N I T

Name of work: Development of Portuguese Street, Diu

Estimated Cost:- Rs. 20,53,68,766/-

Earnest Money: - Rs 30,53,690/-

Period of Completion:-365 days (12 Month) including monsoon
Defect &Maintenance Liability Period: 5 Years from the date of Final Completion of Work.

NIT No. :- 09/2018-19/DSCL/Diu

Addition: ----------
Correction: ----------
Overwriting: ---------
Deletion: ----------

Chief Technical Officer (- - - -) DAO PMC(- - - - -)

Annexure - 20A.13

(Amended as per MAN-332)

INFORMATION AND INSTRUCTIONS FOR CONTRACTORS FOR e- TENDERING FORMING PART OF NIT AND TO BE POSTED ON WEBSITE

1. Information and instructions for Contractors will form part of NIT and to be uploaded
2. On **www.daman.nprocure.com or www.nporcure.com**.

3. The intending bidder must have digital signature to submit the bid.

4. The Bid Document as uploaded can be viewed and downloaded free of cost by anyone including intending bidder.

5. The Earnest Money of Rs 30,53,690/-Drawn in favor of Chief Executive Officer, Diu Smart City Ltd, Diu, in the form of Receipt/ Treasury Challan/ Deposit at call receipt of a schedule bank shall be scanned and uploaded to the e-Tendering website within the period of bid submission. It is mandatory to submit tender fees and EMD online failing which the price bid of that agency will not be opened online and Physical submission of such scanned documents shall reach to office of the Chief Executive Officer, DIU SMART CITY LTD, within 3 (three) working days after closing of online bidding. A part of Earnest Money is acceptable in the form of Bank Guarantee also. In such cases 50% of the Earnest Money or Rs. 20 Lakhs whichever is less shall have to be submitted in shape of FDR/Demand Draft prescribed above as and balance can be submitted in form of Bank Guarantee from a Nationalized Bank.

6. Draft information and instructions for Contractors for e-Tendering where bids are to be inviting on Three stage two **packet bid system** are enclosed as **Annexure - 20A.13.2.**

7. After submission of the bid the contractor can re-submit revised bid any number of times but before last time and date of submission of bid as notified.

8. While submitting the revised bid, contractor can revise the rate of one or more item(s) any number of times (he need not re-enter rate of all the items) but before last time and date of submission of bid as notified.

9. On opening date, the contractor can login and see the bid opening process. After opening of bids he will receive the competitor bid sheets.

10. **Certificate of Financial Turn Over:** At the time of submission of bid contractor may upload Affidavit/ Certificate from CA mentioning Financial Turnover of last 3 years, ending 31st march of previous financial year or for the period as specified in the bid document and further details if required may be asked from the contractor after opening of technical bids. There is no need to upload entire voluminous balance sheet.

11. It is mandatory to fill details / upload scanned copies of all the documents such as VAT registration/Sales Tax registration as stipulated in the bid document. If such document is not uploaded his bid will become invalid and cost of bid document & processing fee shall not be refunded.

12. If any discrepancy is noticed between the documents as uploaded at the time of submission of bid and hard copies as submitted physically by the contractor the bid shall become invalid and cost of bid document and processing fee shall not be refunded.

13. Contractor must ensure to quote rate of each item.

ANNEXURE-20A.13.2
(Amended as per MAN-332)

INFORMATION AND INSTRUCTIONS FOR BIDDERS FOR e-TENDERING FORMING PART OF BID DOCUMENT AND TO BE POSTED ON WEBSITE (Applicable for inviting bids on three bid system)

Chief Executive Officer, Diu Smart City Limited. (DIU SMART CITY LTD), Diu, **on behalf of the President of India** invites **online** the Item rate bid from **firms/contractors** of repute in **Three bid system** for the following work:

S.No.	NIT No	Name of work & Location	Estimated Cost put to bid (in Rs.)	Earnest Money (in Rs.)	Period of Completion	Defect & Maintenance Liability Period *	Last date and time of submission of technical and financial bid	Period during which EMD, Cost of Bid Document, E-Tender Processing Fee and other Documents shall be submitted	Time & date of opening of technical bid
1	2	3	4	5	6	7	8	9	10
1	**09/2018-19/DIU SMART**	**Name of work: Development of Portuguese street, Diu**	Rs. 20,53,68,766	Rs. 30,53,690/-	365 days (12 months) including monsoon	**For 5 years from date of final completion**	**Up to 5:00 pm 30-03-2019**	**After last date & time of submission of bid and upto 5:00 pm on 02-04-2019**	**At 11:00 am on 03-04-2019**

* The Defect & Maintenance Liability Period provided in the above table shall apply with pursuant to the clause 17 of General Condition of Contract and Article 6 of the Integrity Agreement as per the General Condition of Contract.

1. Firms/contractors who fulfill the following requirements shall be eligible to apply. Joint ventures are not accepted. Following are initial criteria for eligibility.

(a) Should have satisfactorily completed the works as mentioned below during the last Seven years ending previous day of last date of submission of tender.

Three similar completed works costing not less than the amount equal to 40% of the Estimated Project Cost.

or

Two similar completed works, costing not less than the amount equal to 60% of the Estimated Project Cost.

or

One similar completed work of aggregate cost not less than the amount equal to 80% of the Estimated Project Cost.

The value of executed work shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to last date of receipt of application for tender.

(b) Average annual **financial turnover** on construction works should be 100% of the Estimated Project Cost during the immediate last three consecutive financial year. (Scanned copy of certificate from CA to be uploaded).

(c) Should not have **incurred any loss** in more than two years during the last five years ending 31st March 2017/2018. (Scanned copy of certificate from CA to be uploaded).

(d) The applicant should have a solvency of amount equal to 40% of the Estimated Project Cost certified by his Bankers.

2. The bidder should not have been blacklisted by any Central Government/State Government Offices/PSUs etc and self-certificate is to be scanned and uploaded.

3. The intending bidder must read the terms and conditions of Form **CPWD-6** carefully. He should only submit his bid if he consider himself eligible and he is in possession of all the documents required.

4. Information and Instructions for bidders posted on website shall form of bid document.

5. The bid document consisting of indicative drawings specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents can be seen and downloaded from **website www.daman.nprocure.com or www.nporcure.comat** free of cost.

6. But the bid can only be submitted **after filling the EMD** in favor **Chief Executive Officer, DIU SMART CITY LTD, Diu, (UT) and other documents as specified.**

e-Tender Processing Fee - Rs. 10,000/- shall be payable to in form of DD in favour of Chief Executive Officer, Diu Smart City Ltd, Diu,(UT).

7. Those contractors not registered on the website mentioned above, are required to get registered beforehand. If needed they can be imparted training on online bidding process as per details available on the website.

8. The intending bidder must have valid digital signature to submit the bid.

9. **Certificate of Financial Turn Over:** At the time of submission of bid contractor may upload

Affidavit/ Certificate from CA mentioning Financial Turnover of last 3 years or for the period as specified in the bid document and further details if required may be asked from the contractor after opening of technical bids. There is no need to upload entire voluminous balance sheet.

10. Contractor must ensure to quote rate of each item.

14. The technical bid shall be opened first on due date and time as mentioned above. The time and date of opening of financial bid of contractors qualifying the technical bid shall be communicated to them at a later date.

15. **Pre Bid conference** shall be held at the office of **Chief Executive Officer, DIU SMART CITY LTD, Diu.** on 25-03-2019 to clear the doubts of intending bidders, if any.

16. The department reserves the right to reject any prospective application without assigning any reason and to restrict the list of qualified contractors to any number deemed suitable by it, if too many bids are received satisfying the laid down criterion.

17. The bidder has to furnish three affidavits as follows.

a) I/We …… S/o …… R/o …….. undertake and confirm that eligible similar works has /have not been got executed through another contractor on back to back basis. Further that, if such a violation comes to the notice of Department, then I/We shall be debarred for tendering in works of Diu Smart City Ltd Diu, in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-in-charge shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee.

b) I/We…… S/o……R/o…….. hereby declare that:-

i) I have submitted the requisite EMD amount, scanned copy uploaded

ii) In case of my tender is not accepted as per terms & condition of NIT and for any refund is made to me, the refund may please be made to my account as per details given below:-

A. Name of agency:- ……..
B. Bank, Branch code, Place details etc:-…….
C. Account No……
D. IFSC code No……
E. UTR/RTGS No……

Chief Executive Officer, DIU SMART CITY LTD, Diu, shall not be responsible in any way for none crediting of EMD/amount in the account of Chief Executive Officer, DIU SMART CITY LTD, Diu, by due date and time as mentioned in NIT.

c) I/We …… S/o…….. resident of ……. Hereby solemnly affirm and declare as under:-

i) That I am sole proprietor/Partner of M/s…….. , R/o…….

List of documents to be scanned and uploaded within the period of bid submission.

1. Certificates of Work Experience and other details as per Performa A to H.
2. Certificate of Financial Turnover and Profit and loss details from CA.
3. Bank Solvency Certificate.

4. Any other Document as specified in the press notice.
5. Affidavit as per provisions of CPWD-6.
6. Copy of bidder Pan Card.
7. i.) Copy of FDR/ Bank Demand Draft/ bank guarantee if any towards EMD

ii) Registration certificate under Diu (UT) Vat-2004 (shall be furnish by the agency within 15 days from the date of acceptance of tender) or Registration under Any new / prevailing Tax Law as per GOI / Local Authority at the time of bidding.

iii) An affidavit that vat and GST return has been filed.

vi) Affidavit regarding work not executed through another agency.

FORM FOR EARNEST MONEY (BANK GUARANTEE)

WHEREAS, contractor..... (Name of contractor) (hereinafter called "the contractor") has submitted his tender dated ..... (date) for the construction of ..... (name of work) (hereinafter called "the Tender") KNOW ALL PEOPLE by these presents that we ..... (name of bank) having our registered office at ..... (hereinafter called "the Bank") are bound unto Chief Executive Officer, DIU SMART CITY LTD, Diu, in the sum of Rs. ..... (Rs. In words .....) for which payment well and truly to be made to the said Engineer-in-Charge the Bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this .....day of 2018

THE CONDITIONS of this obligation are:

(1) If after tender opening the Contractor withdraws, his tender during the period of validity of tender (including extended validity of tender) specified in the Form of Tender;

(2) If the contractor having been notified of the acceptance of his tender by the Engineer-in- Charge:
   (a) Fails or refuses to execute the Form of Agreement in accordance with the Instructions to contractor, if required; OR
   (b) Fails or refuses to furnish the Performance Guarantee, in accordance with the provisions of tender document and Instructions to contractor, OR
   (c) Fails or refuses to start the work, in accordance with the provisions of the contract and Instructions to contractor, OR
   (d) Fails or refuses to submit fresh Bank Guarantee of an equal amount of this Bank Guarantee, against Security Deposit after award of contract.

We undertake to pay to the Engineer-in-Charge up to the above amount upon receipt of his first written demand, without the Engineer-in-Charge having to substantiates his demand, provided that in his demand the Engineer-in-Charge will note that the amount claimed by his is due to him owing to the occurrence of one or any of the above conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date* ..... after the deadline for submission of tender as such deadline is stated in the Instructions to contractor or as it may be extended by the Engineer-in-Charge, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

DATE ..... SIGNATURE OF THE BANK

WITNESS ..... SEAL

(SIGNATURE, NAME AND ADDRESS)

*Date to be worked out on the basis of validity period of 6 months from last date of receipt of tender.

SECTION-I

TECHNICAL BID DOCUMENT
BRIEF PARTICULARS OF THE WORK

1. **Development of Portuguese street, Diu.** The site is located within the island area of Diu Town and consists of streets around 2.4 km in length, connecting in north to the Fort road and Jalandhar beach to the south. It is also a strategic street connecting 3 most important Portuguese era churches in Diu- the Diu Museum (St Thomas Church), St Paul's Church and Government Hospital (St Francis of Assisi).These churches are an integral part of Diu's identity and are still in use today. Portuguese street development is a streetscape improvement project that focuses on revival of heritage value of the churches by developing plazas, gardens and streetscape to provide visitor with a heritage

Below are descriptions of key construction works to be undertaken, the below scope of work is only for guidance and not limited to the items below:

a) Beautification of existing streets with local cobble stones- Approx. length 2.4 km and area of 3 Hectares.
b) Development of pocket plazas and plazas along the key churches
c) Revival and beautification of Museum garden in front of Diu Museum as terrace gardens- Approx. area 5500 sqmt
d) Beautifications of park adjoining to Museum garden as Children's park with play and sport activities where appropriate. Approx area of 6500 sqm
e) Re-aligment and provision of street wide existing and proposed utilities except main sewerage network
f) Provision for street furniture, dustbins, signages, cycle stands etc.
g) Horticulture and landscape works including development of gardens and plazas.

- **The construction work will be carried out in Phases as and when required as per the site conditions. The construction activity has to consider mitigation and alternatives to existing utilities, traffic movement and ownerships.**

SECTION-II

INFORMATION & INSTRUCTIONS FOR APPLICANTS

I. General:

1 Letter of transmittal and forms for deciding eligibility are given in Section III.

2. All information called for in the enclosed forms should be furnished against the relevant columns in the forms. If for any reason, information is furnished on a separate sheet, this fact should be mentioned against the relevant column. Even if no information is to be provided in a column, a "nil" or "no such case" entry should be made in that column. If any particulars / queries are not applicable in case of the applicant, it should be stated as "not applicable". The applicants are cautioned that not giving complete information called for in the application forms or not giving it in clear terms or making any change in the prescribed forms or deliberately suppressing the information may result in the PQ application being summarily disqualified. Application made by telegram or telex and those received late will not be entertained.

3. The application should be typewritten. The applicant should sign each page of the application.

4. Overwriting should be avoided. Correction, if any, should be made by neatly crossing out, initialing, dating and rewriting. Pages of the eligibility criteria document are numbered. Additional sheets, if any added by the contractor, should also be numbered by him. They should be submitted as a package with signed letter of transmittal.

5. References, information and certificates from the respective clients certifying suitability, technical knowledge or capability of the applicant should be signed by an officer not below the rank of Chief Executive Officer, DIU SMART CITY LTD, or equivalent.

6. After opening of the Technical bids, Chief Executive Officer, DIU SMART CITY LTD shall prepare a list of deficiencies found in the bids of each bidder vis-a-vis requirements as per NIT within one week and send these lists to individual bidders by Speed Post with a request to furnish required documents within one week of receipt, failing which it will be presumed that they do not have any further documents to furnish and decision on bids will be taken accordingly. (Added vide OM DG/MAN/257dt. 28.12.2012)

7. The applicant may furnish any additional information, which he thinks is necessary to establish his capabilities to successfully complete the envisaged work. He is, however, advised not to furnish superfluous information. No information shall be entertained after submission of eligibility criteria document unless it is called for by the employer.

8. Any information furnished by the applicant & found to be incorrect either immediately or at a later date, would render him liable to be debarred from tendering / taking up of work in DIU SMART CITY LTD, Diu. Such applicant will be debarred from tendering DIU SMART CITY LTD, Diu and 50% of EMD shall be forfeited.

- The contractor shall carry out performance tests of entire installation as per standard specifications before the work is finally accepted and nothing extra whatsoever shall be payable to the contractor for the tests.

- The contractor shall be responsible to arrange at his own cost all necessary T&P required for the execution of work.

- The contractor shall make his own arrangement for water and temporary electric connections, if required, and make necessary payment for it direct to the department concerned.

- The contractor shall be deemed to have fully acquainted himself with the nature and extent of the work and working conditions at site before submitting the tender. The work shall be executed as per preference of items approved by Engineer-in-charge. If the materials, drawing, designs etc. are not available due to any conditions the programme of the contractors shall be modified accordingly and no compensations/damages shall be payable.

- The Contractor shall have full regard throughout execution, completion and defects liability period to following safety aspects and shall take all necessary steps to ensure that danger to safety is avoided all the time in respect of

  a. Safety of the works

  b. Safety of the Contractors employees and all the persons directly or indirectly engaged by him for the works

  c. Safety of all the employees including persons working on other contracts of Employer at the same site of the Employer and Engineers employees engaged at work site.

  d. Any authorised third party persons on the site.

  e. Contractors plant and equipment

- The contractor shall take all safety measures precautions by exhibiting necessary caution boards, red flags, red lights, and barriers to avoid any accident during execution of work. The contractor shall be responsible for all damages and accident due to negligence on his part. The contractor shall also provide helmets, safety belts etc. required for labors.

- All temporary warning/ caution boards display such as “Construction Work in progress”, “keep away", “No parking” etc. shall be provided and displayed during day as well as night time by the contractor, wherever required and as directed by the Engineer.

- No payment will be made to the contractor for damages caused by rains or other natural calamities or riots during execution of the work and no claims on this account will be entertained.

- The rates of all items of work shall, unless clearly specified otherwise are including cost of all labor, material and other inputs involved in the execution of the item.

- **The construction work will be carried out in Phases as and when required and hence the contractor should quote the rates keeping in mind various phases.**

- Employer bears no responsibility towards any amount of dewatering that the contractors may have to do to effectively execute the Work due to any circumstances. Costs of all dewatering shall be deemed to have been covered by the quoted rates.

- **Bidders should try to acquaint themselves about the site conditions and existing utilities. The construction activity has to consider mitigation, alternatives and upgradation to existing utilities, traffic movement and ownerships.**

- **The contractor should carry out Total station survey with Differential Global Positioning Systems (DGPS) TBM and marking of all spot levels given the large scale of the project before commence of the construction.**

- **If any MOU's signed between the contractor and other agencies, same agencies should execute the work.**

- The Mandatory tests required for materials shall be got done from the labs approved by Chief Executive Officer, DIU SMART CITY LTD,, Diu& all the testing charges shall be borne by the contractor, cost of sample and its carriage shall also be borne by the contractor. Nothing extra shall be paid on this account by the department.

- The contractor shall make all efforts to mechanize the construction work to maximum possible extent by using the latest T & P / machinery and equipment etc.

- The time of completion shall be essence of the contract and to be strictly adhered to by the contractor. He shall provide a PERT chart showing all the activity and events for timely completion of the project.

- The various items of the work shall be taken up simultaneously wherever possible to speed up the work. Nothing extra shall be paid on this account.

- The contractor shall maintain in good condition all work throughout execution, completion and defects liability period. The contractor shall be responsible for and to make good all injuries, damages and repairs, rendered necessary by fire, rain, traffic, floods or other causes.

- The Contractor shall be responsible for:
  - The accurate setting out of the Works in relation to original lines, levels and points of reference given by the Engineer in writing.
  - The correctness of all positions, levels, dimensions and alignment of all parts of the Works, and
  - The provision of all necessary instruments, appliances and labour in connection with the foregoing responsibilities.

- Any defect, error, omission, fault shall be immediately brought to the notice of the Engineer before or during the execution of the works.

- Tenders with any conditions including that of conditional rebate shall be rejected forthwith.

- The contractor should make necessary arrangement for round the clock working including working on Sundays and holidays except National holidays & the planning should be done accordingly.

