall simultaneously control the static switches.
4. On request, the UPS system may automatically transfer the load with a micro-interruption if a major fault occurs on the UPS system and if synchronization with the bypass source has not been established.

F. UPS maintenance:
1. For maintenance purposes, all electronic components shall be accessible from the front of the UPS.
2. In addition, a built-in manually operated mechanical bypass system shall be:
a. Installed in each UPS unit; (for a system with 3 or more UPS units with active redundancy)
3. For personnel safety during servicing or testing, this system shall be designed to isolate the UPS units while continuing to supply power to the load from the bypass AC source. Transfer to the manual bypass mode and back shall be possible without interruption to the load.
4. The UPS shall also include a device making it possible to isolate the rectifiers and the chargers from the normal AC source.

PART 2 - SYSTEM DESCRIPTION

2.1 Technical Characteristics

A. UPS Design Requirements:
1. Output Power Continuous Rating: The continuous output power rating of the UPS shall be [20] kVA at PF=1.

2. Input Voltage: [400] volts AC, -20 percent +15 percent, three-phase, 5 wires 3Ph +N + PE.

3. Output Voltage: [400] volts AC, three-phase, 3 wires plus Neutral plus ground.

4. Battery Autonomy: UPS shall be capable of operating for [30] minutes at 0.8 PF output at a temperature of 2V battery /25 °C on battery power, Design Margin 10%, Ageing Margin 25%, With Minimum VAH 14,4000, Battery Manufacture Should consider Capacity Factor.

5. Battery Type: Valve regulated sealed lead acid (VRLA) 12V

B. AC Input Characteristics:

1. Voltage: 400V volts AC, -20 percent +15 percent, three-phase, 5 wires 3Ph +N + PE.

2. Frequency: 50 hertz, ±5/±10% adjustable.

3. Power Factor: Greater than 0.99 lagging.

4. Total Harmonic Distortion: Less than 3% at 100% load. And efficiency at 25% Load >95% and at 50% Load >95% and on Full load Efficiency Should Match >96%

C. AC Output Characteristics:

1. Voltage: 400 volts AC, ±1 percent steady state variation phase-to-phase voltage volts AC, three-phase, 5 wires.
2. Frequency: 50 hertz, ±2 percent (Inverter Synch with Mains); 50 hertz, ±0.001 percent when free running.
3. Voltage Stability: ±1.0 percent for balanced load, ±2.0 percent for unbalanced load.
4. Voltage Distortion: Maximum 1 percent total (THD) linear loads, maximum 5 percent total (THD) not linear loads.
5. Voltage Transient (Step Load) Response: ±5 percent for load step changes from 100 percent to 20 and from 20 to 100 percent. The system returns to the ±1 percent range in rms value in less than 20 ms.
6. Voltage Recovery Time: Return to within 1 percent of nominal value within 20 milliseconds (one cycle).
7. Phase Angle Displacement: 120 degrees ±1 degree for balanced load; 120 degrees ±2 degrees for 100 percent unbalanced load.
8. Non-Linear Load Capability: Output voltage total harmonic distortion shall be less than 5 percent when connected to a 100 percent non-linear load with a crest factor not to exceed 3 percent.
9. Slew Rate: 1.0 hertz/second.
10. Power Factor: 1 at the rated volt amperes (VA).
11. Inverter Overload Capability: 125 percent of rated load for 10 minutes, 150 percent of

rated

12. Bypass Overload Capability: 1000 percent for one cycle; 150 percent continuously.

D. Battery:
1. Number of Cell: 360 – 372 adjustable

E. Environmental Requirements:
1. The UPS shall operate under the following environmental conditions:

a. Temperature:
1) UPS Module Operating: 0 °C to 40 °C.
2) Non-Operating (Storage): -10 °C to 70 °C.

b. Relative Humidity (Operating and Storage): 0 percent to 95 percent non-condensing.

c. Barometric Pressure: Up to 1000 meters above sea level.

d. Audible Noise: < 60 dBA at 1m.

2.2 MODES OF OPERATION

A. UPS module shall be designed to operate as a double conversion, on-line reverse transfer system in the following modes.

Normal: The inverter shall continuously supply power to the critical load. The PFC rectifier shall derive power from the utility AC source and supply DC power to the inverter while simultaneously float charging the battery.

Emergency: Upon failure of the utility AC power source, the critical load shall be supplied by the inverter, which, without any interruption, shall obtain its power from the battery.

Recharge: Upon restoration of the utility AC power source (prior to complete battery discharge), the PFC rectifier shall power the inverter and simultaneously recharge the battery.

Bypass Mode: The static bypass transfer switch shall be used to transfer the load to the bypass without interruption to the critical power load. This shall be accomplished by turning the inverter off. Automatic re-transfer or forward transfer of the load shall be accomplished by turning the inverter on.

2.3 COMPONENT DESCRIPTION

A. PFC Rectifier and Battery Charger: Incoming AC power shall be converted to a regulated DC output voltage by an IGBT (insulated gate bipolar transistor) power factor correction (PFC) rectifier. The PFC rectifier shall provide high quality DC power to charge the batteries and power the inverter and shall have the following characteristics:
Input Power Factor Correction (PFC): The PFC rectifier shall be power factor corrected so as to maintain an input power factor of 0.99 lagging to unity at 75 percent or above load levels to ensure generator compatibility and avoid reflected harmonics from disturbing loads sharing the utility power.

Input Harmonic Current Suppression: The PFC rectifier shall produce a sinusoidal input AC current on each phase with low harmonic content, limiting THD on the UPS input to below 3 percent at 75 percent or above load levels.

Temperature Compensated Charging: The battery charger shall be equipped with a temperature probe to enable temperature compensated charging and shall adjust the battery float voltage to compensate for the ambient temperature.

Input Phase reversal Correction: The ups shall auto correct and adjust the Input phase sequence to avoid battery discharge and continuity of supply to load whenever there is phase sequence change for MSEB

Auto & Manual battery testing Shall be available in the UPS

B. Inverter: The UPS output shall be derived from a variable frequency with 3 Level Inverter Pulse Width Modulated (PWM) IGBT inverter design. The inverter shall be capable of providing the specified precise output power characteristics while operating over the battery voltage range.

C. Static Bypass - 100 Percent Rated, Continuous Duty: The static bypass transfer switch shall be solid state, rated for 100 percent continuous duty without mechanical contactor device in parallel for higher reliability and consistent response time and shall operate under the following conditions:

1. Uninterrupted Transfer: The static bypass transfer switch shall automatically cause the bypass source to assume the critical load without interruption after the logic senses one of the following conditions:
a. Inverter overload exceeds unit's rating.
b. Battery protection period expired, and bypass current is available.
c. Inverter failure.

2. Interrupted Transfer: If the bypass source is beyond the conditions stated below, the UPS shall make an interrupted transfer (not less than 100 milliseconds in duration).
a. Bypass voltage greater than +10 percent, -10 percent from the UPS rated output voltage.
b. Bypass frequency greater than ±1-±5 hertz (programmable) from the UPS rated output frequency.

3. Automatic Uninterrupted Forward Transfer: The static bypass transfer switch shall automatically forward transfer power, without interruption, after the UPS inverter is turned on after an instantaneous overload-induced reverse transfer has occurred and the load current returns the UPS's nominal rating or less.

4. Manual Transfer: A manual static transfer shall be initiated from the UPS control panel by turning the UPS inverter off.

5. Overload Ratings: The static bypass transfer switch shall have the following overload characteristics:
a. 1000 percent of UPS output rating for one cycle
b. 150 percent continuous.
6. Inbuilt Isolation Transformer at Input with Delta star Conversion, standard Cu K4 Isolation Transformer.
7. Diesel Mode Generation with RECTIFIER WALK-IN TIME to be designed at 1 - 300 Sec selectable to avoid D.G oversizing and 5-30 sec programmable
8. CO2 Emission @ 50% Load & KWH Saving to be mentioned with PEP certification

9.Product must comply to IEC/EN – 62040 1,2,3 along with CE complied

2.4 SYSTEM CONTROLS AND INDICATORS

A. Microprocessor-Controlled Logic:

1. The full UPS operation shall be provided using microprocessor-controlled logic. Operation and parameters shall be firmware-controlled, thus eliminating the need for manual adjustments or potentiometers. The logic shall include, but shall not be limited to, a self-test and diagnostic circuitry such that a fault shall be isolated down to the printed circuit assembly or plug-in power assembly level. Every printed circuit assembly or plug-in power assembly shall be monitored. Diagnostics shall be performed via a PC through the local diagnostics port on the UPS. UPS shall be microprocessor controlled.
2. The UPS shall include, but shall not be limited to, a standard easy-to-use control and indicator panel. Included shall be a backlit, LCD display, LED indicators and synoptic diagram to show the overall running status of the UPS.
3. Display shall facilitate operation by offering the functions listed below:
a. Operating information supplied on the screens.
b. The display shall assist the Owner by providing step-by-step help in the Owner's language.
c. LED mimic diagram. The mimic diagram shall enable display of installation parameters, configuration, operating status and alarms and indication of operator instructions for switching operations (i.e., bypass).
d. It shall be possible to display the following measurements:
INPUT
Voltage (Vac), per phase
Current (Aac), per phase
Frequency (Hz)
Power (kVA)
OUTPUT
Voltage (Vac), per phase
Current (Aac), per phase
Frequency (Hz)
Power (kW), per phase
Load (%), per phase
BYPASS
Voltage (Vac), per phase
Frequency (Hz)
INVERTER
Voltage (Vac), per phase
Frequency (Hz)

AC/DC (Rectifier)
Voltage (Vdc)
BATTERY
Voltage (Vdc), Current (Adc)
Type (Ah)
Autonomy (minute, %)

f. Additional information shall be provided in view of accelerating servicing of the system.

g. Log of time-stamped events. This function shall store in memory and make available, for automatic or manually initiated recall, time-stamped logs of important status changes, faults, and malfunctions, complete with an analysis and display of troubleshooting procedures.

B. Front Panel LCD Display: The UPS control panel shall provide a backlit, LCD with choice of over 8 operating languages for indication of UPS status, metering, battery status, alarm/event log, and advanced operational features.
1. Access: The display shall provide access to:
a. Mimic diagram indicating UPS power flow.
b. Measurements, status indications, and events.
c. Event log with time.
e. Access to measurements.
d. Ups shall have from access.

C. LED Status Indicators: The UPS control panel shall provide three LEDs that shall signal the following status conditions.
Green LED: Load protected.
Yellow LED: Battery Run, UPS on Bypass or Minor fault.
Red LED: Major fault, load not protected.

D. Audible Alarm Reset: The UPS shall provide an audible alarm that can be stopped using the user interface. If a new alarm is sensed after the original alarm has been silenced, it shall reactivate the audible alarm.

E. USB: One USB/RS232 connector with serial output shall be provided for field diagnostics.

F. Dry Contacts: The UPS shall be provided standard with a programmable input/output relay board. This board shall have eight dry contacts (i.e., six for input signals and two for output signals).
1. Contacts shall be programmed as:
a. General Alarm
b. Mains Fault
c. Battery Low
d. Inverter out of tolerance
e. Bypass Operation
f. Booster OK & not (BCB open)
g. Inverter Operation
h. Bypass OK

2.5 MECHANICAL DESIGN AND VENTILATION

A. Enclosure: The UPS shall be housed in a freestanding enclosure with dead front construction. The mechanical structure of the UPS shall be sufficiently strong and rigid to withstand handling and installation operations without risk. The sheet metal elements in the structure shall be protected against corrosion by a suitable treatment, such as zinc electroplating, bi-chromating, epoxy paint, or an equivalent.

B. Cable Access: The standard UPS available shall accommodate bottom entry cables.

C. Ventilation and Heat Rejection: The UPS shall be designed for forced air cooling. Air inlets shall be provided from the front and top of the UPS enclosure. Air exhaust shall be from the top portion of the unit. Full load heat rejection with Axial fans

2.6 BATTERY

A. General: The UPS module shall use a valve-regulated sealed lead acid heavy duty industrial battery, designed for auxiliary power service in an UPS application. The primary battery shall be furnished with impact-resistant plastic cases and housed in a matching cabinet(s) next to the UPS module.

1.7 CERTIFICATION

UPS Should complies with Product Environmental Profile (PEP) Certified and TUV Nord certified Product.

Technical Description: 10 KVA UPS

General characteristics			
Nominal Power (kVA)		10 kVA	
Active Power (kW)		10 kW	
Technology		APFC PWM IGBT Double Conversion Online VFI-SS-111 (Performance Comply to IEC 62040-3)	
Waveform		Pure Sinewave	
Architecture		Tower	
Isolation Transformer		Inbuilt Required	
Input characteristics			
Input Voltage	Vac	230 VAC (L-L for 1Φ) - 1PH + N+Earth	
Input frequency	Hz	50-60Hz +/-10% autosensing	
Input voltage range	Vac	180~260VL-L @ full Load	
THD Input current	100%	≤ 3	
Input power factor		≥ 0.99 @ 100% Load	
Compatibility with gensets		Adjustable Input Frequency +/-10% for stable Genset Operation	
Input connection(M1)		Terminal Block with MCB	
Output characteristics			

Output voltage	Vac	230 Vac +/-1% 1-Phase + N + E	
		Settable to 230 Vac via Display Panel	
Output frequency (nominal)		50Hz+/- 0,1% unless synchronized to line	
		50 Hz/60 Hz/Synch Settable via Display Panel	
Crest factor		3:1	
THD output voltage	100%	<2% with linear load, <4% with nonlinear load	
Output voltage tolerance		+/-1% Balanced Load, +/-2% Unbalanced Load	
Output PF Range		0.8 Lag to 0.8 Lead	
Output Connection		Terminal Block with MCB	
Overload capacity online mode		Upto 110% for 1 Hour ,125% for 10 Min & 150% for 1 Min	
Overload capacity battery mode		Upto 110% for 10 Min, 125% for 1 Min & 150% for 10 Sec	
Overload capacity in bypass mode		Upto 110% Continuous & >150% for 10 Msec	
Efficiency in Double Conversion Mode	25%	Upto 92%	
	50%	Upto 94%	
	75%	Upto 94%	
	100%	Upto 94%	
Efficiency battery mode (DC-AC)	100%	Upto 92%	
Efficiency in eco mode		>98%	
Additional features			
Cold start (DC start)		Yes	
Power Walk in Time		Standard upto 10Sec	
Paralleling		Upto 4 UPS	
Common Battery Configuration		Yes Upto 2 Parallel UPS	
Working Mode		On Line Mode / Eco Mode / CVCF mode	
Manual Bypass		Yes with MCB, Make before break arrangement	
Frequency converter mode		YES	
Batteries			
Number of batteries		±96/108/120Vdc; Battery Qty 16~20 nos,	
Battery Technology		3 Wire (+ve ,N & -ve)	
Battery range/type/voltage		VRLA sealed, maintenance free	
Recharge current (internal)		20A	
Floating Mode Charging voltage		2.25 Vdc per Cell	
Bulk Mode Charging voltage		2.4 Vdc Per Cell and Settable	
Cold start with battery power		Yes available	

Battery protection		Built in DC Fuse & External Breaker at battery bank	
Minimum VAH for 30 Min Backup	VAH	36000 VAH Minimum	
Protection			
Short Circuit		Fuse & Electronic protection for Input, Output, & Battery	
Battery		Standard Battery Management function, Optional Battery compensation with External batt temperature sensor & Battery breaker at External Bank	
EPO		Remote EPO Contact	
Over temperature		Normal Mode: Transfer to Bypass Mode	
		Battery Mode: UPS shuts down immediately.	
Self-Diagnostic			
		Upon Power on, front panel setting, software control,	
Environmental conditions			
Operating temperature		0-40°C	
Degree of protection		IP20	
Relative humidity (%)		0-95% (non condensing)	
Noise level at 1m (dbA)		Max 65dbA at 100% load / <55dbA at load ≤50%	
Heat loss (BTU/h)			
Standard and certifications			
Safety		IEC 62040-1	
EMC		IEC 62040-2	
Performance & Testing		IEC 62040-3	
Other		RoHS & PEP*	

Note:

All material and workmanship has to be as per latest IS / International standards.