- The Contractor shall make necessary arrangements for medical aid to all his workers including availability of first aid box all the time aid the site of work

- The design and drawing may be revised any time during execution of work by competent authority. No claim shall be entertained on this account

- Even BIS marked material may be subjected to the quality test at the discretion of the Engineer-in-charge. Whenever BIS marked materials are brought to the site of work the contractor shall, if required by the engineer-in-charge, furnish manufacturers test certificate or test certificates confirming to the relevant IS Codes.

- Contractor is required to fulfill the provisions of PF (under EPF Scheme) and other labor laws as applicable time to time. The ESI & EPF contribution on the part of employer in respect of this contract shall be paid by the contractor. These contributions on the part of the employer paid by the contractor shall be reimbursed by the Engineer-in-charge to the contractor on actual basis.

- The work may be inspected by central Vigilance Commission or any other agency on behalf of Chief Executive Officer, DIU SMART CITY LTD, Diu. Any deduction/ compensation proposed by CVC or Chief Executive Officer, DIU SMART CITY LTD, Diu, in regard to defective work or work not confirming to specifications, loss of time, amount shall be deducted from bills. No claim of the contractor whatsoever shall be entertained on this account.

- The department will be responsible only to the contractor and his authorized representative and none else, with whom contractor may be in liaison or associated in any manner.

- The contractor shall also make necessary agreement at his own cost for diesel generator sets required for the work, so that the same can be used by him during failure/none availability of electricity. Necessary permission etc. if required shall be taken by him from the concerned authorities. Nothing extra shall be paid on this account

- Nothing extra, what so ever shall be payable to the contractor for executing the work as per general specifications and special conditions in all the above paras.

- The agency shall be fully responsible for safety of labor, working staff etc. Proper safety equipment's like helmets, safety belts, gumboots, barricading etc. as per requirement of site shall be provided by the agency and agency shall be fully responsible for any accident and consequent claims etc. if any and Chief Executive Officer, DIU SMART CITY LTD, Diu, shall not be responsible in any more.

- The quality assurance of the work shall be got done through the third party approved by the Chief Executive Officer, DIU SMART CITY LTD, Diu, and the payment of work done shall be released to contractor after certification of third party for its quality etc. The charges of third party shall be borne by Chief Executive Officer, DIU SMART CITY LTD, Diu.

- **Definitions**

41.1 In this documents, the following words and expression have the meaning here by assigned to them.

41.2 Employee: means the Chief Executive Officer, Diu Smart City Ltd, Diu.

41.3 Bidder: means the individual proprietary firm, in partnership, limited company private or public corporation.

41.4 Year means "Financial Year" unless stated otherwise.

41.5 The word CPWD in NIT and Standard Tender Form may be read as PWD, works Division 2, Diu.

42. Method of application

42.1 If the bidder is an individual, the application shall be signed by him above his full type written name and current address.

42.2 If the bidder is a proprietary firm, the application shall be signed by the proprietor above his full typewritten name and the full name of his firm with its current address.

42.3 If the bidder is a firm in partnership, the application shall be signed by all the partners of the firm above their full typewritten names and current addresses, or, alternatively, by a partner holding power of attorney for the firm. In the later case a certified copy of the power of attorney should accompany the application. In both cases a certified copy of the partnership deed and current address of all the partners of the firm should accompany the application.

42.4 If the bidder is a limited company or a corporation, the application shall be signed by a duly authorized person holding power of attorney for signing the application accompanied by a copy of the power of attorney. The bidder should also furnish a copy of the Memorandum of Articles of Association duly attested by a Public Notary.

43. Final decision making authority

The employer reserves the right to accept or reject any bid and to annul the process and reject all bids at any time, without assigning any reason or incurring any liability to the bidders.

44. Particulars provisional

The particulars of the work given in Section-I are provisional. They are liable to change and must be considered only as advance information to assist the bidder.

II. Site visit

The applicant is advised to visit the site of work, at his own cost, and examine it and its surroundings to himself collect all information that he considers necessary for proper assessment of the prospective assignment.

III. Initial criteria for eligibility

(i) Should have satisfactorily completed the works as mentioned below during the last Seven years ending previous day of last date of submission of tender.

Three similar completed works costing not less than the amount equal to 40% of the Estimated Project Cost

Or

Two similar completed works, costing not less than the amount equal to 60% of the Estimated Project Cost

Or

One similar completed work of aggregate cost not less than the amount equal to 80% of the Estimated Project Cost

(ii) Experience gained as nominated sub contractor shall be considered provided following conditions are met:

- If the contract signed between the employer and main contractor has provision for sub contracting and a signed copy of such contract or its relevant part is submitted
- Work completion certificate from the Main Contractor is provided

(iii) ***Definition of Similar Nature of work***

Similar nature of work shall mean Street Beautification works or Heritage street developments or Garden development or Infrastructure Development road works with street lighting, utility developments. The similar nature of work showcased to meet initial eligibility and to obtain marks. The right to interpret "similar nature of work" is reserved by Chief Executive Officer, DIU SMART CITY LTD, Diu

For smooth functioning and for the co-ordination among the Contractor, it is important that the Civil Contractor shall appoint Contractor who has executed horticulture works, Street lighting-electrical works, and civil contractor shall submit MOU with above contractor's with the tender.

(iv) Firm must be registered as A Class & Above with Special Building category -I, Special Road Category-II, for state Government, R&B Division or central Government.

The value of executed work shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to last date of receipt of application for tender.

(b) The Bidder should have average annual **financial turn over** on construction works should be 50% of the Estimated Project Cost during the immediate last three consecutive financial year. (Scanned copy of certificate from CA to be uploaded).

(c) Should not have **incurred any loss** in more than two years during the last five years ending 31st March 2018. (Scanned copy of certificate from CA to be uploaded).

(d) The applicant should have a solvency of 40% of the Estimated Project Cost certified by his Banker

(e) Experience of similar works shall only be considered of the Main firm with valid documents.

(v) The bidder should not have been blacklisted by any Central Government/State Govt. Offices/PSUs and self-certificate is to be scanned and uploaded.

(vi) The applicant should own construction equipment as per list required for the proper and timely execution of the work. Else, he should certify that he would be able to manage the equipment by hiring etc., and submit the list of firms from whom he proposes to hire.

(vii) The bidders should have sufficient number of Technical and Administrative employees for the proper execution of the contract. The applicant should submit a list of these employees stating clearly how these would be involved in this work.

(viii) The bidder's performance for each work completed in the last seven years and in hand should be certified by an officer not below the rank of Chief Executive Officer, DIU SMART CITY LTD, or equivalent.

IV. Evaluation criteria

IV.1. The details submitted by the applicant will be evaluated for eligibility by Competent Authority or a Committee constituted by him. If required, the works executed by the applicant, who otherwise qualify, may be got inspected by a Committee or any other authority as decided by Competent Authority. The details submitted by the applicants will be generally evaluated in the following manner:

IV.1.1 The initial criteria prescribed in para-III above in respect of experience of similar class of works completed, bidding capacity and financial turn over etc. will first be scrutinized and the applicant's eligibility for the work shall be determined.

IV.1.2 The applicants qualifying the initial criteria as set out in para-III (i) to III (vii) above will be evaluated for following criteria by scoring method on the basis of details furnished by them:

(a)	Financial strength (Form 'A' & 'B')	20 marks
(b)	Experience in eligible nature of work during last seven years (Form 'C')	20 marks
(c)	Performance on works (Form 'D') – Time over run	20 marks
(d)	Performance on works (Form 'D') – Quality	40 marks
	Total	**100 marks**

To become eligible for short listing, the applicant must secure at least **fifty** percent marks in each criteria and **sixty** percent marks in aggregate.

The Authority, however, reserves the right to restrict the list of such qualified contractors to any number deemed suitable by it.

Note: The average value of performance of works for time overrun and quality shall be taken on

the basis of performance report of the eligible similar works.

IV.2 Even though any applicant may satisfy the above requirements, he would be liable to disqualification if he has:

(a) Made **misleading or false representation or deliberately suppressed the information** in the forms, statements and enclosures required in the eligibility criteria document,

(b) Record of poor performance such as abandoning work, not properly completing the contract, or financial failures / weaknesses etc.

V. Financial information

Bidder should furnish the following financial information:
Annual financial statement for the last five year in (Form "A") and solvency certificate in (Form "B")

VI Experience in works highlighting experience in similar works

VI.1 Bidder should furnish the following:

(a) List of eligible similar nature of works successfully completed during the last seven years in (Form "C").

VII Organization information

Bidder is required to submit the information in respect of his organization in Forms "E"

IX Letter of transmittal

The bidder should submit the letter of transmittal attached with the document.

X Opening of Price bid

After evaluation of applications, a list of short listed agencies will be prepared. Thereafter the financial bids of only the qualified and technically acceptable bidders shall be opened at the notified time, date and place in the presence of the qualified bidders or their representatives. The bids shall remain valid for 120 days (as prescribed in CPWD-6 for e-tendering) from the opening of technical bid.

XI Award criteria

1. Subject to clause X above the Authority shall award the work to the eligible bidder whose bid has been determined to be substantially responsive to the bidding documents and who has offered the lowest Evaluated Price Bid.

2 The employer reserves the right, without being liable for any damages or obligation to inform the bidder, to:
(a) Amend the scope and value of contract to the bidder.
(b) Reject any or all the applications without assigning any reason.

3 Any effort on the part of the bidder or his agent to exercise influence or to pressurize the employer would result in rejection of his bid. Canvassing of any kind is prohibited.

XII.3 CRITERIA FOR EVALUATION OF THE PERFORMANCE OF CONTRACTORS FOR PRE-ELIGIBILITY:

<table>
<tr><td></td><td colspan="2">Attributes</td><td colspan="2">Evaluation</td></tr>
<tr><td>(a)</td><td colspan="2">Financial strength (20 marks)
(i) Average annual turnover 16 marks

(ii) solvency Certificate 4 marks</td><td colspan="2">(i) 60% marks for minimum eligibility criteria

(ii)100% marks for twice the minimum eligibility criteria or more
In between (i) & (ii) – on pro-rata basis.</td></tr>
<tr><td>(b)</td><td colspan="2">Experience in similar class(20 marks)
Class of works</td><td colspan="2">(i) 60% marks for minimum eligibility criteria
(ii)100% marks for twice the minimum eligibility criteria or more
In between (i) & (ii) – on pro-rata basis.</td></tr>
<tr><td>(c)</td><td colspan="2">Performance on works (20 marks)
(time over run)</td><td colspan="2"></td></tr>
<tr><td></td><td>Parameter</td><td>Calculation for points</td><td>Score</td><td>Marks</td></tr>
<tr><td></td><td>(i) Without levy of compensation.
(ii) With levy of compensation.
(iii) Levy of compensation not decided</td><td>If TOR=</td><td>1.00 2.00 3.00 >3.50
20 15 10 10

20 5 0 -5

20 10 0 0</td><td>20</td></tr>
<tr><td colspan="5">TOR = AT/ ST, where AT = Actual time; ST = Stipulated Time.
Note: Marks for value in between the stages indicated above is to be determined by straight line variation basis.</td></tr>
<tr><td>(d)</td><td colspan="2">Performance of works (Quality)</td><td colspan="2">(40 marks)</td></tr>
<tr><td></td><td colspan="2">(i) Very Good
(ii) Good
(iii) Fair
(iv) Poor</td><td colspan="2">40
30
20
0</td></tr>
</table>

SECTION III

INFORMATION REGARDING ELIGIBILITY
LETTER OF TRANSMITTAL

From:

To

Chief Executive Officer,
Diu Smart City Limited,
, Fort Road, Diu- 362520

Subject: Submission of Application for the work **Development of Portuguese street, Diu.**

Having examined the details given in press notice and application document for the above work, I we hereby submit the relevant information.

1. I / we hereby certify that the statement made and information supplied in the enclosed forms A to H and accompanying statement are true and correct.

2. I / we have furnished all information and details necessary for eligibility and have no further pertinent information to supply.

3. I / we submit the requisite certified solvency certificate and authorize **Chief Executive Officer, DIU SMART CITY LTD, Diu, Diu (UT)** to approach the Bank issuing the solvency certificate to confirm the correctness thereof. I / we also authorize **Chief Executive Officer, DIU SMART CITY LTD, Diu,** to approach individuals, employers, firms and corporation to verify our competence and general reputation.

4. I / we submit the following certificates in support of our suitability, technical knowledge and capability for having successfully completed the following works:

Name of work: Certificate from

Enclosures:
Seal of applicant

Date of submission:

Signature(s) of Applicants(s)

FORM 'A'

FINANCIAL INFORMATION

I. Financial Analysis: - Details to be furnished duly supported by figures in balance sheet / profit & loss account for the **last five years** duly certified by the Chartered Accountant, as submitted by the applicant to the Income Tax Department (Copies to be attached).

Year	**Gross Annual turnover on construction works.**	**Profit / Loss**
2013-14		
2014-15		
2015-16		
2016-17		
2017-18		

II. Financial arrangements for carrying out the proposed work.

III. Solvency Certificate from Bankers of the applicant in the prescribed Form 'B'.

Signature of Chartered Accountant with seal Signature of Bidder(s).

FORM 'B'

FORM OF BANKERS' CERTIFICATE FROM A SCHEDULED BANK

This is to certify that to the best of our knowledge and information that M/s. / Sh. …….. having marginally noted address, a customer of our bank are / is respectable and can be treated as good for any engagement up to a limit of Rs……. (Rupees …… …… only).

This certificate is issued without any guarantee or responsibility on the Bank or any of the officers.

(Signature)
For the Bank

Note:-

1. Bankers certificates should be on letter head of the Bank, sealed in cover addressed to tendering authority.
2. In case of partnership firm, certificate should include names of all partners as recorded with the Bank.

FORM 'C'

DETAILS OF ALL WORKS OF SIMILAR CLASS COMPLETED DURING THE LAST SEVEN YEARS ENDING PREVIOUS DAY OF THE LAST DATE SUBMISSION OF TENDERS

S. No.	Name of work / project & location	Owner or sponsoring organization	Cost of work in crores of rupees	Date of commen-cement as per contract	Stipulated date of completion	Actual date of completion	Litigation arbitration cases pending / in progress with details *	Name and address / telephone number of officer to whom reference may be made	Whether the work was done on back to back basis Yes/No
1	2	3	4	5	6	7	8	9	10

* Indicate gross amount claimed and amount awarded by the Arbitrator.

Signature of Applicant(s)

Chief Technical Officer (- - - -) DAO PMC(- - - - -)

Addition: ----------
Correction: ----------
Overwriting: ---------
Deletion: ----------

FORM 'D'

PERFORMANCE REPORT OF WORKS REFERRED TO IN FORMS 'C '

1.	Name of work / project & location	:	
2.	Agreement No.	:	
3.	Estimated cost	:	
4.	Tendered cost	:	
5.	Date of start	:	
6.	Date of completion (i) Stipulated date of completion (ii) Actual date of completion	: :	
7.	(a)Whether case of levy of compensation For delay has been decided or not	:	Yes/No
	(b) If decided, amount of compensation levied for delayed completion if any	:	
9.	Performance report: 1) Quality of work 2) Financial soundness 3) Technical Proficiency 4) Resourcefulness 5) General Behaviour	: : : : :	Outstanding/Very Good / Good / Fair / Poor Outstanding/Very Good / Good / Fair / Poor Outstanding/Very Good / Good / Fair / Poor Outstanding/Very Good / Good / Fair / Poor Outstanding/Very Good / Good / Fair / Poor

Dated: Chief Executive Officer, DIU SMART CITY LTD, or Equivalent

FORM 'E'
STRUCTURE & ORGANISATION

1. Name & address of the applicant

2. Telephone no. / Telex no. / Fax no.

3. Legal status of the applicant (attach copies of original document defining the legal status)

(a) An Individual
(b) A proprietary firm
(c) A firm in partnership
(d) A limited company or Corporation

4. Particulars of registration with various Government Bodies (attach attested photocopy)
   Organization / Place of Registration
   Registration No.

5. Names and titles of Directors & Officers with designation to be concerned with this work.

6. Designation of individuals authorized to act for the organization.
7. Has the bidder or any constituent partner in case of partnership firm/Limited company/Joint Venture, ever been convicted by the court of law? If so give details.

8. In which field of Civil Engineering construction the applicant has specialization and interest?

9. Any other information considered necessary but not included above.

Signature of Applicant(s)

CPWD-6

FOR e-Tendering

1. Item rate bids are invited on behalf of President of India, from firms/ contractors of repute in Three bid system for the work: **Development of Portuguese street, Diu**

   The enlistment of the contractors should be valid on the last date of submission of bids. In case the last date of submission of bid is extended, the enlistment of contractor should be valid on the original date of submission of bids.

Estimated Cost:- Rs. 20,53,68,766 /-

Earnest Money:- Rs. 30,53,690/-

1.1 The work is estimated to cost Estimated Cost:- Estimated Cost:- Rs. 20,53,68,766 /-

This estimate, however, is given merely as a rough guide.

1.2 Intending tenderer is eligible to submit the bid provided he has definite proof from the appropriate authority, which shall be to the satisfaction of the competent authority, of having satisfactorily completed similar works of magnitude specified below:-
Criteria of eligibility for submission of tender documents

1.2.1 Firms/contractors who fulfill the following requirements shall be eligible to apply. Joint ventures are not accepted. Following are initial criteria for eligibility.

(a) Should have satisfactorily completed the works as mentioned below during the last Seven years ending previous day of the last date of bid submission.

(i) Experience of having successfully completed the works as mentioned below during the last Seven years ending previous day of last date of submission of tender

Three similar completed works costing not less than the amount equal to 40% of estimated cost put to tender.

or

Two similar completed works, costing not less than the amount equal to 60% of estimated cost put to tender.

or

One similar completed work of aggregate cost not less than the amount equal to 80% of estimated cost put to tender.

Sector undertaking/ State Autonomous Body/ State Public Sector undertaking / City Development Authority / Municipal Corporation of city formed under any act by central / state Government and published in Central / State Gazette.

The value of executed work shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to last date of receipt of application for tender.

(b) Experience gained as nominated sub-contractor shall be considered provided following conditions are met:

- If the contract signed between the employer and main contractor has provision for sub-contracting and a signed copy of such contract or its relevant part is submitted

- Work completion certificate from the Main Contractor is provided

(c) ***Definition of Similar Nature of work***

Similar nature of work shall mean Street Beautification works or Heritage street developments or Garden development or Infrastructure Development road works with street lighting, utility developments. The similar nature of work showcased to meet initial eligibility and to obtain marks. The right to interpret "similar nature of work" is reserved by Chief Executive Officer, DIU SMART CITY LTD, Diu

For smooth functioning and for the co-ordination among the Contractor, it is important that the Civil Contractor shall appoint Contractor who has executed horticulture works, Street lighting-electrical works, and civil contractor shall submit MOU with above contractor's with the tender.