G. DATA NETWORKING:

CAT6 UTP CABLE

1	Type	Unshielded twisted pair cabling system, TIA / EIA 568-C.2 Category 6 Cabling system
2	Network support	Supports ultrahigh speed data networks such as Gigabit Ethernet (1000 Base-T and 1000 Base-TX) and beyond.
3	Warranty	25-year systems warranty; Warranty to cover Bandwidth of the specified and installed cabling system, and the installation costs. Site certificate must be issued by OEM
4	Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR for 4-connector channel
5	Manufacturer	All passive cabling must be from same OEM
6	Conductors	23 AWG solid bare copper
7	Insulation	Polyethylene
8	Jacket	LSZH
9	Filler	PE
10	Frequency tested up to	250 MHz minimum
11	Outer dia	5.5 - 6.1 mm
12	Packing	Box of 305 meters
13	shipping weight	305m reel in a box 24kg
14	Impedance	100 Ohms + / - 15 ohms
15	Performance characteristics to be provided along with bid	Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR
16	Delay Skew:	45ns Max
17	Impedance:	100 ± 15 Ohms

18	Current Rating:	1.5 A Max
19	Conductor DC Resistance:	66.5Ω/km
20	Voltage:	150VAC
21	NVP	67%
22	Propagation delay:	535ns/100m @250MHz
23	Mutual Capacitance:	5.6nF/100m Nominal
24	Insulation Resistance:	500 MΩ Minimum
25	Dielectric Strength:	1000 V RMS
26	Contact Resistance:	10 mΩ Max
27	Protection Class	IP 20
28	Standards	ISO/IEC 11801-1 Ed 1.0 2017-11 IEC 61156-5 2nd ed. EN 50173-1 EN 50288-6-1 TIA 568-C.2 Fire classification: IEC 60332-1 CPR fire class: EN50575
29	Operation temperature	(-20 °C to +60 °C)
FACE PLATE		
	Features	Single Gang square plate, 86mmx86mm
		Write on labels in transparent plastic window – supplied with plate
		Label strips can be installed at transparent plastic window

		Pure White Color
		Should be able to support variety of jacks – UTP, STP, Fiber, Coax etc.
CAT6 INFORMATION OUTLET (Jack)		
1	Features	Category 6, EIA/TIA 568A / EIA/TIA 568B
		All information outlets for 100 W, 22-24 AWG copper cable shall Use insulation displacement connectors (IDC)
		Material should be Plastic or PC grade with UL 94 V-0 approved
		Allow for a minimum of 200 re-terminations and >1000 mating cycles without signal degradation below standards compliance limits.
		Be constructed of high impact, flame-retardant thermoplastic with color and icon options for better visual identification.
		Jack should be With integral cable strain relief, including dust cover.
		PCB-free and tool-free Easy-Lock connection of installation cables
		IDC posts should be pointed
		568A/B configuration
2	Mechanical Characteristics Jack Connector	Plastic Housing: Polycarbonate, UL94V-0 rated or equivalent Operating Life: Minimum 750 insertion cycles Contact Material: Copper Alloy Contact Plating: 50µ" Gold/100µ" Nickel Contact Force: 100g minimum Plug Retention Force: 15 lb.
3	IDC Connector	Plastic Housing: Polycarbonate, UL94V-0 rated or equivalent Operating Life: Minimum 200 reterminations Contact Material: Copper Alloy IDC Contact Plating: Tin/Lead Plate Contact Force: 100g minimum Wire Accommodation: 22-24 AWG solid

4	Electrical Characteristics	Interface Resistance: 20 milliohms Initial Contact Resistance: 2.5 milliohms Insulation Resistance: >100 Megaohms
5	Dimensions (mm)	18.2 H x 22.7 Wx 41.3 D (mm)
6	Weight	approx. 27 gm
7	Standards	IEC 60603-7: Electrical Characteristics of the Telecommunication Outlets ISO/IEC 11801, Second Edition: September 2002 EN 50173-1: May 2007
8	Compatible with connectors	RJ11, RJ12, RJ45
CAT6 - 24 PORT PATCH PANEL		
1	Features	Be made of powder coated steel, in 24 port configurations.
		Allow for a minimum of 200 re-terminations without signal degradation below standards compliance limit.
		Have port identification numbers on the front of the panel. Panel should have PVC cover with port number.
		Should have self adhesive, clear label holders (transparent plastic window type) and white designation labels with the panel, with optional color labels / icons.
		Should be upgradeable as Intelligent Patch Panel without changing the existing Patch Panel hardware and by simple retro fitting of intelligent sensors as and when required.
		Each port / jack on the panel should be individually removable on field from the panel. All jacks must be in Zig-Zag form to have better manageability.
		Should have integrated rear cable management shelf.
		Should be comply with TIA 568B.2-1.

2	Patch Panel Characteristics Material	CRS (cold rolled steel) Thickness: . 060" (1.52mm) Coating: Powder coated and front side PVC cover with port numbering
3	Mechanical Characteristics of Jack Connector	Plastic Housing: UL94V-0 rated or equivalent Operating Life: Minimum 750 insertion cycles Contact Material: Copper Alloy Contact Plating: 50µ" Gold/100µ" Nickel Contact Force: 100g minimum Plug Retention Force: 15 lb.
4	IDC Connector	Plastic Housing: UL94V-0 rated or equivalent Operating Life: Minimum 200 reterminations Contact Material: Copper Alloy IDC Contact Plating: Tin/Lead Plate Contact Force: 100g minimum Wire Accommodation: 22-24 AWG solid
5	Dimensions	24 Port with trays 43.2 mm H x 483mm W x 98mm
6	Weight	1.2kg
7	Standards	TIA/EIA-568-C.2 Component Compliant, IEC-603-7 Compliant, ISO 11801 Class E Compliant
CAT6 Patch cord		
1	Features	Cat 6 U/UTP patch cord for data networks for 10/100BASE-T and 1000BASE-T applications. The patch cable should be made from high quality 26/7 AWG stranded copper wire. It should be available in a range preterminated with RJ45 plugs and feature anti-snag slim strain relief slip on boots. 26/7 AWG stranded copper wire Pre-terminated with WE8W plugs Slim clear anti-snag slip on boots Suitable for EIA 568A or 568B wiring with LS0H sheath and RoHS Compliant
2	Termination type / Connection type	insulation-piercing contact (IPC)

3	Mechanical Characteristics - Cable	Conductor size: 26/7 AWG stranded copper wire Nom. O.D.: 4.5 mm Sheath: LS0H Bend radius: ≥35mm Operating temperature range: -20°C to 60°C
4	Mechanical Characteristics - Plug	MIN operating life: 750 insertion cycles RJ45 plug and boot material: Clear polycarbonate Contact material: 0.35mm thick copper alloy Contact plating: 1.27 µm gold plate RJ45 plug dimensions compliant with: ISO/IEC 60603-7-5
5	Electrical Characteristics	Dielectric Withstanding voltage: 1000 VDC Insulation Resistance at 100 VDC: ≥500 MΩ Current rating: 1.5A @ 25°C
6	Fire Propagation Tests	LS0H Sheath: IEC 60332-1, IEC 61034
7	Standards	Fulfills the requirements of Category 6, Class E (250MHz) according to the present standard of of TIA-568.2 and ISO/IEC 11801 Complies with the Category 6 specifications of the IEC 60603-7-4 /IEC 60603-7-5 connector standard Supports PoE (IEEE 802.3af), PoEP (IEEE 802.3at), 4PPoE (IEEE 802.3bt) and is compatible to IEC 60512-99-001/002 (*) Tested according to IEC 61935-2 LSZH versions