(iv) Firm must be registered as A Class & Above with Special Building category -I, Special Road Category-II, for state Government, R&B Division or central Government

1.2.2 To become eligible for issue of bid, the bidders shall have to furnish an affidavit asunder:-

1. We undertake and confirm that eligible similar works(s) has/have not been got executed through another contractor on back to back basis. Further that, if such a violation comes to the notice of Department, then I/we shall be debarred for bidding in PWD, works Division 2, Diu in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-in-Charge shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee. **(Scanned copy to be uploaded at the time of submission of bid).**

2. Agreement shall be drawn with the successful bidders on prescribed **Form No. CPWD8** which is available as a Govt. of India Publication and also available on website www.cpwd.gov.inBidders shall quote his rates as per various terms and conditions of the said form which will form part of the agreement.

3. The time allowed for carrying out the work will be from the date of start as defined in schedule 'F' or from the first date of handing over of the site, whichever is later, in accordance with the phasing, if any, indicated in the bid documents.

4. (i)The site for the work is available.
(ii) The Architectural and Structural Drawings and specifications for various components for the work are available and attached separately with NIT.

5. The bid document consisting of indicative specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents except Standard General Conditions of Contract Form can be seen on **website www.daman.nprocure.com or www.nporcure.com** at free of cost.

6. After submission of the bid the contractor can re-submit revised bid any number of times but before last time and date of submission of bid as notified.

7. While submitting the revised bid, contractor can revise the rate of one or more item(s) any number of

times (he need not re-enter rate of all the items) but before last time and date of submission of bid as notified.

8. The Earnest Money of **Rs.** 30,53,690**/-** Drawn in favor of Chief Executive Officer, DIU SMART CITY LTD, Diu, in the shape of FDR/Demand Draft shall be scanned and uploaded to the e-Tendering website within the period of bid submission. It is mandatory to submit tender fees and EMD online failing which the price bid of that agency will not be opened online and Physical submission of such scanned documents shall reach to office of the Chief Executive Officer, DIU SMART CITY LTD, within 3 (three) working days after closing of online bidding. A part of Earnest Money is acceptable in the form of Bank Guarantee also. In such cases 50% of the Earnest Money or Rs. 20 Lakhs whichever is less shall have to be submitted in shape of FDR/Demand Draft prescribed above as and balance can be submitted in form of Bank Guarantee from a Nationalized Bank.

   Copy of enlistment order and certificate of work experience and other document as specified in the press notice shall be scanned and uploaded to the e-tendering website within the period of bid submission. No document shall be entertained in physical manner before approval of Technical bid by the competent authority.

   Online bid documents submitted by intending bidders shall be opened only of those bidders, whose EMD and other documents are found in order as per condition of NIT.

9. The bid submitted shall become invalid if:
   (i) The bidders are found ineligible.
   (ii) The bidders do not upload all the documents **(GST registration)** as stipulated in the bid document.
   (iii) If any discrepancy is noticed between the documents as uploaded at the time of submission of bid and hard copies as submitted physically in the office of tender opening authority.

10. The contractor whose bid is accepted will be required to furnish performance guarantee of 5% (Five Percent) of the bid amount within the period specified in Schedule F. This guarantee shall be in the form of an irrevocable bank guarantee bond of any scheduled bank or the State Bank of India in the prescribed form given in Annexure. In case the contractor fails to deposit the said performance guarantee within the period as indicated in Schedule 'F', including the extended period if any, the Earnest Money deposited by the contractor shall be forfeited automatically without any notice to the contractor. The Earnest money deposited along with tender shall be returned after receiving the aforesaid performance.

11. Intending Bidders are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their bids as to the nature of the ground, the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their bid. A bidders shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charge consequent on any misunderstanding or otherwise shall be allowed. The bidders shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a bid by a bidders implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which stores, tools and plant, etc. will be issued to him by the Government and local conditions and other factors having a bearing on the execution of the work.

12. The competent authority on behalf of the President of India does not bind itself to accept the lowest or

any other bid and reserves to itself the authority to reject any or all the bids received without the assignment of any reason. All bids in which any of the prescribed condition is not fulfilled or any condition including that of conditional rebate is put forth by the bidders shall be summarily rejected.

13. Canvassing whether directly or indirectly, in connection with bidders is strictly prohibited and the bids submitted by the contractors who resort to canvassing will be liable for rejection.

14. The competent authority on behalf of President of India reserves to himself the right of accepting the whole or any part of the bid and the bidders shall be bound to perform the same at the rate quoted.

15. The contractor shall not be permitted to bid for works in the PWD, works Division 2, Diu Circle (Division in case of contractors of Horticulture/Nursery category) responsible for award and execution of contracts, in which his near relative is posted a Divisional Accountant or as an officer in any capacity between the grades of Superintending Engineer and Junior Engineer (both inclusive). He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any gazetted officer to the Chief Executive Officer, DIU SMART CITY LTD,, Diu. Any breach of this condition by the contractor would render him liable to be removed from the approved list of contractors of this Department.

16. No Engineer of Gazetted Rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the Government is allowed to work as a contractor for a period of one year after his retirement from Government service, without the prior permission of the Government of India in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of the Government of India as aforesaid before submission of the bid or engagement in the contractor's service.

17. The tender for the works shall remain open for acceptance for a period of One Twenty (120) days from the date of opening of technical bid. If any tenderer withdraws his tender before the said period or issues of letter of acceptance, whichever is earlier, or makes any modification in the terms and conditions of the tender which are not acceptable to the department, then the Government shall, without prejudice to any other right or remedy, be at liberty to forfeit 50% of the said earnest money as aforesaid. Further the tenderer shall not be allowed to participate in the retendering process of the work

18. This notice inviting Bid shall form a part of the contract document. The successful bidders/contractor, on acceptance of his bid by the Accepting Authority shall within 15 days from the stipulated date of start of the work, sign the contract consisting of:-
    a) The Notice Inviting Bid, all the documents including additional conditions, specifications and drawings, SOQs forming part of the bid as uploaded at the time of invitation of bid and the rates quoted online at the time of submission of bid and acceptance thereof together with any correspondence leading thereto.
    b) Standard CPWD **Form-8 and Rules and directions provided in the General Contract Conditions 2014 published by CPWD.**

Chief Executive Officer, DIU SMART CITY
LTD, Diu,(UT).

PRINCIPAL OF TRANSPARENCY

To,

……..,
……..,
……..

Sub: NIT No. ……. for the work **Development of Portuguese street, Diu.**

Dear Sir,

It is here by declared that Chief Executive Officer, DIU SMART CITY LTD, Diu, is committed to follow the principle of transparency, equity and competitiveness in public procurement.

The subject Notice Inviting Tender (NIT) is an invitation to offer made on the condition that the Bidder will sign the integrity Agreement, which is an integral part of tender/bid documents, failing which the tenderer/bidder will stand disqualified from the tendering process and the bid of the bidder would be summarily rejected.

This declaration shall form part and parcel of the Integrity Agreement and signing of the same shall be deemed as acceptance and signing of the Integrity Agreement on behalf of the President of India.

Yours faithfully

Chief Executive Officer, DIU SMART CITY
LTD, Diu,

Acknowledgement by Bidder for acceptance of principal of integrity

To,

Chief Executive Officer,
Diu Smart City Limited,
Fort Road, Diu -362520 Diu (UT).

Sub: Submission of Tender for the work Development of Portuguese street, Diu.

Dear Sir,

I/We acknowledge that Chief Executive Officer, DIU SMART CITY LTD,, Diu is committed to follow the principles thereof as enumerated in the Integrity Agreement enclosed with the tender/bid document.

I/We agree that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that I/We will sign the enclosed integrity Agreement, which is an integral part of tender documents, failing which I/We will stand disqualified from the tendering process. I/We acknowledge that THE MAKING OF THE BID SHALL BE REGARDED AS AN UNCONDITIONAL AND ABSOLUTE ACCEPTANCE of this condition of the NIT.

I/We confirm acceptance and compliance with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by Chief Executive Officer, DIU SMART CITY LTD,, Diu. I/We acknowledge and accept the duration of the Integrity Agreement, which shall be in the line with Article 1 of the enclosed Integrity Agreement.

I/We acknowledge that in the event of my/our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, Chief Executive Officer, DIU SMART CITY LTD, Diu, shall have unqualified, absolute and unfettered right to disqualify the tenderer/bidder and reject the tender/bid is accordance with terms and conditions of the tender/bid.

Yours faithfully

(Duly authorized signatory of the Bidder)

To be signed by the bidder and same signatory competent / authorized to sign the relevant contract on behalf of president of India.

INTEGRITY AGREEMENT

This Integrity Agreement is made at ..... on this..... day of 2017

BETWEEN

Diu Smart City Ltd represented through **Chief Executive Officer, DIU SMART CITY LTD,, Diu,(UT)** (Hereinafter referred as the which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

AND

……
(Name and Address of the Individual/firm/Company)
through ..... (Hereinafter referred to as the (Details of duly authorized signatory)
"**Bidder/Contractor**" and which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

Preamble

WHEREAS the Principal / Owner has floated the Tender (NIT No. .....) (hereinafter referred to as "**Tender/Bid**") and intends to award, under laid down organizational procedure, contract for ……
(Name of work)
hereinafter referred to as the "**Contract**".

AND WHEREAS the Principal/Owner values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relation with its Bidder(s) and Contractor(s).

AND WHEREAS to meet the purpose aforesaid both the parties have agreed to enter into this Integrity Agreement (hereinafter referred to as "**Integrity Pact**" or "**Pact**"), the terms and conditions of which shall also be read as integral part and parcel of the Tender/Bid documents and Contract between the parties.

NOW, THEREFORE, in consideration of mutual covenants contained in this Pact, the parties hereby agree as follows and this Pact witnesses as under:

Article 1: Commitment of the Principal/Owner

1) The Principal/Owner commits itself to take all measures necessary to prevent corruption and to observe the following principles:

(a) No employee of the Principal/Owner, personally or through any of his/her family members, will in connection with the Tender, or the execution of the Contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

(b) The Principal/Owner will, during the Tender process, treat all Bidder(s) with equity and reason. The Principal/Owner will, in particular, before and during the Tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the Tender process or the Contract execution.

(c) The Principal/Owner shall endeavor to exclude from the Tender process any person, whose conduct in the past has been of biased nature.

2) If the Principal/Owner obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal code (IPC)/Prevention of Corruption Act, 1988 (PC Act) or is in violation of the principles herein mentioned or if there be a substantive suspicion in this regard, the Principal/Owner will inform the Chief Vigilance Officer and in addition can also initiate disciplinary actions as per its internal laid down policies and procedures.

Article 2: Commitment of the Bidder(s)/Contractor(s)

1) It is required that each Bidder/Contractor (including their respective officers, employees and agents) adhere to the highest ethical standards, and report to the Government / Department all suspected acts of **fraud or corruption or Coercion or Collusion** of which it has knowledge or becomes aware, during the tendering process and throughout the negotiation or award of a contract.

2) The Bidder(s)/Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Tender process and during the Contract execution:

a) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal/Owner's employees involved in the Tender process or execution of the Contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the Tender process or during the execution of the Contract.

b) The Bidder(s)/Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to cartelize in the bidding process.

c) The Bidder(s)/Contractor(s) will not commit any offence under the relevant IPC/PC Act. Further the Bidder(s)/Contract(s) will not use improperly, (for the purpose of competition or personal gain), or pass on to others, any information or documents provided by the Principal/Owner as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

d) The Bidder(s)/Contractor(s) of foreign origin shall disclose the names and addresses of agents/representatives in India, if any. Similarly Bidder(s)/Contractor(s) of Indian Nationality shall disclose names and addresses of foreign agents/representatives, if any. Either the Indian agent on behalf of the foreign principal or the foreign principal directly could bid in a tender but not both. Further, in cases where an agent participate in a tender on behalf of one manufacturer, he shall not be allowed to quote on behalf of another manufacturer along with the first manufacturer in a subsequent/parallel tender for the same item.

e) The Bidder(s)/Contractor(s) will, when presenting his bid, disclose (with each tender as per proforma enclosed) any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract.

3) The Bidder(s)/Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

4) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm indulge in fraudulent practice **means a willful misrepresentation or omission of facts or submission of fake/forged documents in order to induce public official to act in reliance thereof, with the purpose of obtaining unjust advantage by or causing damage to justified interest of others and/or to influence the procurement process to the detriment of the Government interests.**

5) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm use Coercive Practices (means the act of obtaining something, compelling an action or influencing a decision through intimidation, threat or the use of force directly or indirectly, where potential or actual injury may befall upon a person, his/ her reputation or property to influence their participation in the tendering process).

Article 3: Consequences of Breach

Without prejudice to any rights that may be available to the Principal/Owner under law or the Contract or its established policies and laid down procedures, the Principal/Owner shall have the following rights in case of breach of this Integrity Pact by the Bidder(s)/Contractor(s) and the Bidder/ Contractor accepts and undertakes to respect and uphold the Principal/Owner's absolute right:

1) If the Bidder(s)/Contractor(s), either before award or during execution of Contract has committed a transgression through a violation of Article 2 above or in any other form, such as to put his reliability or credibility in question, the Principal/Owner after giving 14 days' notice to the contractor shall have powers to disqualify the Bidder(s)/Contractor(s) from the Tender process or terminate/determine the Contract, if already executed or exclude the Bidder/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Principal/Owner. Such exclusion may be forever or for a limited period as decided by the Principal/Owner.

2) **Forfeiture of EMD/Performance Guarantee/Security Deposit**: If the Principal/Owner has disqualified the Bidder(s) from the Tender process prior to the award of the Contract or terminated/determined the Contract or has accrued the right to terminate/determine the Contract according to Article 3(1), the Principal/Owner apart from exercising any legal rights that may have accrued to the Principal/Owner, may in its considered opinion forfeit the entire amount of Earnest Money Deposit, Performance Guarantee and Security Deposit of the Bidder/Contractor.

3) **Criminal Liability:** If the Principal/Owner obtains knowledge of conduct of a Bidder or Contractor, or of an employee or a representative or an associate of a Bidder or Contractor which constitutes corruption within the meaning of Indian Penal code (IPC)/Prevention of Corruption Act, or if the Principal/Owner has substantive suspicion in this regard, the Principal/Owner will inform the same to law enforcing agencies for further investigation.

Article 4: Previous Transgression

1) The Bidder declares that no previous transgressions occurred in the last 5 years with any other Company in any country confirming to the anticorruption approach or with Central Government or State Government or any other Central/State Public Sector Enterprises in India that could justify his exclusion from the Tender process.

2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the Tender process or action can be taken for banning of business dealings/ holiday listing of the Bidder/Contractor as deemed fit by the Principal/ Owner.

3) If the Bidder/Contractor can prove that he has resorted / recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal/Owner may, at its own discretion, revoke the exclusion prematurely.

Article 5: Equal Treatment of all Bidders/Contractors/Subcontractors

1) The Bidder(s)/Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact. The Bidder/Contractor shall be responsible for any violation(s) of the principles laid down in this agreement/Pact by any of its Subcontractors/ sub-vendors.
2) The Principal/Owner will enter into Pacts on identical terms as this one with all Bidders and Contractors.
3) The Principal/Owner will disqualify Bidders, who do not submit, the duly signed Pact between the Principal/Owner and the bidder, along with the Tender or violate its provisions at any stage of the Tender process, from the Tender process.

Article 6- Duration of the Pact

This Pact begins when both the parties have legally signed it. It expires for the Contractor/Vendor **365 days** after the completion of work under the contract or till the continuation of defect liability period, whichever is more and for all other bidders, till the Contract has been awarded.

If any claim is made/lodged during the time, the same shall be binding and continue to be valid despite the lapse of this Pacts as specified above, unless it is discharged/determined by the Competent Authority, Chief Executive Officer, DIU SMART CITY LTD,, Diu.

Article 7- Other Provisions

1) This Pact is subject to Indian Law, place of performance and jurisdiction is the **Head quarters of the Division** of the Principal/Owner, who has floated the Tender.

2) Changes and supplements need to be made in writing. Side agreements have not been made.

3) If the Contractor is a partnership firm, this Pact must be signed by all the partners or by one or more partner holding power of attorney signed by all partnership firm members. In case of a Company, the Pact must be signed by a representative duly authorized by board resolution.

4) Should one or several provisions of this Pact turn out to be invalid; the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intensions.

5) It is agreed term and condition that any dispute or difference arising between the parties with regard to the terms of this Integrity Agreement / Pact, any action taken by the Owner/Principal in accordance with this **Integrity Agreement/ Pact or interpretation thereof shall not be subject to arbitration.**

Article 8- LEGAL AND PRIOR RIGHTS

All rights and remedies of the parties hereto shall be in addition to all the other legal rights and remedies belonging to such parties under the Contract and/or law and the same shall be deemed to be cumulative and not alternative to such legal rights and remedies aforesaid. For the sake of brevity, both the Parties agree that this Integrity Pact will have precedence over the Tender/Contact documents with regard any of the provisions covered under this Integrity Pact.

IN WITNESS WHEREOF the parties have signed and executed this Integrity Pact at the place and date first above mentioned in the presence of following witnesses:

.....
(For and on behalf of Principal/Owner)
.....
(For and on behalf of Bidder/Contractor)

WITNESSES:
.....
(signature, name and address)
.....
(signature, name and address)
Place:
Dated :

Diu Smart City Limited, Diu

STATE/UT : Daman &Diu
CIRCLE : PWD Daman.

BRANCH : Chief Executive Officer, DIU SMART CITY LTD,, Diu
DIVISION :
ZONE :

Item Rate Tender & Contract for Works

(A) Tender for the work of :- **Development of Portuguese street, Diu.**

(i) To be submitted online by .....(30-03-2019)..... at 17:00 Hrs.
(ii) Pre Bid conference .....(25-03-2019).....at 15:00 Hrs.
(iii) Technical Bid to be opened online on.....(03-04-2019).....at 11:00 Hrs**.**
(iv) Financial Bid to be opened online on-to be intimated later on.

T E N D E R

I/We have read and examined the notice inviting tender, schedule, A, B, C, D ,E & F. Specifications applicable, Drawings & Designs, General Rules and Directions, Conditions of Contract, clauses of contract, Special conditions, Schedule of Rate & other documents and Rules referred to in the conditions of contract and all other contents in the tender document for the work.

I/We hereby tender for the execution of the work specified for the Chief Executive Officer, DIU SMART CITY LTD, Diu, within the time specified in Schedule 'F', viz., schedule of quantities and in accordance in all respects with the specifications, designs, drawings and instructions in writing referred to in Rule-1 of General Rules and Directions and in clause 11 of the Conditions of contract and with such materials as are provided for, by, and in respects in accordance with, such conditions so far as applicable.

We agree to keep the tender open for acceptance for the period of One Twenty (120) days from the date of opening of technical bid and not to make any modifications in its terms & conditions.

A sum of **Rs.** 30,53,690/- is hereby submitted as earnest money. If I/We fail to furnish the prescribed performance guarantee within prescribed period, I/We agree that the said Chief Executive Officer, DIU SMART CITY LTD, Diu, spicor his successors in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further, If I/ We fail to commence work as specified, I/We agree that Chief Executive Officer, DIU SMART CITY LTD, Diu,or his successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise the said earnest money shall be retained by him towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to therein and to carry out such deviations as may be ordered, upto maximum of the percentage mentioned in Schedule 'F' and those in excess of that limit at the rates to be determined in accordance with the provision contained in Clause 12.2 and 12.3 of the tender form.