PoE Switch

S. No.	Detailed Technical Specifications
1	Minimum 24 x 10/100/1000 Base-T PoE+ and 4 x 1/10G ports. (with required transceiver modules)
2	1 U Rack mountable and should provide stacking of minimum 10 switches with 128Gbps of dedicated stacking/ equivalent bandwidth (All the stacking accessories should be included from day 1).
3	The Switch should have 2GB DRAM and 2GB internal Flash

4	256 Gbps or higher Backplane capacity and minimum 190 Mpps of forwarding rate
5	Should support Non-blocking hardware architecture
6	All interfaces should provide wire speed forwarding for both Fiber and copper modules
7	Support for at least 1000 VLANs & 32k MAC address
8	It should support IGMP snooping v1,v2 & v3
9	It should have static IP routing from Day 1 and should be upgradable to support OSPF and PIM
10	Switch should support 8 hardware queues per port
11	Dynamic Host Configuration Protocol (DHCP) snooping
12	Switch should support LLDP capabilities
13	Should support IP Source Guard , DAI and IPv6 Security feature like IPv6 RA Guard and IPv6 Neighbour Discovery Inspection
14	Should support Secure Shell (SSH) Protocol and Simple Network Management Protocol Version 3 (SNMPv3).
15	Switch needs to have console port for administration & management
16	Management using CLI, GUI using Web interface should be supported
17	FTP/TFTP for upgrading the operating System
18	The Switch should support MACSec
19	Should support Energy Efficient Ethernet
20	IEEE 802.1x support
21	IEEE 802.1D Spanning-Tree Protocol
22	IEEE 802.1p class-of-service (CoS) prioritization
23	IEEE 802.1Q VLAN
24	IEEE 802.3 10BASE-T specification
25	IEEE 802.3u 100BASE-TX specification

26	Switch should have internal redundant power supply and Hot swappable fans
27	Switch should able to support management via CLI, Web interface
28	SNMP v1,v2,v3
29	Switch should be manageable through both IPv4 & IPv6.
30	Switch should be UL-UL60950-1, FCC Part 15, VCCI Class A, EN 55022, EN 55024, EN 300386, CAN/CSA 22.2 No.60950-1, Reduction of Hazardous Substances (ROHS) certified
31	Switch should be IPv6 Logo Certified
32	Switch Should be Common Criteria NDPP/NDcPP certified

Note:

All material and workmanship has to be as per latest IS / International standards.

H. CCTV Surveillance System

	OEM Prequalification Criteria:	
	The **OEM prequalification criteria** will be as under specific Requirements:	
		Documents Required
1	The CCTV OEM authorized should have its toll-free number with Mobile app for any technical support query from the SI or end customer which is very much required for such a big project.	Toll free nos. should be mentioned in the manufacturer's authorization letter and submitted along with the bid.
2	The CCTV OEM should have its toll-free number in India for any technical support query from the SI or end customer with the mobile application-based ticketing website for logging calls and obtain service docket /ticket status. Technical Support number should be mentioned in the manufacturer's authorization letter and submitted along with the bid.	Toll free nos. should be mentioned in the manufacturer's authorization letter and submitted along with the bid.
3	The MAC address of the IP cameras must be registered in the name of OEM.	Proof to be provided by the OEM
4	The CCTV OEM must have self-owned service center for last 5 years from the date of submission of bid **(not as joint venture, partnership firms or through any other association)**	OEM's GST registration document clearly mentioning service tax no. to be given as proof
5	The proposed camera OEM should be a member in any of the present "ONVIF Organization Committee i.e., Steering Committee/Technical Committee or	Proof to be provided by the OEM

	Technical Services Committee or full membership for last 4 year.	
6	The OEM for IP Cameras & VMS should have a registered entity and direct presence in India for more than 10 years as on bid submission date and should be present globally in the same line of manufacturing for at least 15 years. Camera, NVR OEM should submit a declaration letter along with letter of incorporation confirming the same.	Camera OEM should submit a declaration letter along with letter of incorporation confirming the same
7	The OEM of major items (like CCTV Camera of all types, VMS, Servers, Storages, switches etc.) its sister concerns, or any of its group company or Subsidiary **should not have been blacklisted** in last 10 years by any Ministry under Government of India or by Government of any State in India or any of the Government PSUs as on tender floating date.	Certificate / affidavit mentioning that the Bidder is not blacklisted by any Ministry under Government of India or by Government of any State in India or any of the Government PSUs.
8	The CCTV OEM must have executed a similar nature of work i.e., Supply of CCTV cameras to similar customer i.e., Courts or Jails with minimum 2000 number of cameras in single order.	Documentary proof to be submitted
9	The CCTV OEM should have own Technical, Service Support Center in India with L1, L2 & L3 Support.	Documentary proof to be submitted
10	The OEM for IP Cameras & VMS should have at least 50 employees on its payroll in India. Declaration letter from the HR/country Head/Director/CEO of OEM to be submitted along with the bid.	Documentary proof to be submitted

11	All The Camera, NVR, VMS, and Intrusion system should be from same OEM	Undertaking from OEM and Bidder

- **Fixed Dome Camera**

SR no	Parameters	Minimum Specification	Compliance (Yes/No)
1	Image Sensor	1 / 2.7" Progressive Scan CMOS	
2	Effective Pixels	2560 × 1440	
3	Min. Illumination	Color: 0.01 Lux @ F1.2, AGC ON; Color: 0.04 Lux @ F2.2, AGC ON; 0 lux with IR	
4	Shutter Speed	1 s to 1/100,000 s	
5	S/N Ratio	≥52 dB	
6	Angle Adjustment	Pan : 0°-355°, Tilt : 0°-67°, Rotation : 0°-355°	
7	Focal Length	2.8 /3.6 mm @ F2.0	
8	Iris Type	Fixed Iris	
9	Field of View	2.8 mm @F2.0, horizontal field of view:110°,Vertical: 77.6°	
10	Video Compression	H.265 / H.264	
11	H.264 Compression Standard	Base Line / Main Profile / High Profile	
12	H.265 Compression Standard	Main Profile @ Leve4.1 High Tier	
13	Resolution	4MP(2560×1440), 1080P(1920x1080), 720P(1280x720), D1, CIF, 480 x 240	
14	Max. Frame Rate	30fps @ 4MP (2560×1440)	
15	Video Bit Rate	64Kbps - 5 Mbps	
16	Multiple Streaming	Triple streams	
17	Main Stream	60Hz: 4MP/3MP/1080P(1-30fps); 50Hz: 4MP/3MP/1080P(1-25fps)	
18	Sub Stream	60Hz: 720P(1-15fps)/D1 /CIF (1-30fps); 50Hz: 720P(1-12fps)/D1/CIF (1-25fps)	
19	Third Stream	60Hz: D1/CIF/480x240 (1-30fps); 50Hz: D1/CIF/480x240 (1-25fps)	
20	Smart Codec	ROI, 3 zones	
21	Quality Control	Five levels under VBR; Freely adjustable under CBR	

22	Image Setting	time stamp, text overlay, flip & mirror, ROI, Saturation, Brightness, Chroma, Contrast, Wide Dynamic, Sharpen, white balance, video rotation, Scheduled profile settings, AGC	
23	Day & Night	IR cut filter with auto switch	
24	Wide Dynamic Range	Yes	
25	IR Distance	Up to 30M	
26	Digital Zoom	Yes	
27	Image Features	Defog, BLC, HLC, 2D/3D DNR	
28	Corridor Pattern	Yes	
29	Video Privacy	4 zones video mask	
30	Intelligent Video Analytics	Object removal (object left/missing detection), scene change and video blur detection, intrusion and line crossing	
31	Alarm Triggers	Motion detection, Intelligent video analytics, Network disconnect, video tampering, IP address conflict, illegal login, SD Card full, SD Card error, Alarm input, Alarm output	
32	Edge Storage	Built-in micro SD card slot, up to 128GB	
33	Network Protocol	TCP/IP, UDP, DHCP, NTP, RTSP, PPPoE, DDNS, SMTP, FTP, UPnP, Unicast, Multicast, ICMP, HTTP, HTTPS, DNS, DDNS, RTP, RTCP, IGMP, 802.1X, QoS, Ipv4, Ipv6	
34	Cyber Security	HTTPS / IP Filter / IEEE 802.1X / Blacklist & whitelist / account security / telnet access control / serial password	
35	Online Connection	Support simultaneous monitoring for up to 4 users; Support multi-stream real time transmission	
36	API	ONVIF Profile (S & G)	
37	Network	1 RJ45 10M/100M self-adaptive Ethernet port	
38	Hardware Reset	Yes	
39	Operating Temperature	- 30 °C to 60 °C	
40	Operating Humidity	10 % to 90 % relative humidity	
41	Ingress Protection	IP67	
42	Vandal Resistance	IK10	
43	Power Supply	DC12V / PoE	
44	Power Consumption	< 6W	

45	Warranty	3 years	
46	Emissions	FCC Part 15.107 Class A, FCC Part 15.109 Class A , EN 55032, EN 55035 (IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8)	
47	Immunity	EN 55030-4	
48	Safety	UL 62368-1, IEC 62368-1 EN 62368-1, CAN/CSA C22.2 No. 62368-1-14, J62368-1, AS/NZA 62368.1	
49	Environment	RoHS (IEC 62321-3-1, IEC 62321-5, IEC 62321-4, IEC 62321-6, IEC 62321-7, IEC 62321-7-2, IEC 62321-8), WEEE, REACH	
50	NDAA Compliant	Yes	
51	BIS Certified	Yes	
52	Support	• The OEM shall have a self-owned support Service Center and RMA in India from last 5 years and Toll Free number. • The OEM shall be registered in India for more than 10 Years and present globally for more than 20 years	

- **8-Channel Network Video Recorder**

Sr. No	Parameter	Description	Compliance (Yes/No)
1	Compression	H.264H / H.264 /H.265/ MJPEG	
2	Maximum IP Cameras	8 channel full HD	
3	Two-way Talk	1 channel Input, 1 channel Output, RCA	
4	Operating System	Windows 10 or Ubuntu Linux 18.04, Windows Server 2019	
5	Typical Video Storage Rate	576 Mbps	
6	OSD	Camera title, Time, Video loss, Camera lock, Motion detection, Recording	
7	Record Mode	Manual, Schedule (Regular(Continuous), MD, Alarm), Stop	
8	Trigger Events	Recording, PTZ, Tour, Alarm out, Video Push, Email, FTP, Snapshot, Buzzer, network loss, video loss	
9	Video Detection	Motion Detection, MD Zones: 396 (22x 18), Video Loss & Camera Blank	
10	Resolution	12MP, 4K, 6Mp, 5Mp, 3Mp, 2Mp, 1.3Mp, 720P & etc.	
11	Local Client Display Rate (fps)	700@HD resolution (Windows) 900@HD resolution (Linux) 1800@analog resolution	

12	Sync Playback	1/4/9/16	
13	Search Mode	Time/Date, Alarm, MD & Exact search (accurate to second), Smart search, event, bookmark search	
14	Playback Function	Play, Pause, Stop, Rewind, Fast play, Slow play, Next file, Previous file, Next camera, Previous camera, Full screen, Repeat, Shuffle, Backup selection, Digital zoom	
15	Backup Mode	USB Device / Network / Internal SATA Burner	
16	Maximum Hard Drives	8, 10TB Each	
17	Maximum Storage	80 TB RAID	
18	Raid Controller	RAID 5	
19	Monitor Output	1 DVI-I + 1 HDMI + 1 Display Port, max 2 simultaneous monitors	
20	Operating System Location	128 GB SSD (RAID 1 optional)	
21	CPU	Gen 7 Intel Core i7	
22	RAM	16 GB (optional)	
23	Network Functions	HTTP, TCP/IP, IPv4/IPv6, UPNP, RTSP, UDP, SMTP, NTP, DHCP, DNS, IP Filter, PPPOE, DDNS, FTP, Alarm Server	
24	NIC	2 RI-45 port (10/100/1000Mbps)	
25	USB	4 x USB 2.0, 2 x USB 3.0	
26	DVD	External (optional)	
27	Audio Outputs	1	
28	Smart Phone	iPhone, iPad, Android, Windows Phone	
29	Maximum User access	128 users	
30	Keyboard & Mouse	Included	
31	Regulatory	CE, FCC, cULus, UL Listed	
32	Power Supply	AC120V-240V, VAC, Auto Sensing, 50-60Hz	
33	Working Environment	5°C to 35°C	
34	IP Systems Power & Heat	240 Watts/790 BTU/h (Max) 140 Watts/470 BTU/h (Typical)	

- **Hard Disk Drive**

SR. No	Parameter	Description	Compliance (Yes/No)
1	internal	Device Type: Hard drive	
2	08 TB	Formatted capacity[5]	
3	3.5-inch	Form factor	
4	YES	Advanced Format (AF)	
5	YES	RoHS compliant[6]	
6	Up to 64	Cameras supported	
7	16+	Drive Bays Supported	
8	32	Al Streams	
9	All Frame Al	Firmware Feature Name	
10	YES	Tarnish resistant components:	
11	6 Gb/s	Performance Interface transfer rate (max)[5] Buffer to host	
12	256	Cache (MB)[5]	
13	7200 RPM	Performance Class	
14	300,000	Load/unload cycles[7]	
15	80TB/yr	Annualized workload rating[8]	
16	<1 in 10^14	Non-recoverable read errors per bits read	
17	1,000,000	MTBF	
18	Read/Write 5.3 Ideal 4.7 Standby and Sleep 0.4	Average power requirements (W) Read/Write Idle Standby and Sleep Idle	
19	0 to 65 -40 to 70	Temperature (°C, on the base casting) Operating Non-operating	

Note:

All material and workmanship has to be as per latest IS / International standards.

Schedule - E (Make Of Material List)

A. CIVIL WORK

1. Approved makes of materials are listed below. The contractor should get Approved the sample of material/furniture in respect of quality and source of supply manufacturer approved by committee. All suchapproved samples should be kept at site in the custody of GBU. The tests for the make in external laboratoryin presence of Consultant/DTA/GBU to be carried out by Contractor at his own cost as per relevant latest codes. Every items purchase bills shall be produced to GBU as and when asked for.
2. Mockup Furniture and material as directed by engineer in charge should get approved by committee.

CIVIL WORKS		
Sn	**Item**	**Brands**
1	Concrete Work	
a	Cement	ULTRATECH, J K LAKSHMI, SANGHI, HATHI, AMBUJA, WONDER,INDIA CEMENT, HIGH BOND, JKSUPER
b	TMT Reinforcement Bar Fe – 500 /500D	**TATA-TISCON, SAIL, ESSAR, ELECTRO TMT, NILKANTH,JSW,JINDAL,FRIENDS**
c	Sand	As per Mix design for concrete work or zone-II.
		For Masonry and plaster work zone – III
2	Masonry Work	
a	Brick Masonry	Having crushing strength not less than 35 Kg/Sq.cm. ofLocally Available
3	Structural Steel Work	
a	Structural Rolled Steel sections - beams, channels, tee, flats, angles, bars(round, square ,hexagonal)	Tata, SAIL, RINL, Jindal, Essar,Asian
b	Structural Hollow steel sections (Square&Rectangular)	Tata, SAIL, Jindal, Asian, Essar, Appolo,Asian
c	Structural tubular sections	Tata, SAIL, Jindal, Asian, Essar, Appolo,Asian
4	Wood Work (Door, Window & Interior)	
a	Teak Wood	Ghana, Nagpur, Berma Teak (Indian Teak)
b	Flush Door (decorative / non decorative)	Greenply, Kit Ply, Anchor, Archidply, Bhutan Board
c	Ply Wood	Greenply, Kit Ply, Anchor, Archidply,
d	WPC Door	Century PLY, Archidply,