Further, I/We agree that in case of forfeiture of Earnest Money or both Earnest Money and performance guarantee as aforesaid, I / We shall be debarred for participation in the re-tendering process of the work.

I/We undertake and confirm that eligible similar work(s) has/have not been got executed through

another contractor on back to back basis. Further that, if such a violation comes to the notice of Department, then I/we shall be debarred for tendering in PWD, works Division 2, Diu in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-in-Charge shall be free to forfeit the entire amount of Earnest pay Deposit/Performance Guarantee.

I/We hereby declare that I/We shall treat the tender documents drawings and other records connected with the work as secret/confidential documents and shall not communicate information / derived therefrom to any person other than a person to whom I/We, am/are authorised to communicate the same or use the information in any manner prejudicial to the safety of the state.

Dated …………………

Signature of the Contractor
Postal Address --
Telephone No.--
FAX -------------------------------------
E-MAIL --

Witness:----------------------------- -----
Address:--------------------------------
Occupation:----------------------------

ACCEPTANCE

The above tender (as modified by you as provided in the letters mentioned hereunder) is accepted by me for and on behalf President of India for a sum of Rs. *_ _ _ _ _ _ _ _ _ (Rupees *_)

The letters referred to below shall form part of this contract Agreement:-

(a) -----------------------------*
(b) -----------------------------*
(c) ----------------------------*

For & on behalf of the Chief Executive Officer, DIU SMART CITY LTD,, Diu

Signature…………………………..

Dated …………….

Designation…………………………….

SCHEDULES

SCHEDULE 'A'
Schedule of quantities, enclosed as separate file to the NIT.

SCHEDULE 'B'
Schedule of materials to be issued to the contractor:

S.No.	Description of item	Quantity	Rates in figures & words at which the material will be charged to the contractor.	Place of issue
1	2	3	4	5
---------- NIL ----------				

SCHEDULE 'C'
Tools and plants to be hired to the contractor:

Sl. No.	Description	Hire charges per day	Place of issue
1	2	3	4
---------- NIL ----------			

SCHEDULE 'D'
Extra schedule for specific requirements / documents for the work, if any. **NIL**

SCHEDULE 'E'
Reference to General Conditions of contract: As per the form no. CPWD 8 and General Contract Conditions- 2014 Published by CPWD for Civil works which is available on CPWD website at http://cpwd.gov.in/Publication/GCC14.pdf.

Name of work:- **Development of Portuguese street, Diu**

Estimated cost of work:- **Rs. 20,53, 68,766/-**

(i) Earnest money:- **Rs.** 30,53,690 **/-**to be returned after receipt of Performance Guarantee

(ii) Performance Guarantee:- **5% of tendered Value.**

(iii) Security deposit :- 2.5**% of tendered Value to be deducted from the running bills**

SCHEDULE 'F'

General Rules & Directions: -

Officer inviting tender:		Chief Executive Officer, DIU SMART CITY LTD,, Diu
Definitions:		
2 (v)	Engineer-in-Charge	Chief Technical Officer, DIU SMART CITY LTD,, Diu, Diu (UT)
2 (viii)	Accepting Authority	Chief Executive Officer, DIU SMART CITY LTD

Addition: ----------
Correction: ----------
Overwriting: ---------
Deletion: ----------

Chief Technical Officer (- - - -) DAO PMC(- - - - -)

2 (x)	Percentage on cost of materials and labour to cover all overheads and profits.	15%
2 (xi)	Standard schedule of Rates	Rajkot R & B Division, Junagadh district 2015-16, Gujarat State Electrical SOR 2015.
2 (xii)	Department	Diu Smart city Limited
9 (ii)	Standard CPWD contract form	CPWDform8 and General Contract Conditions 2014 published by CPWD& corrected up to the date of bidding.
Clause 1 (i) Time allowed for submission of Performance Guarantee from the date of issue of letter of acceptance. (ii) Maximum allowable extension with late fee @ 0.1% per day of the Performance Guarantee beyond the period provided in (i) above.		15 days 15 days
Clause 2 Authority for fixing compensation under clause 2.		Chief Technical Officer, DIU SMART CITY LTD, Diu
Clause 2A Whether Clause 2A shall be applicable		**No**
Clause 5 Number of days from the date of issue of letter of acceptance for reckoning date of start		**22 days**

Table of Mile Stones

S.No.	Description Milestone	Time Allowed in days (from date of start)	Amount to be with held in case of non achievement of mile stone
1.	1/8 of the whole work	1/4 of the whole work	In the event of non achieving the necessary progress as assessed from the running payments, 1% of tendered value of work will be with held for failure of each mile stone.
2.	3/8 of the whole work	1/2 of the whole work	
3.	3/4 of the whole work	3/4 of the whole work	
8.	Full	Full	

Time allowed for execution of work **365 days (12 months)**

Authority to decide:	
1. Extension of time 2. Rescheduling of mile stones 3. Shifting of date of start incase of delay in handing over of the site	Chief Executive Officer, DIU SMART CITY LTD, Diu Chief Executive Officer, DIU SMART CITY LTD, Diu Chief Executive Officer, DIU SMART CITY LTD, Diu
Clause 6, 6A **Clause applicable – (6 or 6A)**	**Clause 6A**
Clause 7 Gross work to be done together with net payment / adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment.	**Rs. 2.25 Crores or as decided by Engineer-in- Charge.** **Subject to Compliance of satisfactory test results from Approved laboratory for different items of work which includes NDT, Core Cutting etc…**
Clause 10A List of testing equipment to be provided by the contractor at site lab.	**As per CPWD Specification-2009 Volume-I & II and relevant IS Codes.** Testing equipment's required at site should be as below. 1. Cube testing machine 2. Set of cube moulds for concrete 3. Slump Testing Cone 4. Rapid moisture master 5. Weighing balance (scientific & Conventional) 6. Set of sieves 7. Vernier calipers 8. Theodolite and allied instruments 9.Calibrated Glass Jars 10.Automatic Ovens 11. Any other equipments as desired by Engineer in Charge.
Clause 10 – B(ii) Whether clause 10-B(ii) shall be applicable	**Not Applicable**
Clause 10C – Component of labour expressed as percent of value of work	**Not Applicable**

Clause 10 CA:-

S.No.	Materials covered under this clause	**Applicable All India Price Index (Base 2011-2012 = 100)**	Base price and its corresponding period of all the materials covered under clause 10CA **	
			Base price	Corresponding period
1	Cement (PPC)	**109.9***	*Rs. 4756/- mt*	2015-16
2	Reinforcement Bars TMT-FE 500D			
(i)	Primary Producer	**82***	Rs. 3675/- per quintal	2015-16
3	Structural Steel	**85.6***	Rs. 4497/- Per quintal	2015-16
4	Bitumen (VG30) Bulked		Rs.28800/-mt	16th Feb. 2019(Koyali)

* WPI for financial year 2016-17.

** Base price and its corresponding period of all the materials covered under clause 10CA is to be mentioned at the time of approval of NIT. In case of recall of tenders the base price may be modified by adopting latest base price, and its corresponding period.

Clause 10CC – Not Applicable (Clause 10CC to be applicable in contracts with stipulated period of completion exceeding the period shown in next column.) Schedule of component of other Materials, Labour, POL etc. for price escalation	Exceeding 12 Months
Component of civil (Except materials covered under clause 10 CA)/ Electrical construction materials expressed as percent of total value of work. Total material %=75%	Xm= - - - - (to be worked out after deducting material of 10CA from 75%)
Component of labour expressed as percent of total value of work.	Y =25%
Component of POL expressed as percent of total value of work. Note: Xm…..% should be equal to (100)-(materials covered under clause 10CA i.e. Cement, Steel and other material specified in clause 10CA + Component of Labour + Component of P.O.L)	Z = NIL

Clause 11: Specifications to be followed for execution of work.	CPWD Specification for works-2009 Vol I &II with up to date correction slips till last date of submission of tender and as detailed in nomenclature of items.

Clause 12:- Type of work:-**Original Work**

Clause 12.2.& 12.3

Deviation limit beyond which clauses 12.2 & 12.3 shall apply for **Super Structure**.	**30%**
Deviation limit beyond which clauses 12.2 & 12.3 shall apply for **foundation work**.	**100%**

Clause 16 Competent Authority for deciding reduced rates.	Chief Executive Officer, DIU SMART CITY LTD or Chief Technical Officer, DIU SMART CITY LTD, Diu.

Clause 18
List of mandatory machinery, tools & plants to be deployed by the contractor at site.

1.	Hopper Mixer	2
2.	Truck/Tipper/Transit Mixer	4
3.	Steel shuttering	As per Requirement to complete the work
4.	Crane	1
5.	Building Hoist	1
6.	Excavator	4
7.	Batch Mix Plant	1
8.	Tendom Roller	1
9.	Vibration Compactor	1
10.	Paver Finisher	1
11.	Hot Mix Plant	1
12.	Special Equipment	3
13	Pump for de- watering	2
14	Tractor	1
15	Cube testing machine	1
16	Min Laboratory with all equipment	1
17	Steel cutting and bending machine	1
18	Electric weight scale	1

Clause 25 **Constitution of Dispute Redressal Committee:**	**(a) For total claims more than Rs. 25.00 lakh.** **As per manual provision** **(b) For total claims up to Rs. 25.00 lakh.** As per manual provision

Clause 36(i)

Requirement of Technical Representative (s) and Recovery Rates

Sl. No.	Minimum Qualification of Technical Representative	Discipline	Designation ((Principal Technical / Technical Representative)	Minimum Experience	Number	Rate at which recovery shall be made from the contractor in the event of not fulfilling provision of clause 36 (i)	
						Figures (in Rs.)	Words
1	Graduate Engineer	Civil Engineer	Project Manager	20	1	Rs. 60,000/- per Month	Rs. Sixty Thousand per Month Only
2	Graduate Engineer		Deputy Project Manager	12	1+1	Rs. 40,000/- per Month/per person	Rs. Forty Thousand per Month Only
3	Graduate Engineer or Diploma Holder Engineer		Project/ site engineer	5 10	2+1	Rs. 25,000/- per Month	Rs. Twenty five Thousand per Month Only
4	Graduate Engineer		Quality Engineer	8	1	Rs. 25,000/- per Month	Rs. Twenty five Thousand per Month Only
5	Diploma Engineer		Surveyor	8	1	Rs. 15,000/- per Month	Rs. Fifteen Thousand per Month Only
6	Graduate Engineer		Project planning /billing engineer	6	1+1	Rs. 15,000/- per Month	Rs. Fifteen Thousand per Month Only

Assistant Engineers retired from Government services that are holding Diploma will be treated at par with Graduate Engineers.

Diploma holders with minimum 10 years relevant experience with a reputed construction co. can be treated at per with Graduate Engineers for the purpose of such deployment subject to the condition that such diploma holders should not exceed 50% of requirement of degree engineers.

Clause 42

(i)	(a) Schedule/statement for determining the theoretical quantity of cement & bitumen on the on basis Junagadh District SOR 2015-2016 /Market rate	
(ii)	Variations permissible on theoretical quantities:	
a)	Cement for works with estimated cost put to tender not more than Rs. 5 lakhs	3% plus/minus
	for works with estimated cost put to tender more than Rs 5 lakh	2% plus/minus
b)	Bitumen for all works.	2.5% plus only & nil on minus side
c)	Steel Reinforcement and structural steel sections for each diameter, section and category.	2% plus/minus
d)	All other materials.	Nil

RECOVERY RATES FOR QUANTITIES BEYOND PERMISSIBLE VARIATION

Sl. No	Description of Item	Rates in figures and words at which recovery shall be made from the Contractor.	
		Excess beyond permissible variation	Less use beyond the permissible variation
1	**Cement**	**Nil**	**Rs.** 4756/- (Rupees Four thousand Seven Hundred Fifty six only) Per MT
2	**Reinforcement Bars (TMT)** **(a) Primary Prouder** **(b) Secondary Producer**	**Nil** **Nil**	Rs. 3675/- (Rupees Three Thousand Six Hundred seventy Five only) Per QT
3	**Structural steel**	**Nil**	**Rs.**4497/- (Rupees Four Thousand Four Hundred Ninety Seven Only) Per QT

PERFORMANCE GUARANTEE

(i) The contractor shall submit an irrevocable Performance Guarantee of 5% (Five percent) of the tendered amount in addition to other deposits mentioned elsewhere in the contract for his proper performance of the contract agreement, (not withstanding and/or without prejudice to any other provisions in the contract) within period specified in Schedule 'F' from the date of issue of letter of acceptance. This period can be further extended by the Engineer-in-Charge up to a maximum period as specified in schedule 'F' on written request of the contractor stating the reason for delays in procuring the Performance Guarantee, to the satisfaction of the Engineer-in-Charge. This guarantee shall be in the form of Cash (in case guarantee amount is less than Rs. 10,000/-) or Deposit at Call receipt of any scheduled bank/Banker's Cheque of any scheduled bank/Demand Draft of any scheduled bank/Pay Order of any scheduled bank (in case guarantee amount is less than Rs. 1,00,000/-) or Government Securities or Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the form annexed hereto. In case a fixed deposit receipt of any Bank is furnished by the contractor to the Government as part of the performance guarantee and the Bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the Government to make good the deficit.

(ii) The Performance Guarantee shall be initially valid up to the stipulated date of completion plus 60 days beyond that. In case the time for completion of work gets enlarged, the contractor shall get the validity of Performance Guarantee extended to cover such enlarged time for completion of work. After recording of the completion certificate for the work by the competent authority, the performance guarantee shall be returned to the contractor, without any interest.

(iii) The Engineer-in-Charge shall not make a claim under the performance guarantee except for amounts to which the Chief Executive Officer, DIU SMART CITY LTD, Diu, is entitled under the contract (not withstanding and/or without prejudice to any other provisions in the contract agreement) in the event of:

(a) Failure by the contractor to extend the validity of the Performance Guarantee as described herein above, in which event the Engineer-in-Charge may claim the full amount of the Performance Guarantee.

(b) Failure by the contractor to pay Chief Executive Officer, DIU SMART CITY LTD, Diu, any amount due, either as agreed by the contractor or determined under any of the Clauses/Conditions of the agreement, within 30 days of the service of notice to this effect by Engineer-in-Charge.

(iv) In the event of the contract being determined or rescinded under provision of any of the Clause/Condition of the agreement, the performance guarantee shall stand forfeited in full and shall be absolutely at the disposal of the Chief Executive Officer, DIU SMART CITY LTD,, Diu.

ADDITIONAL CONDITIONS

1. The contractors are advised to inspect and examine the site and its surroundings and satisfy himself with the nature and extent of site and work, the hydrological and climatic conditions the means of access to the site, the constraints of space for stacking material/machinery, labour etc. he requires, if any, weather conditions at site, general ground/subsoil conditions etc. or any other circumstances which may affect or influence their bid. No claim, whatsoever, shall be entertained from the bidder, on the plea that the information supplied by the Owner Is insufficient or is at variance to the actual site conditions.

2. The work shall be carried out as per **CPWD specifications for works-2009 Vol. I & II** with up to date correction slips unless otherwise specified in the nomenclature of individual item or in the specifications and special conditions, where specifications are silent, the decision of Engineer-in-Charge shall be final and binding on contractors.

3. The rates for different items of work shall apply for all heights and depths, leads and lifts unless otherwise specified in the agreement or specifications applicable to the agreement.

4. Any damage done by the contractor to any existing work during the course of execution of the work shall be made good by him at his own cost.

5. The contractor should preserve and protect the construction already carried out by him during the entire course of work as well as during rainy season from flood. Any such damage to works will be rectified by contractor at his risk and cost.

6. Articles manufactured by the reputed firms and approved by Engineer-in-Charge shall only be used. Only articles classified, as 'first quality' by the manufacturer shall be used unless otherwise specified. In case articles bearing ISI certification are not available in the market, quality of samples brought by the contractor shall be judged by standards laid down in the relevant CPWD specifications. For the items not covered by CPWD specifications relevant BIS standards shall apply. The sample of materials to be brought to site for use in work shall be got approved from the Engineer-in-Charge before actual execution of work.

7. The contractor shall submit a detailed programme of work within 15 days of the date of issue of letter of intent. Detailed programme should include all the mile stone, cash flow, material procurement, manpower deployment. Program must show clearly the critical path to complete the project in time. The Engineer-in-Charge can modify the programme and the contractor shall have to work accordingly. During review of work progress, Engineer in Charge can ask to modify the programme. Contractor shall resubmit the modified programme in 2 days.

8. The quantities of each item shall not be exceeded beyond the agreement quantities without prior permission of Engineer-in-Charge.

9. Statutory deductions on account of GST, income tax and surcharge as applicable shall be made from the gross amount of the bill.

10. The contractor shall make his own arrangements for obtaining electric connection, if required and make necessary payments directly to the department concerned.

11. The Employer shall in no way be responsible for either any delay in getting electric and/or water and/or telephone connections for carrying out the work or not getting connection at all and no claim whatsoever

on this account shall be entertained from the contractor. Also contingency arrangement of standby water & electric supply shall be made by the contractor for smooth progress of the work on account of power failure or disconnection for any reason whatsoever it may be. No claim of any kind whatsoever shall be entertained on this account from the contractor. Nothing extra shall be payable on this account.

12. All types of mortars to be used in the work shall be mixed in the mechanical mixer and hand mixing shall not be permitted.

13. The contractor shall make his own arrangement for getting the permission to ply the trucks from the traffic police.

14. No payment shall be made to the contractor for any damage caused by rain, snow fall, floods or any other natural causes whatsoever during the execution of work. The damage caused to work shall have to be made good by the contractor at his own cost and no claim on this account shall be entertained.

15. Other agencies may also simultaneously be executing the work of electrification, Horticulture or external services and other building works for the same building. Along with this work. The contractor shall afford necessary facilities for the same and no claim in the matter shall be entertained. The contractor shall especially co-ordinate with the other agencies carrying out their work.

16. Some restrictions may be imposed by the security staff etc. on the working and or movement of labor and materials, etc., the contractor shall be bound to follow all such restrictions / instructions and nothing shall be payable on this account.

17. The contractor shall take all precautions to avoid accidents by exhibiting necessary caution boards. He shall be responsible for all damages and accidents caused due to negligence on his part. No hindrance shall be caused to traffic during the execution of the work by storing materials on the road.

18. The contractor shall be fully responsible for the safe custody of the material issued or brought by him to site for doing the work.

19. Testing of materials: -
    In case there is any discrepancy in the frequency of testing as given in the list of mandatory test and that in the individual sub-head of work as per the **CPWD specifications for works-2009 Vol-I & II and relevant IS-Code** with upto date correction slips, the higher of the two frequencies shall be followed and nothing extra shall be payable to the contractor on this account.

    Contractor shall carryout all required test pre and post construction including NDT for cement, steel, flooring tiles, piles (load test and integrity test etc..) or any other item related to construction without claiming any extra cost what so ever from the employer in this regard.

    Samples of all fittings and fixture to be provided shall be got approved from the Engineer-in-charge before use in the work.