5	Aluminum Work (Door, Window &Interior)	Jindal, Hindalco, Banco, National, Royal Touch
6	Calcium silicate board / Gypsum Board.	Saint Gobain (India Gypsum), Hilux, Lafartz, Aerolite, Amazon
7	Dead Locks/ Mortiselocks/ Narrowstiledeadlocks/ Tubular locks	Kich, Dorma, Dorset, Yale, Godraj, Enerite, Sigma,Opel,Ozone, Europa
8	Tile Work	
a	Ceramic Tiles	AGL, Sunheart, Johnson, Kajaria, RAK, CERA, Somani, Vermora
b	Glazed Tiles	AGL, Sunheart, Johnson, Kajaria, RAK, CERA, Somani, Vermora
c	Vitrified Tiles	AGL, Sunheart, Johnson, Kajaria, RAK, CERA
d	Tile Adhesives & Grouting material	BAL, Laticrete, Kerakoll, Ardex Endura, Mapie,Fairmate
e	White Cement	Birla, J.K.
9	Paint Work	Johnson & Nicholson, Asian, Berger, ICI, Birla(putty), JK(Putty) Nerolac, Indigo, juton
10	Texture External Plaster/paint	Spectrum, juton, Terre Palette, Asian paint,
11	Water Proofing Chemicals	
a	Chemical Water proofing & Integral WaterProofing Compound	Chryso, CICO, Fosroc, Kryton, Sika, Dr.FIXIT, Plastocrete plus, FAirmate, Pidilite Ind Ltd, ECMASConstruction Chemicals Pvt. Ltd.
b	Epoxy Grouting	Laticrete, Dubond., K2, Epoxy, Kerakoll, Ardex Endura
12	Door Window Hardware	Kich, Dorma, EPPW, Palladium, ozone, Godrej, Enox, Sleek, Hettich, Ozone, Ebco
13	Floor Spring	Dorma, Mab, Hafle, Doorset, Everite, Ozone Hardwyn, Ebco
14	Hydraulic Door Closer	Dorma, Yale, Hafle, Hardwyn, Trium, Ozone Everite, Hyper, Ebco
15	Pre-coated Steel Roofing/ Walling Sheets550 Mpa	Tata Bluescope, Interarch, Nippon Dendro (poly steel)ShreePrecoated (Metacolor)
16	Calcium Silicate / Mineral Fibre FalseCeiling	Gyproc- Saint gobain, Aerolite, Armstrong,
17	Plumbing PiPes	Astral, Supreme, Prince, Finolex, Ashirvad ,Miraj,Flowkem, TRUFLOW

18	Sanitary Fitting	Cera, Hindware, Roco,Vida,Jaquar, Plumber, parry,Johnson
19	C.P Fitting	Esco, Jaquar, Cera, Hindware, parry, Johnson

B. PLUMBING WORK

LIST OF MAKES FOR SANATARY AND PLUMBING WORK		
Sn	**Item**	**Brands**
1	Vitreous China Sanitary ware	Cera, Hindware, Roco,Vida,Jaquar, Plumber,parry, Johnson.
2	Plastic W. C. Seat Cover	Cera, Hindware, Roco,Vida,Jaquar, Plumber,parry, Johnson.
3	Stainless Steel sinks	Nirali, Johnson, Prestige, Parry, Futura
4	C. P. Fittings & Accessories	Esco, Jaquar, Cera, Hindware, parry,Johnson
5	Ultra Voilet Water Purifier	Ion Exchange, thermax, Wipro
6	Hydro pneumatic System and WaterSupply Pumps	Grundfos, Kirloskar, CRI, xylem, Lubi
7	G. I. Fittings	RV'&' R'Mark, Unik, DRP, UNCO, RBRAND, UNIK, ZOLOTO, TATA,BANSAL
8	G. I. Pipe/M. S. Pipes	Tata, Jindal, Prakash, Zenith, Surya, Asian, Gujarat SteelTube, BANSAL, Appolo
9	C. P. V. C. Pipes & Fittings	Astral, Supreme, Prince, Finolex, Ashirvad ,Miraj, Flowkem, Truflow
10	U. P. V. C. Pipes & Fittings	Astral, Supreme, Prince, Finolex, Ashirvad ,Miraj, Flowkem, Truflow
11	P. V. C. Pipes & Fittings	Astral, Supreme, Prince, Finolex, Ashirvad ,Miraj, Flowkem, Truflow
12	Gun metal valves	Zoloto, L&T, Leader, Sant, L&K, Premier, Aatco,Honeywell,Kartar
13	CI Sluice Valves, Check valves	Kirloskar, IVC, Burn, William Jacks, Indian Valve(IVC), Advance,Leader, Zoloto, Kartar
14	Ball Cocks	GPA, Sant, L & T, L & K., Honeywell, kartar, Zoloto
15	UPVC Borewell Column pipe	Astral, Supreme, FLowkem, Ashirvad Pipes, Duke, Kisan,Precision, Truflow
16	HDPE Pipes	Duralinr, PenwaltAgru, Nocil, Jain, Supreme, Reliance

17	Fibre reinforced R.C.C. ManholeCover	Pratibha, CIDCO, Himalaya, Alcock
18	C. I. Manholes Covers and Frames	AshokIron, Raj, Neco, R.I.F., B.C., Neer, GMGR Approved ISI Marked
19	Submersible Drainage Pumps	Kirloskar, Mather &Platt, KSB, Grundfos, Xylem, CRI, Lubi
20	Liquid Level Controllers Liquid LevelIndicators	Hema, Minilec, Radar, Sant, Sigma, Gelco, Honeywell
21	Borewell Pump	DP, KSB, Kirloskar, Mather & Platt, Lubi
22	Mirror	Modi, Asahi, Saint Gobin
23	Drinking Water Cooler	Usha. Bluestar, Voltas
24	Chlorine Dosing System	Toshcon, Chloromax, Astalm
25	Seat Cover (heavy duty)	Cera, Parryware, Somany, Jaquar
26	Butterfly Valve	Audco, C & R, Zoloto, AIP, Kartar
27	Gunmetal Non Return Valve	Leader, Audco, Zoloto, AIP, Sant
28	Water Meter	Kapstan Bombay, Voltas Kent, Calcutta, Siemens
29	SWR Pipe	Astral, Supreme, Prince, Finolex, Ashirvad Pipes, Jain, Kisan /KSR.
30	Copper Pipe	IBP-Neco, Rajco
31	Hot Pipe Insulation	Armacel, Champion & Charminar
32	RCC Hume Pipe and Fittings	Patel Hume Pipes, Alcock, Indian Hume Pipe
33	Poly ethylene Composite PressurePipe	KITEC
34	Stoneware Pipes & Fittings	Mahavir, Taya & Unique
35	Pump Set	KSB, Kirlosker, Wasp, Crompton, Beacon, Grundfos, Beacon,Lubi
36	PVC Water Tank (3 Layer)	Astral, Supreme, FLowkem, Vector, Sintex

C. ELECTRIC WORK

SR. NO.	ITEM DESCRIPTION	MAKE LIST
1.	MEDIEM VOLTAGE / WIRES FOR INTERNAL WIRING	RR CABLE / HAVELLS / POLYCAB / AVOCAB
2.	DISTRIBUTION BOARD	LEGRAND / SCHNEIDER / HONEYWELL / LK-E&A (L&T) / HAVELLS
3.	MCB, RCCB	SEIMENS / SCHNEIDER / ABB / LEGRAND / LK-E&A
4.	MODULAR SWITCHES, SOCKET &	HONEYWELL- HORIZON / LEGRAND-MYRIUS / HAVELLS

5.	LUGS / BIMETALLIC LUGS	DOWELL`S / HMI / COMET / HEX
6.	CABLE GLAND	JAINSON / COMET / POLYCAB / HEX
7.	PVC CONDUITS AND ACCESSORIES	PRECISION / NIHIR / POLYCAB / ASTRAL / BBC / BEC /
8.	LIGHT FIXTURES	LIGHTING TECHNOLOGIES / HAVELLS / OSRAM /
9.	EXHAUST FAN	BAJAJ / HAVELLS / CROMPTON / USHA / ORIENT
10.	PVC PIPE & ACCESSORIES	PRECISION / POLYCAB / NIHIR / VRAJ
11.	FLOOR TRUNKING & FLOOR JUNCTION	MK – HONEYWELL / LEGRAND / OBO
12.	UPS	NUMERIC / DELTA / EATON / APC
13.	EARHTHING	ALLIED / ELAPP / RAPID / ELECTROEARTH / ASHLOK
14.	CAT-6	LEGRAND / HAVELLS / D-LINK / FINOLAX / MOLEX
15.	NETWORKING SYSTEM	D-LINK / LEGRAND / MOLEX
16.	OPTIC FIBER CABLE	COMMSCOPE-TYCO / MOLEX / R & M / LEGRAND / C3C
17.	CCTV	PELCO / HONEYWELL / TYCO
18.	CASSETTE TYPE SPLIT AC	DAIKIN / MITSUBISHI / TOSHIBA / BLUE STAR / HITACHI / VOLTAS
19.	WATER COOLER	VOLTAS / USHA / BLUE STAR

Schedule-F

Testing Of Material

For ensuring quality control and workmanship, various test prescribed below corresponding to the material concerned shall be taken at periodic intervals as stipulated below.

Item No. as per Sch. B	Brief Description of Materials to be Tested	Prescription of Test which Shall be Carried Out	Frequency @which Test Shall be Carried Out	Total No. of Test to be Carried Out
	Coarse Aggregate (Metal, Kapchi, Gravel, etc.)	• Gradation Test • Impact Value • Flakiness Index • Water Absorption • Stripping Value	• 1 to 100 Cum – 1 Test • 100 to 500 – 3 Test • 500 to 1500 – 5 Test • 1500 to 5000 – 7 Test	
	Grit	• Stripping Value	• One Test per Work	
	Sand	• Gradation • Fineness Modulus • Specific Gravity • Water Absorption • Silt Content	• One Test per 150 Cum or as per requirement of relevant specification	
	Tiles	• Dimension Test • Transverse Strength • Water Absorption • Abrasion Test	• One Test per 2000 Tiles	
	Teakwood	• Anatomy Test • Density Test • Moisture Content Test	• One Test per work	
	Bricks	• Dimension and Tolerance • Water Absorption • Effluence • Compressive Strength	• One Test @ 50,000 Bricks	
	Cement	• Consistency • Setting Time	• Up to 50 MT – 1 Test	

		• Compressive Strength • Fineness • Chemical Analysis • Soundness	• 50 – 100 MT – 2 Test • 100 – 200 MT – 3 Test • 200 – 300 MT – 4 Test • 300 – 500 MT – 5 Test	
	Steel	• Tensile Strength • Yield Stress • Elongation • Size	• One test / 40 tonnes / per category	
	C.C. Cube test 1:2:4	• Compressive Strength	• 1 to 5 Cum – 1 Test • 6 to 15 Cum – 2 Test • 16 to 20 Cum – 3 Test • 51 & Above Cum- 4 + 1 for each additional 50 Cum or part thereof	
	Aluminium Sections	• Gauge, Section	• One Test for each section	

Sign of Contractor

Schedule-G

FINANCIAL BID

With reference to your DTP document dated****, I having examined the bidding documents and understood their contents, hereby submit my Bid for the aforesaid Project. The Bid is unconditional and unqualified.

I hereby submit our Financial Bid/ Price Bid compromising percentage of Total Project Cost above / below / equal with respect to the estimated Cost of Project (Including applicable GST and including any other taxes) and offer to perform the Project in respect thereof for the following commercial consideration:

Item of Work	**Total amount according to estimated quantities**	**Above/ Below**	**Quoted Rates in Percentage**	**Contract Value (in INR)**
As per Bill of Quantities attached in Technical Bid. Note: To be paid as per the actual execution of the work				

The Bidding percentage hereby will be applicable in respect to each BoQ items individually. I agree to keep this offer stays valid till the end of the contract.

Estimated amount
Put to tender Rs_____
Deduct_____% **Below** Rs_____
Net. Rs_____
In Words_____

Estimated amount
Put to tender Rs_____
Add_____% **Above** Rs_____
Net. Rs_____
In Words_____

Notes

1. All work shall be carried out as per Public Works Department Handbook and other specifications of Division or as directed.
2. Rates quoted include clearance of site (prior commencement of work and at its close) inall re spects and hold good for work under all conditions, site, moisture, weather etc.
3. All Above rates are inclusive of all taxes excluding GST. GST will be paid extra over the Contract Amount.

Signature of the Contractor

Registrar, GBU

ANNEXURE A

PERFORMANCE SECURITY

BANK GUARANTEE FOR PERFORMANCE SECURITY

[To be stamped in accordance with Stamp Act,]

The ……,

……..

……..

WHEREAS:

(A) …….. (the **"Contractor"**) and the ……, …….. (the **"Authority"**) have entered into a Contract dated …….. (the **"Contract"**) whereby the Authority has agreed to the Contractor to undertake the Project (as defined in the Contract), subject to and in accordance with the provisions of the Contract.

(B) The Contract requires the Contractor to furnish a Performance Security to the Authority in a sum of Rs.____/- (Rupees ____) the "**Guarantee Amount**") as security for due and faithful performance of its obligations, under and in accordance with the Contract, during the Term (as defined in the Contract).

(C) We, …… through our Branch at ……Ranchi (the **"Bank"**) have agreed to furnish this Bank Guarantee by way of Performance Security.

NOW, THEREFORE, the Bank hereby, unconditionally and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees and undertakes to pay to the Authority upon occurrence of any failure or default in due and faithful performance of all or any of the Contractor's obligations, under and in accordance with the provisions of the Contract, on its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums upto an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.
2. A letter from the Authority, under the hand of an Officer not below the rank of ……. in the Authority, that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Contract shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authoritsy shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations under the Contract and its decision that the Contractor is in default shall be final, and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any Dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.
3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the

Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.
5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Contract or to extend the time or period for the compliance with, fulfilment and/ or performance of all or any of the obligations of the Contractor contained in the Contract or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Contract and and /or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.
6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Contract or for the fulfilment, compliance and/or performance of all or any of the obligations of the Contractor under the Contract.
7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for ….. days during the Term and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee, no later than ___ (____) months from the date of expiry of this Guarantee, all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.
8. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.
9. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred Branch, which shall be deemed to have been duly authorised to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

10. This Guarantee shall come into force with immediate effect and shall remain in force and effect for a period of …. Days as mentioned in the Contract or until it is released earlier by the Authority pursuant to the provisions of the Contract.

Signed and sealed this ……. day of ……., 20…… at ……..

SIGNED, SEALED AND DELIVERED
For and on behalf of
the BANK by:

(Signature)
(Name)
(Designation)
(Code Number)
(Address)
NOTES:

i. The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.
ii. The address, telephone number and other details of the Head Office of the Bank as well as of issuing Branch should be mentioned on the covering letter of issuing Branch.

ANNEXURE B- Circular PDW -10 – 2017 – 01 - C

મકાનો તથા પુલોના આર.સી.સી. કામોમા લોખડના સળીયાના માપો લખવા તથા ચૂકવણામા લેપ લેન્થ ની લંબાઈ ગણતરીમા નહી લવા બાબત

ગુજરાત સરકાર
માર્ગ અને મકાન વિભાગ
સચિવાલય, ગાંધીનગર
પરિપત્ર ક્રમાંક:- PDW-10-2017-01-C
તા.૧૫-૦૨-૨૦૧૭

પરિપત્ર:-

મકાન, રસ્તા અને પુલોના કામોમાં આર.સી.સી. આઇટમોમાં સમાવિષ્ટ સ્ટીલ રેઇનફોર્સમેન્ટના માપો લખવા અને ચૂકવણા દરમ્યાન લેપની લંબાઇ ગણતરીમાં લેવામા આવે છે. રેઇનફોર્સમેન્ટમાં લેપની વધુ સંખ્યાને પ્રોત્સાહન ન આપતા સળંગ રેઇનફોર્સમેન્ટ (સળીયા) જ મહદઅંશે વપરાય એ તાંત્રિક રીતે વધુ યોગ્ય છે.