20. The rate for all items of work, shall unless otherwise clearly specified include cost of all labour, material and other inputs including making of any sleeves, core cuts, core cut filling material, expansion materials, weather prevention coats, clamps, bolts, nuts etc. involved in the execution of the items. All Items to be executed in line with the drawings provided in the tender. Rates to be quoted taking in account tender drawings and details. No extra payment shall be entertained against such items.

21. The order of preference in case of any discrepancy as indicated in condition no. 8.1 under "Conditions of Contract" given in the **General Conditions of contract for Central P.W.D work 2014**(with amended up to last date of submission of tender) form may be read as the following.
    a. Description of Schedule of quantities.
    b. Additional Specifications and special conditions, if any.
    c. Contract clauses of **General conditions of contract for Central P.W.D works 2014**(with amended up to last date of submission of tender) form.
    d. CPWD Specifications.
    e. Architectural drawings.
    f. Indian Standard Specifications / BIS.
    g. Sound engineering practice.

    Any reference made to any Indian Standard Specifications in these documents, shall imply to the latest version of that standard, including such revisions / amendments as issued by the Bureau of Indian Standards up to last date of receipt of tenders. The contractor shall keep at his own cost all such publications of relevant Indian Standards applicable to the work at site.

22. Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and their payment, housing, feeding and transport.

23. The contractor shall make his own arrangement of water for construction and drinking purpose as well for electricity and its distribution at his own cost. The department will render only assistance to the contractor for making application to DJB/ authorised Electric supply agency, if required. All the fees and charges including consumption charges shall be borne by the contractor. The water should be as per CPWD specifications, 2009.

24. The contractor will not have any claim in case of any delay by the Engineer-in-Charge in removal of trees or shifting, removing of telegraph, telephone or electric lines (overhead or underground), water and sewer lines and other structure etc., if any which may come in the way of the work. However, suitable extension of time can be granted to cover such delay.

25. The malba /garbage generated at site due to construction activities shall be removed from the site immediately & shall be disposed off by the contractor to the approved dumping site identified by the Engineer-in-charge. The surplus soil/earth shall be disposed of as per the directions of Engineer-in-charge separately.

26. The contractor shall clean the site thoroughly of scaffolding materials, rubbish, equipments left out of his work and dress the site around the building to the complete satisfaction of the Engineer-in-charge before the work is treated as completed.

27. Relation with Public Authorities

The contractor shall comply with all obligations arising out of legal orders and directions that may be given to him from time to time, by any local or public authorities and shall pay out of his own money, all charges becoming payable to such authorities. He shall co-ordinate his activities during execution, with all agencies including PWD, Design Consultants, and Construction management consultants, agencies like DDED (Daman & Diu Electricity department), GEB (Gujarat Electricity Board), DMC (Daman Municipal Corporation), PWD (Public Works Development), Government of Gujarat Daman Telephones and their representatives without any dispute.

28. Foreign Exchange Requirement

It should be clearly understood that no foreign exchange sanction would be made available for either purchase of equipments, plants, machinery's, material of any kind or any other thing, required for execution of the work. It should also be clearly understood that no request for importing equipments, materials, plants, etc. that may be required in carrying out the work shall be entertained.

29. The labor welfare cess/ fund @ 1% of gross work done shall be deducted.

30. **Maintenance of Register of Tests**- All the registers of tests carried out at Construction Site or in outside laboratories shall be maintained by the contractor which shall be issued to the contractor by Engineer-in-Charge.

31. **Maintenance of Material at Site (MAS) Register**- All the MAS Registers shall be maintained by Contractor which shall be issued to the contractor by Engineer-in-Charge.

32. Contractor shall be responsible for safe custody of all the test registers.

33. Avoidance to damage of roads. :

The Contractor shall ensure that no damage to roads and bridges on the route to the sites occurs due to his or his subcontractor's traffic. He shall ensure minimum possible hindrance to the traffic movements on public roads and bridges due to his materials, plant, temporary works etc. No materials shall be stacked on public roads and thoroughfares.

34. Barricading

i. The site is to be barricaded on all sites with 3m high GS sheets.
ii. The detailed design of barricading of considering height of barricade, wind load etc. should be prepared by contractor. The design calculation and working drawing will be provided by the contractor & approved by Engineer- in- Charge. The G.S sheet barricading will be designed above the wall area on the iron frame embedded properly in concrete block.
iii. Access gate of adequate sized opening in barricading should be provided to allow smooth flow of contractor's machinery, trucks, trailers etc.
iv. Contractor shall take measures to maintain the integrity of the barricade and will maintain safe work condition at site.
v. Contractor shall write Chief Executive Officer, DIU SMART CITY LTD, Diu, name and logo at suitable interval over a primary coat of red oxide zinc chromate primer and paint as directed by Engineer-in-Charge.
vi. After successful completion of work, all the barricading will be dismantled / removed by contractor and it will be the property of contractor.
vii. The work of barricading mentioned as above shall be executed by the agency at his own cost and nothing shall be paid on this account.

35. Discoveries

Anything of geological or archaeological or other interest or articles of value or antiquity discovered on the Site shall be the absolute property of the Employer. The Contractor is to notify the Engineer of such discoveries and carry out the Engineer's instructions for dealing with them without damages, thefts etc. In carrying out the Engineers instructions to dealing with such articles if the contractor incurs extra costs or suffers delays, the Engineer shall determine after due consultation with the Employer and the Contractor amounts of such costs and extension of time in accordance with the corresponding clauses of the contract.

36. Refund of security deposit regarding specialized items of work

(1)For some of the specialized items of work such as waterproofing works, Sanitary installations/ Water Supply/ Drainage Works, Aluminum Doors/ Windows/ ventilators/ Structural Glazing Works, Stone/ Tile Works, kiln seasoned and chemically treated wooden shutters etc. that are entrusted to specialized firms or registered contractors who associate specialized agencies, the contractor/firm executing the work should be asked to give a specific guarantee that they shall be responsible for removal of any defects cropping up in these works executed by them during the guarantee period. The form of the guarantee to be executed by the contractors is given vide Annexure I to V.

(2)It has further been decided that 2.5% of the security deducted from the bills of the contractors shall be refunded to him after expiry of maintenance period in accordance with the terms of the contract in this behalf.

37. Settlement of Disputes:

If the Contractor believes that a decision taken by the Engineer was either outside the authority given to the Engineer by the Contract or that the decision was wrongly taken, the decision shall be referred to the Dispute Review Expert (also referred to as adjudicator) within 14 days of the notification of the Engineer's such decision.

Procedure for Disputes resolution:

- The Dispute Review Expert shall give a decision in writing within 28 days of receipt of a notification of a dispute.
- Dispute Review Expert shall be paid daily at the rate specified in the Contract Data together with reimbursable expenses of the types specified in the Contract Data and the cost shall be divided equally between the Employer and the Contractor, whatever decision is reached by the Adjudicator. Either party may refer a decision of the Adjudicator to an Arbitrator within 28 days of the Dispute Review Expert written decision. If neither party refers the dispute to arbitration within the next 28 days, the Dispute Review Expert decision will be final and binding.

38. Cost control

A. Variations

a. The Engineer shall make any variation of form, quality or quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion, be appropriate, he shall have the authority to instruct the Contractor to do and the Contractor shall do any of the following:
   - Increase or decrease the quantity of any work included in the contract,
   - Omit any such work,
   - Change the character or quality or kind of any such work,
   - Execute additional work of any kind necessary for the completion of the Works or
   - Change any specified sequence or timing of construction of any part of work.

   No such variation shall in any way vitiate or invalidate the contract, but the effects, if any, of all such variations shall be valued in accordance with the following sub clauses. Provided that where the issue of an instruction to vary the Works is necessitated by some default or breach of contract by contractor or for which he is responsible, any additional cost attributable to such default shall be borne by the Contractor.

b. The Contractor shall not make any such variation without an instruction of the Engineer. No instruction is required for quantities varying from those provided for the items in the contract bill of quantities.

B. Valuation of Variations

a. The basis for the valuation of variations for addition to the contract price shall be as follows in the same order of priority.

b. Contract unit rates for individual items shall apply to varied quantities where there is a quantity variation.

c. In case of other types of variations following procedure shall apply.

- If the Contract does not contain any rates or prices applicable to the varied work, the rates and prices in the Contract shall be used as a basis for valuation so far as may be reasonable. If this fails
- Suitable rates or prices shall be agreed upon between the Engineer and the Contractor after due consultations among the Employer, the Engineer and the Contractor. These shall be based on
- The material costs, the labour costs, the cost of use of all plant, machinery and equipment, the cost of all temporary and incidental works, the overheads and the Contractors profit.
- The overheads shall be taken at 3 % of the sum of material costs, the labour costs, the cost of use of all plant, machinery and equipment, the cost of all temporary and incidental works.
- The Contractors profit shall be taken at 10 % of the sum of material costs, the labour costs, the cost of use of all plant, machinery and equipment, the cost of all temporary and incidental works, the overheads.

d. In the event of disagreement, the Engineer shall fix such rates and prices as are, in his opinion appropriate and shall notify the Contractor accordingly with a copy to the Employer.

e. The Engineer shall determine provisional rates and prices to enable on account payments to be included in the Interim Payment Certificates, until rates and prices are agreed as final by the Employer, the Contractor and the Engineer.

f. The Engineer shall have the power to vary the rates or prices of all such items contained in the contract, if the nature or amount of any varied work relative to the nature or amount of the whole of the Work or part thereof, is such that, in the opinion of the Engineer, the rate or price contained in the contract, by reason of such varied work, is inappropriate or inapplicable. Then after due consultation with the Employer and the Contractor, the Engineer shall vary the rates or prices of such items of work.

g. The Contractor shall not be entitled to additional payment for costs, which could have been avoided by giving early warning.

h. If, on the issue of the Taking Over Certificate for the Whole of the Work, it is found that as a result of: A. all varied works and B. Day works and C. adjustment of price in accordance with the price escalation clauses of this contract, but not from any other cause, there have been additions to or deductions from the contract price which taken together are in excess of 15% of the Effective Contract Price (Contract Price +Day works allowance) then and in such event there shall be added to or deducted from the Contract sum such further sum as may be agreed between the Engineer and the Contractor after due consultation with the Employer and the Contractor by the Engineer. These further sums shall be decided considering
    - Contractors general site and overhead costs and
    - Amount by which the additions or deductions from the contract price shall be in excess of 15 % of the Effective Contract Price.

    In case of disagreement in determination of the further sum, the Engineer shall determine this amount and his determination shall be binding on the Contractor and the Employer.

39. Defect & Maintenance Liability Period.

The Defect &Maintenance Liability Period for the Work shall be of the Five (5) years from the date of final completion. The above mentioned period shall supersede the defect liability period provided in the Clause 17 of General condition of Contract (GCC) and shall be applicable for the Work with reference to the provisions of clause 17 of GCC and Article 6 of the Integrity Agreement as per the GCC.

SPECIAL CONDITIONS FOR PROCUREMENT OF CEMENT

1. The contractor shall procure OPC cement in work from reputed manufacturers of cement having a production capacity not less than one million tonnes or more per annum, such as ACC, Ultra Tech, Siddhi, Sanghi Cement, Birla Jute & cement corporation of India etc., as approved by Ministry of Industry, Government of India and holding license to use ISI certification mark for their product. The tenderers may also submit a list of names of cement manufacturers which he proposes to use in the work. The tender accepting authority reserves rights to accept or reject name (s) of cement manufacturer(s) which the tenderer proposes to use in the work. No change in the tendered rates will be accepted if the tender accepting authority does not accept the list of cement manufacturers, given by the tenderer fully or partially.

The supply of cement shall be taken in 50 kg. bags bearing manufacturer's name and ISI marking. Samples of cement arranged by the contractors shall be taken by the Engineer-in-Charge and got tested in accordance with provisions of relevant BIS codes. In case of test results indicate that the cement arranged by the contractor does not conform to the relevant BIS Codes, the same shall stand rejected, and it shall be removed from the site by the contractor at his own cost within a week's time of written order from the Engineer-in-Charge to do so.

2. The cement shall be brought at site in bulk supply of approximately 25 tonnes or as decided by the Engineer-in-charge. The cement godown of the capacity to store a minimum of 500 bags of cement shall be constructed by the contractor at site of work for which no extra payment shall be made.

3. Double lock provision shall be made to the door of cement godown. The keys of one lock shall remain with Chief Executive Officer, DIU SMART CITY LTD, Diu, Engineer-in-charge or his authorized representative and the keys of the other lock shall remain with the contractor. The contractors shall be responsible for the watch and ward and safety of the cement godown. The contractor shall facilitate the inspection of the cement godown by the Engineer-in-Charge at any time.

4. The cement shall be got tested by the Engineer-in-Charge and shall be used on the work only after satisfactory test results have been received. The contractor shall supply free of charge the cement required for testing including its transportation cost to testing laborites. The cost of tests shall be borne by the contractor / department in the manner indicated below:

(a) By the contractor, if the result shows that the cement does not conform to relevant BIS code.

(b) By the department, if the result shows that the cement conforms to relevant BIS codes.

5. The actual issue and consumption of cement on work shall be regulated and proper accounts maintained as provided in clause 10 of the contract. The theoretical consumption of cement shall be worked out as per procedure prescribed in clause 42 of the contract and shall be governed by conditions laid therein. In case of cement consumption is less than theoretical consumption including permissible variation; recovery at the rate show prescribed shall be made. In case of excess consumption no adjustment need to be made.

6. Cement brought to site and cement remaining unused after completion of work shall not be removed form site without written permission of Engineer-in-Charge.

7. The damaged cement shall be removed from the site immediately by the contactor on receipt of a notice in writing form the Engineer-in-Charge. If he does not do so within three days of receipt of such notice, the Engineer-in-Charge shall get it removed at the cost of the contractor.

SPECIAL CONDITION FOR PROCUREMENT OF STEEL

1. The contractor shall procure TMT bars of **Fe500-D grade** (the grade to be procured is to be specified) from primary producers such as SAIL or TISCO or RINL or JINDAL or JSW Steel Ltd. as approved by the Ministry of Steel. In case of non-availability of steel form primary producers the NIT approving authority may permit use of TMT reinforcement bars procured from secondary producers. In such cases following action is to be taken by NIT approving authority:

    a. The grade of the steel **Fe500-D grade** to be procured is to be specified as per BIS 1786-2008.

    b. The secondary producers must have valid BIS license to produce HSD bars conforming to IS 1786: 2008. In addition to BIS license, the secondary producer must have valid license form either of the firms Tempcore, ThermexEvcon Turbo & Turbo Quench to produce TMT Bars.

    c. The TMT bars procured form primary producers shall conform to manufacture's specifications.

    d. The TMT bars procured form secondary producers shall conform to the specifications as laid by Tempcore, Thermex, Evcon Turbo & Turbo Quench as the case may be.

    e. TMT bars procured either from primary producers or secondary producers, the specifications shall meet the provisions of IS 1786 : 2008 pertaining to **Fe500-D grade** of steel as specified in the tender of steel as specified in the tender .

    f. All TMT Bars to be duly factory coated against corrosion in coastal environments.

2. The contractor shall have to obtain and furnish test certificates to the Engineer-in-charge in respect of all supplies of steel brought by him to the site of work.
3. Sample shall also be taken and got tested by the Engineer-in-Charge as per the provisions in this regard in relevant BIS codes. In case the test results indicate that the steel arranged by the contractor does not conform to the specifications as defined under para (1) (d) & (1) (e) above, the same shall stand rejected, and it shall be removed from the site of work by the contractor at his cost within a week time after the written orders from the Engineer-in-Charge to do so.

4. The steel reinforcement bars shall be brought to the site in bulk supply of 10 tonnes or more, or as decided by the Engineer-in-Charge.

5. The steel reinforcement bars shall be stored by the contractor at site of work in such a way as to prevent their distortion and corrosion, and nothing extra shall be paid on this account. Bars of different sizes and lengths shall be stored separately to facilitate easy counting and checking.

6. For checking nominal mass tensile strength bend test, re-bend test etc. specimen of sufficient length shall be cut from each size of the bar at random, and at frequency not less than that specified below.

Size of bar	For consignment below 100 Tones	or consignment over 100 Tones
Under 10mm dia bars	One sample for each 25 Tones or part thereof	One sample for each 40 Tones or part thereof

10mm to 16mm dia bars	One sample for each 35 Tones or part thereof	One sample for each 45 Tones or part thereof
Over 16mm dia bars	One sample for each 45 Tones or part thereof	One sample for each 50 Tones or part thereof

7. The contractor shall supply free of charge the steel required for testing including its transportation to testing laboratories. The cost of test shall be borne by the contractor.

8. The actual issue and consumption of steel on work shall be regulated and proper accounts maintained as provided in clause 10 of the contract. The theoretical consumption of steel shall be worked out as per procedure prescribed in clause 42 of the contract and shall be governed by conditions laid therein. In case the consumption is less than theoretical consumption including permissible variations recovery at the rate so prescribed shall be made. In case of excess consumption no adjustment need to be made.

9. The steel brought to site and steel remaining unused shall not be removed form site without the written permission of the Engineer-in-Charge.

10. In case contractor is permitted to use TMT reinforcement bars procured form secondary producers then:

10.1 The rate of providing & laying TMT reinforcement bars as quoted by the contractor in the tender shall also be reduced by **Rs.2.25** p**er kg**.

11. The steel brought to site and steel remaining unused shall not be removed form site without the written permission of the Engineer-in-Charge

PARTICULAR SPECIFICATIONS

1 **GENERAL**: The work in general shall be executed as per the description of items, special conditions, provision of this NIT and **CPWD Specifications for works-2009, Vol. – I & II** with up-to-date correction slips:-

1.1 The work shall be executed and measured as per metric dimensions given in the Schedule of Quantities, drawings etc. (FPS units wherever indicated are for guidance only)

1.2 All stone aggregate and stone ballast shall be of hard stone variety to be obtained from approved quarries and or any other source to be got approved from the Engineer-in-charge.

2 Dewatering:

i. Sub-soil water table at work site is reported to be about approx1 meter to 2 Meter below general ground level.

ii. Dewatering shall be carried out by suitable means with adequate stand-by arrangements and the disposal of water shall be done as per the direction of the Engineer-in-charge.

iii. The subsoil water from dewatering may be required to be connected to the raw water grid in the area for use in horticultural purpose, for which no extra payment will be made. However, only the cost of providing and laying pipe line beyond site boundary shall be paid.

iv. Sub-soil water level shall be maintained at least 50cm below the P.C.C level during laying of P.C.C water proofing treatment, laying of basement raft and beams including filling of earth/sand under the basement floor. The water table shall not be allowed to rise above base of raft level until completion of outer retaining wall including water proofing of vertical surface of walls and back filling along the walls upto ground level and until the structure attains such height to counter balance the uplift pressure. The Rate for earth work in excavation in or under water and /or liquid mud are inclusive of pumping out or bailing out water and to maintain sub-soil water table at lower level during execution as per specifications and Structural drawings. For other items of cement concrete, reinforcement cement concrete, brick work, steel work, finishing work, water proofing & soil anchors nothing extra is payable for execution of these items under water.

v. The rates quoted by the contractor shall be inclusive of working in or under water conditions and including pumping or bailing out water encountered from any source such as tidal variation, rains, floods, leakage from sewer and water mains, sub soil water table being high or for reasons of stability of structure or any other cause whatsoever. The extent and decision of pumping or bailing out of water shall be as per requirements of site and stability of structure and decision of Engineer-in-charge in this regard shall be final and binding on the contractor. Nothing extra shall be payable on this account.