MORT&H સ્પેશીફીકેશનના પ્રવર્તમાન ધારાધોરણ મુજબ રેઇનફોર્સ (સળીયા)ના ચૂકવણામાં લેપની લંબાઇના માપો ગણતરીમાં લેવામાં આવતા નથી. (Section 1608)

MORT&H સ્પેશીફીકેશનના પ્રવર્તમાન ધારાધોરણ મુજબ માર્ગ અને મકાન વિભાગ હેઠળ મકાન, રસ્તા અને પુલના રેઇનફોર્સ (સળીયા)ના સ્પેશીફીકેશનમાં Mode of Measurement & Payment માં હવે પછી નીચે મુજબના ફેરફાર કરવા આથી સુચના આપવામા આવે છે

EXISTING ITEM	PROPOSED AMENDMENT (As per MORT&H Speciafication Item No.1608)
મકાનના સ્પેશીફીકેશન	મકાનના સ્પેશીફીકેશન
5.4.10 Providing an Mild Steel reinforcement for R.C.C. work including bending binding and placing in position etc. complete up to floor two level.	**5.4.10** Providing an Mild Steel reinforcement for R.C.C. work including bending binding and placing in position etc. complete up to floor two level.
5.4.11 High yield deform bars steel reinforcement for R.C.C. work including bending, binding and placing in position complete up to floor two level.	5.4.11 High yield deform bars steel reinforcement for R.C.C work including bending, binding and placing in position complete up to floor two level.
3.2 Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is resorted to in place lap joints, such	*3.2 Reinforcement shall be measured in length including hooks, if any, separately for different diameters as actually used in work, excluding overlaps. From the length so*

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joints shall be measured for payment as equivalent length of overlap as per design requirement. From the length so measured, the weight of reinforcement shall be calculated in tones on the same basis of as per M-18 even though steel is supplied to the contractor by the department on actual weight. Length shall include hooks at the ends Wastage and annealed steel wire for binding shall not be measured and the cost of these items shall be deemed to be included in the rate for reinforcement.	*measured, the weight of reinforcement shall be calculated in tonnes on the basis of IS: 1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or other methods for binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.*
EXISTING ITEM	**PROPOSED AMENDMENT (As per MORT&H Speciafication Item No.1608)**
રસ્તાના સ્પેશીફીકેશન **Item No. 39 :** Providing steel reinforcement. a) Providing and placing in position mild steel bar reinforcement including cutting, bending, hooking and tying complete as per details. b) High yield strength deformed bars reinforcement. **(10)** Reinforcement shall be measured in length separely for different diameters as actually used in the work, from the length so measured the weight of reinforcement shall be calculated in tones on the same basis of IS : 1732 even though steel is suppled to the contractor by the Department on actual wieghment. Length shall ilcude hooks at ends. Wastege and annealed steel wire for binding shall not be measured and cost of thes items shall be deemed to be	રસ્તાના સ્પેશીફીકેશન **Item No. 39 :** Providing steel reinforcement. a) Providing and placing in position mild steel bar reinforcement including cutting, bending, hooking and tying complete as per details. b) High yield strength deformed bars reinforcement. ***(10) Reinforcement shall be measured in length including hooks, if any, separately for differenct diameters as actually used in work, excluding overlaps. From the length so measured, the weight of reinforcement shall be calculated in tonnes on the basis of IS: 1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or***

included in the rates for reinforcement.	*other methods for binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.*
પુલના સ્પેશીફીકેશન Item: 21 –Providing (A) Mild Steel Reinforcement (B) High Yield Strength Deformed bars, reinforcements. (10) Reinforcement shall be measured in length including overlaps, separately for different diameter, as actually used in the work, where welding or coupling is restored to, in place of lap-joints, such joints shall be measured for payment as the equivalent length of over lap as per design requirement. From the length so measured the weight of reinforcement shall be calculated in tones on the same basis of IS 1732 even though steel is supplied to the contractor by the Department on actual weighment. Length shall include hooks at ends. Wastage and annealed steel wire for binding shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.	પુલના સ્પેશીફીકેશન Item: 21 –Providing (A) Mild Steel Reinforcement (B) High Yield Strength Deformed bars, reinforcements. *(10) Reinforcement shall be measured in length including hooks, if any, separately for differenct diameters as actually used in work, excluding overlaps. From the length so measured, the weight of reinforcement shall be calculated in tonnes on the basis of IS: 1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or other methods for binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.*

(એન. જી. પરમાર)
ખાસ ફરજ પરના અધિકારી(વિ.યો.)
માર્ગ અને મકાન વિભાગ

Divisional Accounts Officer
P.I.U.-Tender Cell
Gandhinagar

પ્રતિ.

1) અંગત સચિવશ્રી, સચિવશ્રીનું કાર્યાલય, મા.મ.વિભાગ, સચિવાલય, ગાંધીનગર
2) અંગત સચિવશ્રી, સચિવશ્રીનું કાર્યાલય, નર્મદા, જ.સં. પા.પુ. અને ક. વિભાગ, સચિવાલય, ગાંધીનગર
3) અંગત સચિવશ્રી, અગ્ર સચિવશ્રીનું કાર્યાલય, આરોગ્ય, પ.ક. વિભાગ, સચિવાલય, ગાંધીનગર
4) અંગત સચિવશ્રી, અ. મુ. સચિવશ્રીનું કાર્યાલય, શહેરી વિકાસ, શ.ગૃ.નિ.વિભાગ, સચિવાલય, ગાંધીનગર
5) અંગત સચિવશ્રી, અગ્ર સચિવશ્રીનું કાર્યાલય, પંચાયત, ગ્રા.ગૃ. નિ. અને ગ્રા. વિ. વિભાગ, સચિવાલય, ગાંધીનગર
6) એકાઉન્ટન્ટ જનરલશ્રી, રાજકોટ / અમદાવાદ
7) સર્વે મુખ્ય ઈજનેરશ્રીઓ, મા.મ.વિભાગ, સચિવાલય, ગાંધીનગર
8) સર્વે મુખ્ય ઈજનેરશ્રીઓ, નર્મદા, જ.સં. પા.પુ. અને ક. વિભાગ, સચિવાલય, ગાંધીનગર
9) મેનેજીંગ ડીરેકટરશ્રી, ગુજરાત રાજ્ય માર્ગ વિકાસ નિગમ, નિર્માણ ભવન, ગાંધીનગર
10) મુ.ઈ. અને ડીરેકટરશ્રી, એન્જીનીયરીંગ સ્ટાફ ટ્રેનીંગ કોલેજ, ગાંધીનગર
11) ડીરેકટરશ્રી, ગુજરાત એન્જીનીયરીંગ રીસર્ચ ઈન્સ્ટીટ્યુટ (ગેરી), વડોદરા
12) ઉપ સચિવશ્રી, ગુજરાત તકેદારી આયોગ, તકેદારી ભવન, ગાંધીનગર
13) નાણાં સલાહકારશ્રી, મા.મ.વિભાગ, સચિવાલય, ગાંધીનગર
14) સર્વે અધિક્ષક ઈજનેરશ્રીઓ, મા.મ.વિભાગ (રાજ્ય, પંચાયત, ને.હા., પાટનગર યોજના વર્તુળ, વિદ્યુત વર્તુળ સહિત)
15) સર્વે કાર્યપાલક ઈજનેરશ્રીઓ, (ઉક્ત વર્તુળ હેઠળના.)
16) સર્વે તાંત્રિક અધિકારીશ્રીઓ, મા.મ.વિભાગ, સચિવાલય, ગાંધીનગર
17) સર્વે તાંત્રિક શાખાઓ, મા.મ.વિભાગ, સચિવાલય, ગાંધીનગર
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Divisional Accounts Officer
P.I.U.-Tender Cell
Gandhinagar