3 TEMPORARY EARTH RETAINING STRUCTURE:

i. The space for movement of heavy construction machineries or the space for open earth excavation by benching, in steps or in slope may not be available. A temporary earth retaining structures like Steel sheet pile / soldier pile etc. with strutting or soil / rock anchors shall be required for the safety of existing building and trees before taking up deep basement excavation work for the construction of basement.

ii. The information and details given herein, in the architectural, structural drawings, preliminary soil investigation report and elsewhere in the tender documents is only indicative and for general information and guidance only. The Contractor and his associate, structural Design Consultant shall inspect the site of work and get familiar with the actual site conditions.

iii. The department shall not be responsible if soil is found to be of different character and properties during actual execution of work or testing of soil. The Department shall not be responsible for the inaccuracy thereof or any interpretation or conclusion drawn from them by the contractor.

iv. The contractor may carryout detailed soil investigation at his own cost if he considers so. No payment shall be made to him for this purpose. The Owner shall not bear any responsibility for the lack of such knowledge and also the consequences thereof to the contractor. The information and site data shown in the drawings and mentioned in the tender documents have been furnished, in good faith, for general information and guidance only. The Employer/Engineer in no case shall be held responsible for the accuracy thereof and/or deductions, interpretations or conclusions drawn there from by the contractor and all consequences shall be borne by the contractor and no claim, whatsoever, shall be entertained from the contractor. It is presumed that the contractor has satisfied himself for all possible contingencies, situations, bottlenecks and acts of coordination which may be required between different agencies.

v. The detailed analysis, design, drawing of temporary earth retaining structure shall be obtained from reputed institute like from IIT / CBRI / CRRI / NCCBM and shall be submitted along with detailed calculation sheets with references of relevant BIS codes, manual etc. within 30 days from the date of issue of acceptance letter by the Engineer-in-charge. The design shall be based on the actual soil properties/ characteristics and shall be able to withstand the surcharge of existing buildings, excavated earth, dynamic loads of vehicular movement and vibrations caused by construction machinery and equipment's. The strutting, or the anchors, and the waler beam etc. shall be as per the structural design and analysis. The department will have option to get the design proof checked from designated consultant. The contractor shall modify the design and drawings and resubmit the same, if required without any extra cost / claim. However, the contractor shall be solely responsible for the design, safety of men, materials and stability of existing structure and trees.

vi. The Analysis, Design & Drawing of temporary earth retaining structure shall specify details like the spacing, type, size, unit weight, material, elastic section modulus of members, depth of embedment, Specification for wooden lagging, waler beams and anchors etc.

vii. The expenses on design, drawing of temporary earth retaining structure, soil investigation and geo technical survey shall be borne by the Contractor. The quoted rates shall include all the above expenses and no claim for cost/ expenses shall be entertained by the department.

viii. If required by the Engineer-in-Charge, contractor shall provide basic equipment/devices for measurements of deformations / settlements to measure ground water table, Settlement gauge etc.

to check settlement of adjoining buildings. The equipment's will be installed as per direction of Engineer-in-charge. Calibration and measurements of all equipment's shall be performed by the contractor and shall be checked by independent agency if desired by the Engineer –in-Charge. Results from each measurement shall be recorded & submitted to Engineer-in-charge expeditiously.

ix. The work of providing temporary earth retaining structure as per approved design and drawings shall be carried out by the contractor either himself if he has the required experience of executed such works or through experienced associated agency having satisfactory completed of work (s) of Providing Steel Sheet Piles or Soldier Piles/H-Beams and or Diaphragm Wall etc. as earth retaining structure.

x. The materials for removable temporary earth retaining structure/ shoring / strutting etc. shall be the property of contractor and after successful completion of raft & retaining wall the same shall be removed from the site after use as per direction of Engineer-in-charge.

xi. Sheet piles/ Soldier piles and appurtenant materials shall be tested and certified to meet the specified chemical, mechanical and sectional properties requirement prior to delivery to site, as per relevant IS code.

xii. Before execution of work, the contractor shall submit the construction procedure/ Methodology and Specifications of Temporary Earth Retaining Structure from the structural consultant viz IIT/CBRI/NCBM and shall get approved from Engineer in Charge. The work of earth retaining structure shall be carried out strictly in accordance with the sequence, specifications, and procedure given in approved structural design & drawings and as per direction of Engineer in Charge.

xiii. The Contractor shall submit the layout plan showing alignment arrangement of proposed temporary earth retaining structure clearly indicating the clear distance from the existing buildings /trees and the proposed basement along with design and drawing showing complete details.

xiv. The rate quoted by the agency shall be inclusive of mobilization to site all necessary machineries, equipment's, handling, storing, installation, cutting holes, splicing, driving, re-driving, bailing out water, pulling out and removal of the temporary earth retaining structure / strutting, instrumentations etc. men, materials etc., other incidentals for execution of work, with all safety measure as required for the execution of construction work for safety of surrounding existing buildings structures, parked / moving vehicles, equipment's etc. as per direction of Engineer-in-charge.

xv. The safety of the adjacent existing buildings is to ensure so that no settlement or any damage due to settlement, land slide etc. because of deep basement excavation work is caused. For the safety, the Contractor shall install required apparatus / equipment's for close monitoring any settlement or crack development, damages in the nearby buildings at his own cost. The contractor shall provide all necessary equipment's/gauges for measurements of deformation/settlement in the adjacent buildings as directed by Engineer-in-charge. Monitoring instruments are to be maintained in good working conditions throughout the construction period is responsibility of contractor. Daily reading of instruments shall be recorded and got checked by the authorized representative of Engineer-in-charge. Checking operations (at least once in a week) shall be done by an experienced independent agency appointed by contractor with approval of Engineer-in-charge. All expenditure incurred on this independent agency shall be borne by the contractor. The Contractor shall be held liable for all damages on any account including defective installation, execution and removal of earth retaining structure.

xvi. The non-submission of the analysis, design & drawings of Temporary Earth Retaining Structure within 30 days from the date of start or failure to resubmit within 7 days if required by the Engineer-in-Charge shall amount to nonperformance on the part of contractor/ Agency. The Engineer-in-charge shall be at liberty to take action to forfeit the Earnest money and the performance guarantee and shall be at disposal of Government of India.

xvii. **Measurement**: For the payment of temporary earth retaining structure, the depth of exposed excavated vertical earth face and the perimeter in straight horizontal length correct to a centimeter shall be measured. The area shall be worked out in sqm nearest to two decimal. The temporary earth retaining structural member shall be measured upto the dredge line only for measuring depth. No payment shall be made for the embedded structural member below dredge line. The payment shall be made only for the surface area and nothing extra is payable for erecting system of sheets/pegs/wedges/waler beam/ channel etc.

xviii. **Rates:** The Rate shall be inclusive of all the operations, analysis, design redesign and drawings for temporary earth retaining structure, removal of temporary earth retaining structure ,soil investigation, geo technical survey to locate the underground services /cables, water supply and sewer lines etc., equipment's, instrumentation inserts, anchors, waler beams materials, equipment machineries tools tackles and plants, bailing out water etc. complete required for safe execution of work as per approved structural design / drawing and as per direction of Engineer-in -charge .

xix. Rate of item is inclusive of detailed soil investigation of area where construction activity to be carried out including Geo-technical survey of the area for locating electric, sewer water supply lines and other services in the proposed area of construction.

4. RCC WORK

4.01 Approved curing compounds may be used in lieu of moist curing with the permission of the Engineer-in-Charge. Such compound shall be applied to all exposed surfaces of the concrete as soon as possible after the concrete has set. Impermeable membrane such as polythene sheet covering the concrete surface may also be used to provide effective barrier against the evaporation. For this no extra payment shall be admissible.

4.02 The finishing of RCC shall be very good so that no finishing /rendering is required. The extra provision of water proof ply for the same has been taken. Plastering even at the cost of the contractor will not be allowed on ceiling, beams, RCC walls and columns etc.

4.1 Design Mix Concrete:-Design mix concrete shall be used in the work for all structural members. Following parameters shall be adopted for mix design as per IS-456-2000 (Latest Edition)

4.1.1 Approved admixtures conforming to IS 9103 shall be permitted to be used. The chloride content in the admixture shall satisfy the requirement of BS 5075. The total amount of chloride content in the admixture mixed concrete shall satisfy the requirement of IS 456-2000.

4.1.3 The concrete mix design with and without admixture will be carried out by the contractor, at his own cost, through one of the following laboratories/Test houses to be approved by Engineer-in-charge:-

(i) IIT, New Delhi / Any other IITs / NITs
(ii) National Council for Cement & Building Materials, Ballabhgarh.
(iii) CRRI, New Delhi

(iv) New Delhi college of Engineering
(iiv) SVNIT Surat

4.1.4 In the event of all the four laboratories being unable to carry out the requisite design/testing; the contractor shall have to get the same done from any other reputed laboratory with prior approval of the Engineer-in-Charge.

4.1.5 The various ingredients for mix design/laboratory tests shall be sent to the approved lab/test houses through the Engineer-in-charge and the samples of such ingredients sent shall be preserved at site by the contractor till completion of work or change in Design Mix whichever is earlier. The sample shall be taken from the approved materials which are proposed to be used in the work.

4.1.6 The Contractor shall submit the mix design report from approved laboratory for approval of Engineer-in-Charge within 45 days from the date of issue of letter of acceptance of the tender. No concreting shall be done until the mix design is approved by Engineer-in-charge.

The contractor shall make cubes of trial mixes as per approved mix design at site laboratory for all grades of concrete in presence of the Engineer in charge using same ingredients as adopted for design mix, prior to commencement of concreting and get them tested in presence of Engineer-in-charge . The testing and the acceptance of the trial mixes shall be as per CPWD Specifications. The conformity of mix design should be established by conducting three repeat trial mix tests. In each repeat trial mix test six cubes of standard size 15 cm x 15 cm x 15 cm shall be cast, out of which three cubes shall be tested after 7 days & 3 cubes shall be tested after 28 days. This provision shall be as per relevant paras of CPWD specifications 2009.

4.2 90% of the total trial mix tests shall be done in the laboratory established at site by the contractor and remaining 10% in the laboratory of Central Design Organization, CPWD or in any other laboratory as directed by Engineer-in Charge. Samples of various materials required for testing shall be provided free of cost by the contractor. Testing charges, if any, shall be borne by the department provided the sample passes the test, otherwise it shall be borne by the contractor. All other expenditures required to be incurred for taking the samples; conveyance, packing etc. shall be borne by the contractor himself. (This supersedes provision of clause 10A of General Conditions of Contract for CPWD works (CPWD-8). The contractor shall produce all the materials in advance so that there is sufficient time for testing and approval of the materials and clearance before use in work. The Engineer in charge shall be at liberty to test representative sample(s) of each item of schedule of quantity in any approved laboratory as decided by him. The samples of testing shall be provided by the contractor free of cost. Any expenditure required to be incurred for taking sample; conveyance and packing shall be borne by the contractor. In case of any sample of particular lot fails in testing the contractor shall be bound to replace the entire lot with fresh material of prescribed specifications. The rejected lot shall be returned to the contractor only after fresh lot is supplied. Testing charge in respect of failed sample will be recovered from the contractor.

4.3 For each change of source or quality / characteristic properties of the ingredients from that approved & used in the concrete mix during the work, a fresh mix design shall be got done by the contractor. However, maximum two such changes shall be permitted in the whole work. For any change, the Contractor shall bear the cost of fresh Mix Design. Revised trial mix tests shall be conducted at laboratory established at site or Engineer-in-Charge may order for testing of these cubes from the independent laboratory and shall be submitted by the contractor as per the direction of the Engineer-in-charge.

4.4 The cost of packaging, sealing, transportation, loading, unloading, cost of samples and the testing charges for mix design in all cases shall be borne by the contractor.

4.5 The mix design shall be done considering the degree of quality control as **"Good"** in all cases.

4.6 Formwork for Exposed concrete surface

4.6.1 All vertical members for formwork shall be of steel like acroprops, H frames / cup lock system etc. Care shall be taken to set all formwork in perfect line, level (or in required camber or slope as specified) and Plumb. Formwork propping shall be strong, rigid and sturdy. The formwork shall be as per pattern, design shown in drawings. Formwork shall be done accurately and precisely so as to achieve neat, clean and smooth concrete surface, in line, level and plumb. Clinks, twists, offsets, warps, riveting etc. in plates or forms shall not be allowed. Before placing concrete, forms shall be thoroughly cleaned off of all rust, dust and loose materials. Mould release agent of approved make or as per the Architect / Engineer in charge shall be applied on sheathing before placing the reinforcement steel. Also the formwork material will be of laminated plywood/best quality steel sheathing or any sort of such material, as approved by the Architect, so that all exposed concrete surfaces have uniform colour and texture. After deshuttering, all concrete surfaces shall be properly rendered with sand paper or emery stone. The sample of the exposed concrete shall be got approved by the architect or engineer in charge. For walls and columns, the sheathing plates shall be bolted with special nuts and bolts- spring coils and PVC cone spacer. No through bolts shall be allowed for basement walls and water retaining structure for which no extra amount shall be paid for.

4.6.2 For all kind of exposed concrete work only one brand (to be approved by the Architect or Engineer-in-charge) of cement shall be used. **For exposed concrete element specified in the drawing, steel shuttering made out of CR MS sheet not less than 2mm thickness (14 guage) or laminated plywood not less than 12 mm with MS angle steel supporting frame work shall be used.**

For other concrete shuttering material shall be as follows:

- Columns: Moulds from marine ply with wooden battens or steel plates
- Straight walls / Curved wall in plan: Marine plywood with wooden battens / Acro make or equivalent make steel plates and soldiers.
- Beam: steel plates and marine ply with battens

4.6.3 **Formwork for Exposed Work**

4.6.3.1 Exposed / Ordinary fair finished formwork for walls, columns, beams of basement and water retaining structures

For water retaining structure the shuttering plates on either side shall be bolted with tie rods made from spring coils on either side, welded with two nos. 8mm MS rods. PVC cone shall be placed on either side of the tie rod. The whole tie rod assembly along-with PVC cone shall be placed/fixed with special type of bolts on either side of the shuttering plates. Length of the tie rod along-with PVC cone shall be equal to the width / thickness of the element to be shuttered. Holes of cones shall be filled with rich cement mortar (1:1) and bonding agent in recommended proportion.

4.6.3.2 Exposed / Ordinary fair finished formwork For walls, columns, beams of Super structure For walls, columns and beams, the shuttering plates on either side shall be bolted with through tie rods made from round bars minimum 12 mm with heavy quality PVC sleeves and minimum 25 mm thick PVC cones on either side of the sleeve. The whole tie rod assembly along-with PVC cone shall be placed /fixed with through bolts on either side of the shuttering plates. Holes of cones shall be filled with rich cement mortar (1:1) and bonding agent in recommended proportion.

Where batching plants are used, moisture content may be determined by moisture probes fitted to the batching plants.

5 REQUIREMENT OF DESIGN MIX

5.1.1 The mix design for a specified grade of concrete shall be done for target mean compressive strength, Tck

= fck + 1.65 S

Where: fck = characteristic compressive strength at 28 days.
S = Standard deviation which depends on degree of quality control.

5.1.2 The degree of quality control for this work shall be **"Good"** for which the standard deviation (s) for different grades of concrete as per IS456-2000 shall be followed.

Standard deviation calculations of test results shall also be done as per clause 9.2.4 of IS456-2000 for maintaining the quality control.

5.1.3 The mix design shall be carried out generally in accordance with the provisions made in CPWD specification and IS456-2000 read along with the provisions mentioned in this document.

5.1.4 Acceptance criteria for trial Mix:-

Average of all the cubes tested at 28 days shall be more than target mean strength (i.e. fck + 1.65 S). No individual cube shall be less than 0.85 times the target mean strength.

5.1.5 Work Strength Test & Acceptance criteria:-

(a) Acceptance of concrete, work strength test & cube test shall be carried out as per CPWD specification 2009 Vol-I with up to date correction slips.

6.0 WATER PROOFING:

6.1 The work in general shall be executed as per CPWD specifications.

6.2 The water proofing compound used in integral water proofing treatment shall satisfy all the requirements indicated in IS:2645 and shall be got tested before its use.

6.3 Total quantity of the water proofing compound required shall be arranged only after obtaining the prior approval of the Engineer-in-Charge in writing. Materials shall be kept under double lock and key and prper account of water proofing compound used in the work shall be maintained. It shall be ensured that the consumption of the compound is as per specified requirements.

6.4 Contractor shall associate himself with anyone of the specialist firms mentioned in approved list of specialized agencies for the work relating to the Water Proofing Treatment. In case, the contractor intends to get the water proofing work executed from an agency other than as specified in **NIT**. He shall apply to the Engineer-in-Charge in writing along with the credentials and relevant details including name of owner/company, its location, capacity technical establishment, past experience etc. Engineer-in-Charge shall give approval in writing and the work shall not be started without said written approval of

the Engineer-in-Charge. The entire responsibility for the quality of this treatment and its efficiency shall however, rest with the main contractor only.

6.5 The contractor shall ensure that the basement of the building shall be absolutely water tight and seepage/leak free. In case any seepage/leakage etc. is noticed the contractor shall make it water tight & seepage/leak proof at his own cost.

7 Construction Joints:

(i) The construction joints shall be provided only at locations shown in the structural drawings or as approved by Engineer-in-Charge. Reinforcement shall continue through construction joints

(ii) The foreign matter and laitance shall be cleaned properly by compressed air before start of further work.

(iii) All construction joints in RCC raft shall be injection grouted with cement slurry. Nothing extra shall be paid on this account.

8.0 Guarantee Bond:

Ten years guarantee bond in prescribed proforma attached at **Annexure-I** herewith shall be submitted by the contractor which shall also be signed by both the specialized agency and the contractor to meet their liability/liabilities under the guarantee bond. However, the sole responsibility about efficiency of water proofing treatment shall rest with the building contractor.

Separate guarantee bonds shall be submitted by the Contractor for different type of water proofing work.

Ten per cent of the cost of water proofing work shall be retained as security deposit and the amount so withheld would be released after ten years from the date of expiry of maintenance period under the agreement, if the performance of the work done is found satisfactory. If any defect is noticed during the guarantee period, it shall be rectified by the contractor within seven days of receipt of intimation of defects in the work. If the defects pointed out are not attended within the specified period, the same will be got done from other agency at the risk and cost of contractor.

The security deposit against this item of work shall be in addition to the security deposit mentioned elsewhere in contract form.

9.0 Register to be Maintained:

(i) Cement Register

A register in prescribed form, giving details regarding day to day receipts of cement as procured by the contractor, consumption in work and balance available on the site, will be maintained at the work site by the contractor. This register shall invariably be signed daily by the contractor or his authorized representative in token of its correctness and shall be made available to Engineer whenever asked, for his verification of every entry made, regarding procurement by the contractor and consumption of these materials in execution.

(ii) Inspection Records and Registers

The Contractor/s shall maintain accurate records, plans and charts shows the dates and progress of all main operations and the Engineer shall have access to this information at all reasonable times. Records of tests made shall be handed over to the Engineer after carrying out the tests.

(iii) Site Order Register

The Contractor/s shall promptly acknowledge and note by signing in the register the orders given in Site Order Register by the Engineer or his representative or his superior officers and comply with them. The Contractor/s shall report the compliance to the Engineer within reasonable time so that it can be checked.

(iv) Steel Register

This register will record the receipts of steel items and details of reinforcement and members wherever steel is used.

(v) Labour Register

This register will be maintained to show daily strength of labour in different categories employed by the Contractor/s.

(vi) Log Book of Events

All events are required to be chronologically logged in this book shift wise and date wise. The representative of the Engineer will sign and the contractor will have to sign. The register Performa, charts, etc. will be property of the PWD.

(vii) Any other Register considered necessary by the Engineer shall be maintained at site in which the representative to the Engineer and the Contractor/s will have to sign. All registers, program, charts etc. will be the property of the PWD.

10.0 Quality of Materials, Plant and Workmanship

- All materials, plant and workmanship shall be:

(i) Of the respective kinds and quality as described in the contract and in accordance with the Engineers instructions and subject to tests as the Engineer may require at any or all places, such as manufacturers facility, site, during fabrication, preparation etc., as specified in the contract.

(ii) The Contractor shall provide all assistance required by Engineer for carrying out the tests. Costs of tests are covered by the contractors quoted rates for the works.

(iii) All samples shall be provided by the Contractor free of costs.

- The Engineer and his personnel shall have access to all locations of work all the time for inspection of work. Contractor shall provide all necessary assistance to the Engineer and his personnel for this at no extra costs. Contractor shall inform before 24 hrs for any inspection/testing.

- On inspection, if the Engineer finds that certain works, materials and/or plant are defective and/or not in accordance with the Contract, he shall notify the Contractor thereof immediately with his objections and reasons. The Contractor shall then promptly make good the defect or remove defective materials, plant from site.

- All work or any part of shall be covered up only after approval of the Engineer in respect of the quality of materials used and workmanship.

- The Contractor shall uncover any part of the work or make openings in or through as required by Engineer from time to time for inspection and shall make good such part only after approval of the Engineer to such covered up work.

- In case of default on the part of the contractor in removal and making good of any defective materials, workmanship and/or plant, the Employer shall engage another agency to carry out the same at the Contractors risks and costs.

- **Tests**
  If the Engineer instructs the Contractor to carry out a test not specified in the Specification to check whether any work has any Defect or not, Contractor shall perform the same and submit the results to the Engineer at contractor's cost.

- **Correction of Defects during Defects liability period**

(i) The Engineer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and is defined in the Contract Data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.
(ii) Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Engineer's notice.

- **Uncorrected Defects during Defects liability period**

(i) If the Contractor does not rectify or correct a defect within the time specified in the Engineer's notice, the Engineer will assess the cost of having the Defect corrected, and the Contractor will bear the costs of such defective work as well as all works carried out over such defective work until the defect is removed to the satisfaction of the Engineer.
(ii) Only the Defects Liability Certificate referred to in following clause shall be deemed to constitute the approval of the works.
(iii) **Defects Liability Certificate:** The Defects liability certificate shall be given by the Engineer to the Employer, with a copy to the Contractor, within 28 days of the expiry of the Defects Liability Period. The Contract shall remain incomplete until issue of the Defects Liability Certificate.

- The defects Liability Certificate shall mention clearly that the Contractor has completed his obligations to execute and complete the works and remedy defects therein to the satisfaction of the Engineer.

- Payment of balance amount of retention money shall not be interlinked with the issuance of the Defects Liability Certificate.

- **Unfulfilled obligations:** Despite issuance of the Defects Liability Certificate, the contract between the Employer and the Contractor shall remain in force in respect of unperformed obligations incurred under the provisions of the Contract prior to the issue of the Defects Liability Certificate

11.0 Demolition and Dismantling item

All items mentioned under the criteria of "Demolition" shall include – Providing, erecting and dismantling all necessary scaffolds, tools, tackles, construction cranes and other equipments etc. working at any floors in the functioning facilities, breaking as far as practicable – with Mechanical Breakers using appropriate attachments, scrapping the surfaces with wire-brush or broom to remove the remnant lumps, cleaning the surface with air-jet or water jet, transporting via external independent temporary passage / lift / ramp to avoid disturbance in working of the institute, all debris down to ground level, with the help of covered sacs or chutes or through adjustable, flexible garbage ducts for preventing spread of dust and avoiding

free hurling or throwing from upper floors, hauling immediately to the demarcated dump – yards on site, for temporary stacking, segregating the salvable / resaleable scrap and finally carting away remaining debris from the site etc. complete.

For all operations involving “Demolition” there is an option to work manually or by mechanical tools like breakers. Working with mechanical breaker is specified here for

a. Speeding up construction work
b. Controlling numbers of workers
c. Reducing impact to the structure due to heavy hammer blows,
d. Controlled collection of debris,
e. Possibility of deferring working hours to harmonise with working of the Institute.

For efficient working with mechanical breaker proper planning of temporary platforms for supporting both men and machine should be done. Along with the main jack hammer for breaking, various tools and attachments are provided. Depending upon required depth of demolition, strength of material to be demolished and accuracy required specific attachment should be used.

Cost of working with the mechanical breaker should include cost of all maintenance repairs required for the main machine, consumption of power or fuel and tool-bits cables for drawing power, cost of operator and helper, transportation etc.

Along with the operator for breaker, sufficient number of labourers should be kept for fast removal of debris from the site, which will be done in stages as under;

a. Horizontal conveyance from the spot of breaking on a particular floor to a muck station on that floor, where retention period should not exceed 24 hours.
b. Vertical conveyance from the floor muck station downwards with the help of chutes or lifts or through ramp to a temporary stack – yard at ground level, where retention period should not exceed 48 hours.
c. Horizontal conveyance of salvaged material to store located on ground level, and disposal of rubbish to a spot outside the premises.

Free hurling of debris, or throwing from window or balcony or any opening from upper floor to ground level is strictly prohibited. Any person violating this requirement shall be severely penalized.

After using the breaker, manual demolition operations with the help of chisel or scrapper might be needed for accurate manipulation of the work. The surfaces might be scrapped with wire brush or scrapper and cleaned with brooms etc to receive further repair materials under controlled environment. The surfaces might have to be cleaned with jet of water or air to prevent any loose fine material mixing up with repair materials.

For items pertaining to demolition, no material is consumed. Workmanship and mode of measurement are defined separately in items. Number of sets of machinery to be installed depends upon quantam of work to be handled in given time frame. Proper organization of labour gangs for debris disposal is very important. Workers and supervisory staff should be provided with helmets and safety belts while working at heights. The whole area where demolition work is going on should be cordoned and warning signs prominently displayed.

General.

1) **All rates should be inclusive of taking all required precaution measures to execute and carry out the work in safe manner.**
2) **To keep good in condition all the building elements those required to be retained.**
3) **Protecting building & its surroundings where movements (patients, visitors, vehicular etc.) are envisaged**
4) **Providing necessary barricading, coverings, additional steel supports to the building by forms, props, H Frames, Spans, shuttering etc., where by the purpose of providing the safety & no damage gets solved.**
5) **No extra payments will be made for providing such measures stated above.**

11.01.a Demolition and disposal of unserviceable materials with all leas and lift. (ii) unreinforced cement concrete / Pavments / rubble

1.0 Workmanship

1.1 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.

1.2 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.

1.3 Necessary dropping, shoring and under pinning shall be provided for the safely 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.

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

1.5 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.

1.6 All materials obtained from demolition shall be the property of Govemment. Unless olherwise specified and shall be kept in safe custody untill handed *over* to the Engineer-in-charge.

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

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

2.0 Mode of measurement and payment

2.1 Measurement 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 cement concrete shall be

measured under this item. Specifications for deduction for voids, openings etc. shall be on same basis as that employed for construction of work.

2.2 All work shall be measured in decimal system as fixed in this place subject to the following limits, unless otherwise stated hereinafter:

(a) Dimensions shall be measured to the nearest 0.01mt.
(b) Area shall be worked out to the nearest 0.01 sq.mt.
(c) Cubical connection shall be work out to the nearest 0.01 cu.m.

2.3 The rate shall include the 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 storing for the safety of the portion not required to be pulled down or of adjoining property and providing temporary enclosures or partitions where considered necessary.

2.4 The rate shall be for a unit of one cubic meter.

11.01.b Demolition including stacking of serviceable materilas and disposal of unserviceable materials with all lead and lift. (i) R.C.C. work/Road works

1.0 Workmanship

1.1 The relevant specifications of items no. 11.01.a shall be followed except that demolition of RCC Work is to be done.

1.2 Where ever necessary while breaking concrete for RCC slabs, a complete centering should be done below, as if a new slab is to be cast. Breaking is being done from upper level. The centering should be strong to withstand impact and vibration while working with breaker. Sometimes there is a temptation to work from one edge and proceed towards the other edge, working on the reinforcement jail, this would results into avoidance of centering with another objective of dropping the debris to the lower level without involving extra labour. In the distressed structure, it cannot be relyed on reinforcement to carry load of men and machinery. Corroded steel might give way any time. If fresh slab is not to be cast at the same location, reinforcement is cut off after removal of concrete.

1.3 While breaking concrete for RCC beams, care should be taken to support slabs on both sides of the beam. If beam is to be retrofitted after partial removal of concrete, all superimposed loads should be relieved and adequate props be placed at selected locations below the beam too. In case of partial precise demolition of beams, manual breaking might be advantageous.

1.4 Column demolition is normally partial only. Before executing demolition of column, adequate props have to be provided to transfer of loads from the uppermost level up to the working level. Damaged concrete should be removed all round including the one behind the corroded bars, very carefully, preferably manually.

2.0 Mode of Measurement and payment

2.1 The relevant specifications of items No.11.01.a shall be followed except that the demolition of reinforced concrete structure. The unserviceable materials shall be disposed of all leads and lifts. The rate excludes scraping straightening of reinforcement but includes cutting of reinforcement.

2.2 The rate shall be for a unit of one cubic meter.

11.02.b Providing material and labour for Demolition of Brick work and stone masonry including stacking of serviceable materilas and disposal of unserviceable materials with all lead and lift.(ii) In Cement Mortar..

1.0 Workmanship

1.1 The relevant specifications of item no. 11.01.a shall be followed except demolition of brick or stone masonry in cement mortar is to be done.

2.0 Mode of measurement and payment

2.1 The relevant specifications of item No. 11.01.a shall be followed except that the wall and independent piers of columns of brick or stone masonry shall be measured in cubic meters. All copings, corbles, cornices and other projections shall be included with the wall measurements.

2.2 In measuring thickness plastered walls, the thickness of plaster shall be included. The unserviceable materials shall be disposed off with all lead and lift. Ashlar face stones dressed stone etc. if required to be taken down intact shall be dismantled and measured separately in cubic meters.

2.3 The rate is exclusive of cleaning of bricks and stones. Honey comb works and hollow block walling shallbe measured as solid.

2.4 The rate shall be for a unit of one cubic meter.

11.04.a Dismentaling of sheet roofing including ridges, Hips, Valleys, Gutters etc. stacking of serviceable materilas and disposal of unserviceable materials with all lead and lift.(i) G.I.sheet roofing.

1.0 Materials

1.1 The relevant specifications of item No. 11.01.a shall be followed except that G.I. sheet roofing shall be dismantled instead of concrete work.

2.0 Mode of measurement and payment

2.1 The area of G.I. Sheet roofing shall be measured in sq. meter, Ridge, hips and valley shall be girthed and included with roof area. Corrugated and semi-corrugated surfaces shall be measured flat and not girthed.

2.2 Supporting member such as rafters, purlins, beams, joints, trusses, etc., shall be measured separately.

2.3 The rate shall be including disposal of unserviceable materials with all leads and lifts and stacking the serviceable materials as directed.

2.4 The rate shall be for a unit of one sqm.

11.04.b Dismentaling of sheet roofing including ridges, Hips, Valleys, Gutters etc. stacking of serviceable materilas and disposal of unserviceable materials with all lead and lift.(ii) A.C. sheet roofing

1.0 Workmanship

1.1 The relevant specifications of item No. 11.01.a shall be followed except that the A.C. Sheets roofing shall be measured in this item.

2.0 Mode of measurement and payment

2.1 The relevant specifications of item No. 11.01.a shall be followed except that the A.C. Sheets roofing shall be measured in this item.

2.2 The rate shall be for a unit of one sq. meter.

11.04.c Dismentalings manglore of country tile roofing with battens boarding etc. including stacking of serviceable materilas and disposal of unserviceable materials with all lead and lift.(ii) A.C. sheet roofing.

1.0 Workmanship

1.1 The relevant specifications of item no. 11.01.a shall be followed that the country tile roof of manglore roof shall be dismantled.

2.0 Mode of measurement and payment

2.1 The relevant specifications of item No. 11.01.a shall be followed.

2.2 The supporting members shall be measured under separate item.

2.3 The rate includes labour required for disposal of unserviceable item with all leads and lifts.

2.4 The rate shall be for a unit of one sq. meter.

11.05 Dismentling steel work including distempering and stacking the materials with all lead and lift.

1.0 Materials

1.1 The relevant specifications of item no. 11.01.a shall be followed except that the dismantling of steel works shall be carried out.

2.0 Mode of measurement and payment

2.1 The relevant specifications of item No. 11.01.a shall be followed.

2.2 The weight of the member shall be computed from standard tables unless the actual weight can be readily determined.

1.1 Riveted works where rivets are required to be cut, the same shall be carried out under this item and nothing extra shall be paid.

2.3 In farmed steel gate, the weight of any covering materials of filling such as iron sheets and expanded metal shall be added to the weight of the main articles if such covering is not ordered to be taken out separately.

2.4 The rate includes stacking the materials as and where directed with all leads and lifts.

2.5 The rate shall be for a unit of one kg.

11.06.a Dismentling doors, windows, ventilators etc. (wood or steel) shutters including chowkhats architraves, holdfasts and other attachment etc. complete and stacking them within all lead and lift.(ii) Exceeding 3 Sq.M. in area

1.0 Workmanship

1.1 The relevant specifications of item no. 11.01.a shall be followed except that the doors, windows, ventilators etc. (wood or steel) shutters including chowkhats, architaves, holdfasts and other attachments etc. are to be dismantled.

2.0 Mode of measurement and payment

2.1 The relevant specifications of item no. 11.01.a shall be followed.

2.2 The doors, windows, ventilators etc. not exceeding 3 sqm In area (each) including shutters and chowkhats, Architraves, holdfasts and other attachment to grames etc. will be dismantled and measured under this item.

2.3 The rate includes stacking serviceable materials as and where directed with all leads and lifts.

2.4 The rate shall be for a unit of one number.

12 Providing and laying in position Ready Mixed M-250 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability, including placing of PVC sleeves during

casting as per direction of the EIC. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 450 kg)

1.1 Ready mix concrete

1.2.1 Grades and Strength Requirements of Concrete

General

Ready mix Concrete shall consist of the material described under site batched concrete sections, using separate coarse and fine aggregate in an appropriate combination determined in the course of the of mix design . The overall grading shall be such as to produce a concrete of the specified quality which will work readily in to position without segregation. The ready mix concrete shall conform to IS:4926 and shall be delivered in agitating trucks. The RMC may contain flyash as per the acceptable norms.

Slump

The water shall be added to the cement and aggregate during mixing to produce concrete having a sufficient workability to enable it to be well consolidated, to be worked in to the corners of the shuttering and around the reinforcement to give the specified surface finish, and to have the specified strength. Water cement ratio shall be maintained as per IS. 456-1978 when a suitable amount of water has been determined, the resulting consistency shall be maintained throughout the corresponding parts of the work and tests shall be conducted to ensure the maintenance of this consistency. The max slump at the point of the discharge should not exceed 110mm max.

Concrete Grades

Grade of concrete used in the works shall be shown on the drawings or as directed by the Architect/Project Manager. The minimum cement used for M-20 shall be 300 Kg. Per Cum, 350 Kgs for M-25 and 400 Kgs for M-30.

The compressive strength of concrete shall not be lesser than as mentioned below :-

Grade	Compressive Strength Kg/Sq.cm	
	7 days	28 days
M – 100	70	100
M - 150	100	150
M - 200	135	200
M - 250	170	250
M - 300	200	300
M - 350	235	350
M – 400	270	400

2 Transporting Concrete

Concrete shall be transported in agitating trucks without contamination, loss of ingredients or segregation. In no case shall a period of more than 4 hours have elapse between the wetting of mix and discharge of the concrete at site.

3 Concrete placement

General

Concrete, when deposited, shall have a temperature of not less than 5^0c (41°F) and not more than 32°C (90°F).

The concrete shall be placed in the positions and sequences indicated on the drawings, in this specification and/or as directed by the Architect/Project Manager.
Contractor shall give adequate notice to the Architect/Project Manager of his intention to concrete any section of the works.
Except where otherwise directed, concrete shall not be placed unless the representative of the Architect/Project Manager is present and has previously examined and approved the positioning, fixing and condition of the reinforcement or any other items to be embedded and the cleanliness, positioning and suitability of the concreting surface.
The concrete shall be deposited as nearly as possible in its final position. It shall be placed in such a manner as to avoid segregation of the concrete and displacement of the reinforcement, other embedded items, or formwork. It shall be brought up in horizontal layers not exceeding 450 mm in compacted thickness unless otherwise authorised or directed by Architect/Project Manager. Concrete shall not be placed simultaneously on each side of large horizontal specified or approved construction joints.
Shutters for walls or thin sections of considerable height shall be provided with openings or other devices that will facilitate the cleaning of the accumulation of hardened concrete on the shutters or on the metal reinforcement above the level of the concrete and the removal of concrete in the case of segregations.

Placing concrete in cold weather

No concrete shall be mixed or placed while the ambient temperature is above 40°C. on a rising thermometer or below 4°C. on a falling thermometer. The contractor shall supply an accurate maximum and minimum thermometer and hang it in an approved position on the works. Aggregates that have been exposed to frost shall not be used until completely thawed. Concrete shall be maintained by approved means at a temperature of not less than 4°C. during placing, and for a period of three days thereafter. All concrete placed during cold weather or when a frost is predicated or is likely to occur or occurs contrary to expectation, shall be protected from freezing by approved means.

Placing of concrete in wet weather

Concrete shall not be mixed and or placed in rainy weather or when there is likelihood of impending heavy showers. If it becomes necessary to place concrete during rainy weather, the contractor shall provide adequate protection by means of tarpaulin or similar other water proof material to immediately cover fresh concrete to prevent rain falling over it. This protection shall be left on the concrete for a period of 24 hours after placing of concrete.

4 Concrete placement under water

Concrete placed under water shall be deposited through a tremmie pipe the diameter of which shall be at least 8 times the size of the largest aggregate used in the concrete mix.
The construction of and the method of handling the tremmie pipes shall be approved by the Architect/Project Manager. The pipes shall be waterproof and sufficiently strong to withstand severe handling conditions and any joints must be sealed with adequate gaskets.
At the commencement of tremmie work the bottom of the pipe shall be sealed before being lowered in to position. The seal shall only be broken by the concrete being placed.
The concrete placed in contact with a horizontal construction joint shall have a lower proportion of coarse aggregate and a higher proportion of cement than the remainder of the concrete. The proportion shall be agreed with the Architect/Project Manager's Representative.

All underwater concrete shall be placed in still water within a cofferdam or formwork which shall extend above water level.

The proportions of the mixes shall be agreed in accordance with the strength and workability required by the specification. To allow for losses an addition of 10% of cement shall be added to mixes of concrete scheduled to be placed under water.

5 Quality Control

i) In order to ensure that the quality of materials and the mix proportions are suitable for the particular grade of concrete required are so maintained, sampling and testing shall be carried out regularly during the course or the works.

ii) Workability testing shall be carried out in accordance with IS:456. The results shall lie within the range upon which the accepted mix design is based. Testing shall be carried out at such a frequency that the required workability is consistently achieved.

iii) Samples of concrete shall be taken at random in accordance with IS: 516 at the time and place of deposition of the concrete at a frequency of sampling for each grade of concrete and from each concrete mixing plant at six cubes of 150 mm nominal size per 50 cubic meters of concrete placed in the works or twice per week.

iv) Notwithstanding the foregoing, additional samples shall be taken by the contractor when directed by the Architect/Project Manager. The test cube procedure shall be in accordance with IS: 516 throughout.

v) Compliance with the specified characteristic strength shall be assumed if :

a) Each of the six cubes in a group has a test strength not less than the characteristic strength or,

b) Not more than one cube has a test strength less than the specified characteristic strength but not less than 85% of the specified characteristic strength and the average strength of the group of four test results is not less than the specified characteristic strength plus the standard deviation of the group.

6 Seven day cube tests

Acceptance of concrete is based on the 28th day results. However, the contractor shall establish a relationship between 7 days and 28 days strengths by carrying out 7 days tests at the time of performing the laboratory testing and from subsequent quality control testing. This relationship shall be used in interpreting any further test results to predict the probable value of the corresponding 28 days cube strengths. The contractor shall without delay advise the Architect/Project Manager of any sample that appears likely to fail to meet the specification and the contractor shall take any necessary action to minimize the effect of such failure.

7 Acceptance Criteria

The general Acceptance Criteria of any and all of the concrete work shall be as per the relevant Clauses of IS. 456.

If any of the works tests are not up to the standard, the Architect/Project Manager shall have the power to stop the work until the reason is investigated and steps taken to prevent further low results. The contractor shall not be entitled to any claims on account of such delays. Any concrete carried out from the batch that is afterwards found to be faulty, will be liable for rejection and if so directed, the contractor shall at his own expenses dismantle and replace the defective work and any work built thereon or shall take such other measures as may be deemed necessary by the Architect/Project Manager.

At the discretion of the Architect/Project Manager, the contractor may be allowed to prove by means of a load test to be carried out at his own expense that the concrete is capable of safely withstanding the loads as specified in the test.

8 Formwork:

Forms shall be used, wherever necessary, to confine the concrete and shape it to the required dimensions. Forms shall have sufficient strength to with-stand the pressure resulting from placement and vibration of the concrete and shall have sufficient rigidity to maintain specified tolerances.

Structurally adequate, form work shall also conform to the requirements of the special architectural finishes of the in-situ Plain and Reinforced Concrete only specified/or shown on the drawings. Shop drawings of such form shall be subject to the approval of the Project Engineer prior to its use. Project Engineer shall refuse concreting of any part which in his opinion may not yield specified finishes.

Formwork shall be of wrought timber, steel, plywood, proprietary building boards and such special material, as may be shown on the drawings or approved by Project Engineer which gives the required finish to the surface of concrete. Wooden formwork shall be free from loose knots and shall be well seasoned. For the external concrete finishes 1.5 mm thick mild steel sheet forms shall be used. Contractor shall furnish shop drawings of such formwork prepared on the basis of architectural concept for the approval of Project Engineer.

Formwork shall conform to the shape, lines and dimensions as shown on the plans, and be so constructed as to remain sufficiently rigid during the placing and compacting of concrete, and shall be sufficiently tight to prevent loss of liquid from the concrete. The design and engineering of the formwork, as well as its construction, shall be the responsibility of Contractor. Where necessary to maintain the specified tolerances, the formwork shall be cambered to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and due to construction loads.

Contractor shall establish and maintain in an undisturbed conditions, and until final completion and acceptance of the Work, sufficient control points and bench marks to be used for reference purpose to check tolerances. The formwork shall be designed so that soffits of slabs and sides of beams, columns, and wall may be removed first leaving the forms to the soffits of beams and their supports in position.

Forms shall be sufficiently tight to prevent loss of mortar from the concrete. Chamfer strips shall be placed in the corners of forms to produce beveled edges on permanently exposed surfaces as shown on drawings. Interior corners on such surfaces and the edges of formed joints will not require beveling unless required by the drawings.

Positive means, wedges or jacks of accurate adjustment and proper removal of shores and struts shall be provided and all settlement shall be taken up during placing of concrete. Forms shall also be securely braced against lateral deflections.

Where concreting of narrow members is required to be carried out within formwork of considerable depth, temporary openings in the sides of the formwork shall be provided where necessary to facilitate the placing and consolidation of the concrete.

Small temporary openings shall be provided at the bottom of the formwork to columns, walls and deep beams to permit the cleaning out of debris and observations immediately before concrete is deposited.

Form ties shall be constructed so that the ends or end fasteners can be removed without causing appreciable spalling at the faces of the concrete. After the ends or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than twice the diameter or twice the minimum dimension of the tie from the formed faces of concrete to be permanently exposed to view except that in no case shall this distance be less than 20 mm when the formed face of the concrete is not to be permanently exposed to view, form tie may be cut off flush with the formed surfaces. Through bolts shall be permitted provided that they are greased to allow for easy withdrawal and the holes subsequently made good. Through bolts are not to be used on water-retaining structures.

At construction joints, contact surface of the form sheathing for flush surfaces exposed to view shall overlap the hardened concrete in the previous placement by not more than 25 mm. The forms shall be held against the hardened concrete to prevent offsets or loss of mortar at the construction joint and to maintain a true surface.

Wedges used for final adjustment of the forms prior to concrete placement shall be fastened in position after the final check.

Forms shall be sufficiently tight to prevent leakage of grout or cement paste. Board forms having joints opened by shrinkage of the wood shall be swelled until closed by wetting before concrete is placed. Plywood and other wood surface not subject to shrinkage shall be sealed against absorption of moisture from the concrete either by
(1) a field applied, approved form oil or sealer, or (2) a factory applied nonabsorptive liner.

When forms are coated to prevent bond with concrete, it shall be done prior to placing of the reinforcing steel. Care shall be taken that such approved coating is kept out of contact with the reinforcement. Whereas-cast finishes are required, materials, which will impart a stain to the concrete, shall not be applied to the form surfaces. Where the finished surface is required to be painted, the material applied to form surface shall be compatible with the type of paint to be used.

13 Steel work, welded in built up sections framed work including cutting, hoisting, fixing in position and applying a priming coat of read lead paint. (A)In beams and joists, channels angles Tees, flats, with connecting plates or angle cleats as in main and cross beams. Hip and jack rafters, purlins conneted to common rafters and the like. All types of section including H- sections, UC, ISMB, ISMC etc.

Workmanship:

The steel sections as specified or required shall be cut, square and to correct lengths, as per drawings and design. The cut ends exposed to view shall be finished smooth. No. two pieces shall be welded or other wise jointed to make up the required length of member, except as indicated in the drawings or as directed. All straightening and shaping to form shall be done by application of pressure and not by hammering. Any bending or cutting shall be carried out in such a meaner as not to impair the strength of the metal. All operations shall be done in cold state unless otherwise directed/permitted.

Steel riveted or bolted in built up sections, frame work.

The steel structure as shown in the drawings or as per direction of the Engineer-in-charge shall be laid out one level platform to full scale and to full size or in parts. A steel tape shall be used for measurements to ensure maximum accuracy.

Wooden templates 12 mm to 19 mm thick or metal sheet template shall be made to correspond to each connecting gussets plate and rivet holes shall be accurately marked on them and drilled. The template shall be laid on the steel members, and holes of the steel members shall also be marked for cutting. The base of steel columns and the position of Anchor bolts shall be carefully set out.

All stiffeners shall be formed by pressure and where practicable, the metal shall not be cut and welded in making these. In major works or where so specified shop drawings giving complete details and information for the fabrication of the component parts of the structure, including location type size, length and details of rivets, bolts, or weld shall be prepared in advance of the actual fabrication and as approved. The drawings shall indicate the shop and field rivets and bolts. The steel member shall be distinctly marked or stenciled with paint with the identification mark as given in the shop drawings.

The bars shall be thickened at the ends, so as to provide for screwed threads and gradually tapered off to meet their normal section.

Great accuracy shall be observed in fabrication of various member, so that these can be assembled without being unduly packed, strained or forced into position and when built up, shall be true and free form twist, bniks, buckles, or open joints. Before making holes individual members for fabrication, the steel work intended to be welded or bolted together shall be assembled or clamped properly and tightly so as to ensure close abutting or lapping of the different members. All stiffeners shall bear tightly both at top and bottom without being drawn or caulked. The abutting joints shall be cut or dressed true and straight and fitted close together.

Web splice plates and filters under stiffeners shall be cut to fit within 3 mm or flange angles, web plates of girders shall have not cover plates, shall have their ends flush with the top of angles forming the flanges unless otherwise required. The web plates when spiced shall have clearance of more than 6 mm.

The erection, clearance for cleared ends of members connecting steel to steel shall preferably be not greater than 1.5 mm. The erection clearance at the ends of beams without web cleats shall to be more that 3 mm at each end but where for a practical reason greater clearance is necessary, suitably designed seating shall be provided.

Pins and rollers shall be accurately turned to gauge. These shall be straight and smooth and free from flows. The roller bearing shall be provided with adequate arrangement for holding the girders or truss resting on it. In columns caps and bases, the ends of shafts together with the attached gussets angles, channels etc., after welding together shall be accurately mechanized so that the parts connected butt against each other over the entire surfaces of contract connecting angles or channels shall be fabricated and placed in position with greater accuracy so that they are not unduly reduced in thickness by machining.

The ends of bearing stiffeners shall be machanised or ground to fit tightly both at the top and bottom. All holes shall generally be drilled to the required size and at the required size and at required position. Sub punching shall be permitted, provided it is done 3 mm or less in diameter and remade thereafter to the required size. The holes for rivets and bolts shall be larger by 0.4 to 6 mm than the nominal diameter of rivets or black bolts depending up on the diameter of rivets.

Holes shall have their axis perpendicular to the surface bored through. The drilling or reamering shall be free form butts, and the holes should be clean and accurate. Holes for counter shunk bolts shall be made in such a manner that their heads fit flush with the surface after fixing.

The fabrication work shall be completed in workshop as far as it is practicable to do so. Site joints shall be done with rivets and fitted bolts or black bolts, as shown in the drawings or as directed. Generally the following principles shall govern the use of rivets turned and fitted bolts, and black bolts.

Rivets and turned and fitted bolts shall be used where the connection is such that slip under load has to be avoided.

Welding shall generally be done by electric process. Gas welding shall be resorted to using oxyacetylene flame with specific approval. Gas welding shall not be permitted for structural steel work.

The work shall be done as shown in the shop drawings which should clearly indicate various details of the joints to be welded, shop and site weldes as well as type of electrodes to be used. Symbol for welding on plans and shop drawing shall be according to I. S. 813-1986. As far as possible every effort shall be made to limit the welding that must be done after improper welding that is likely to be done due to heights and difficult position on scaffoldings etc.

The welding work shall conform to I. S. 816-2000.

Preparation of surfaces: Surface, which is to be welded together, shall be free from loose mill scale, rust, paint, grease or other foreign matter. A coating of boiled linseed oil shall be permitted.
Assembly for welding: Before welding is commenced, the plates shall first be brought together and firmly clamped or spot welded at specified distance. The temporary connection has to be strong enough to hold the plates accurately in place without displacement.

Precautions: All operations connected with welding and cutting equipment shall conform to safety requirement given in I. S. 818-1968

The following points shall be borne in mind during the process of welding:

- Welds shall be made in flat position wherever practicable.
- Arc length, voltage and amperage shall be suited to the thickness of material, type of groove and other circumstances of the work.
- The segments of welding shall be such that where possible, the members who offer the greatest resistance to compression are welded first.

The defective welds, which shall be considered harmful to the strength, shall cut out and rewelded.

Finished welds and adjacent parts shall be protected with clean boiled linseed oil and after all stag has been removed welds and adjacent parts shall be painted after the same are approved.

All the members shall be thoroughly cleaned of rust, scales, dust etc, and given a priming cot of red lead paint before fixing them in position.

Testing of welding to be added in the specification.

The rate includes cost of all material, labour, erection, hoisting, scaffolding protective measure, required for proper completion of the item of work. This shall also included conveyance and delivery handling, loading, unloading and storing etc. required for completing the item described above including necessary wastage involved.

The rate shall be for a unit of one Kg.

Measurement of steel shall be on the basis of length of the sections as per drawings and standard weight as per IS code. Weight of bolt / welding shall not be considered for payment

14 Providing TMT Bar FE 500D reinforcement for R.C.C. work including bending, binding and placing in position complete upto floor two level (Brands: Tata, Sail, Vizag, RINL, Jindal)

The rate shall include for Supply, cutting, straightening, bending, lapping, placing, binding, fixing in proper position, at any height with 16 gauge annealed binding wire, necessary chairs for keeping the reinforcement in position and wastage, cement mortar cover blocks at proper positions to maintain necessary cover as shown in drawings. As the length of reinforcement required in various structural members may be more than the standard length of reinforcing bars available in the market, The Contractor shall carry out the lapping / welding of reinforcement as specified by the Engineer at no extra cost. Welding rods, labour and machine shall be The Contractor's supply. Reinforcement shall be bent in accordance with the procedure stipulated in IS: 2502.

Standard weight shall be measured and paid for the net length of the bar and paid for kg basis. Material and Labour cost of laps will not be paid

15 Extra for Providing formwork with sheathing steel sheets so as to give a fair finish in

(B) Flat surfaces such as soffits of slabs Landings and the like. 2) Floors etc. above 200mm in thickness.

(C)Vertical surface such as walls (any thickness) partitions & lime including attached pilasters buttresses plinth & string course & like.

(G) Columns, Pillars, Posts and struts. (1) Square, Rectangular or polygonal in plan.

Fair finish form work shall be in plywood, sawn timber or steel as required for shaft, container walls, stairs, slab, beams, columns, parapets, etc for all concrete work including staging, scaffolding, etc. either using slip form or lift form or any other method approved by the Engineer, to get more precise and accurate dimensions of members in line, level and plumb.

These items are for elements having 'exposed' RCC finish. Since there will not be any plaster to cover concrete members for which formwork is to be required under this item and since no correction or patch work can be done, work shall be more precise to yield accurate dimensions of members in line, level and plumb. The surfaces shall be neat, clean and smooth and free from any blemish. Formwork shall be in laminated shuttering plywood (plastic coated) or steel - as required. Same shuttering material shall be used for standard sizes as well as for residual sizes. Only new material shall be used. Include for neat cleaning and rendering of the exposed concrete surface after de-shuttering as directed by the Engineer

The shuttering shall have smooth and even surface and the joints shall not permit leakage of cement grout. Timber used shall be well seasoned, free from loose knots, projecting nails, splits or other

defects that may mar the cement surface of concrete. It shall not be so dry as to absorb water from concrete and swell and bulge, or so green or wet as to shrink after erection. Species of timber that are not affected appreciably by its contact with water shall be used. The timber shall be accurately sawn and planed on the sides and the surface coming in contact with concrete. For exposed concrete faces, timber for shuttering shall be wrought on all faces in contact with concrete.

Wooden formwork with metal sheet lining or steel plates stiffened by steel angles shall also be permitted. Where metal forms are used, all bolts and nuts shall be countersunk and well ground to provide a smooth plane surface. The chamfers, bevelled edges and mouldings shall be made in the formwork itself. Opening for fan clamps and other fittings connected with services shall be provided in the shuttering as directed by the Engineer-in-charge. As far as practicable, clamps shall be used to hold the forms together. Where use of nails is unavoidable minimum number of nails shall be used and these shall be left projecting so that they can be easily withdrawn. Use of double head nails shall be preferred.

Surface Treatment for Shuttering: The surfaces of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution, raw linseed oil, form oil of approved manufacture or any other approved material (such as polythene/polyethylene sheets), to prevent adhesion of concrete to form work. Soap solution, for the purpose shall be prepared by dissolving yellow soap in water to get the consistency of paint. Inside surfaces of forms shall be thoroughly cleaned before application of any of the materials mentioned above. Release agents shall be applied strictly in accordance with the manufacturers' instructions and shall not be allowed to come in contact with any reinforcement. Re-use of the shuttering shall be permitted only after the inside surface has been thoroughly cleaned in the manner described above.

Measurements: Where it is stipulated that the formwork shall be paid for separately, measurement shall be taken of the area of shuttering in contact with the concrete surface.
Dimensions of formwork shall be measured correct to 10mm. The measurements shall be taken separately under each of the items mentioned above.

16 Providing & fixing Malyasian Hardwood column/beam sections size 100x100 mm thick with appropriate length and available to square post core outer corners ,including alternative ways to attached post to beam/column used to steel plate and adjusting nut and steel dowels work to be carried out in all floor ,with all height and as per detail drawing.complete. The rate inclusive of seasoning, chemical treatment and randha work

Material :

Shall be approved brand of Malyasian Hardwood with chemically treated and seasoned with minimum 2.5 mtr length with required size. Material shall comply with the CSA O-80 Series of standards.

Workmanship:

Providing and fixing the member in Column beam section as per the detail drawings submitted by the Architect or Engineer in charge with adjoining steel plates / nuts/ fastners etc. Work shall be strickly carried out under proper supervision with technically skilled staff. Final coating for weather protection shall be done at site only. Wood shall have Exterior polish pigment for protecting wooden surfaces from discoloration which comes from exposure to UV light. Wooden members, vertical and horizontal shall be fixed in proper alignment; cutting shall be done with proper mechanical tools. Joining of member with steel member shall be done with fastners. Use only

ecologically clean, tested and approved chemicals that are 100% safe for health, do not have any smell and don't cause allergies. Treated wood is typically used in applications where it may be exposed to moisture for considerable periods so any fasteners and connectors used with treated wood must also be resistant to these conditions. In addition, most wood preservatives designed for exterior use contain copper that may react with the metals used to fabricate fasteners and connectors therefore, it is important to use the right type of fastener and/or connectors. Where treated wood is used in dry environments to prevent damage by wood-destroying insects, including termites, corrosion is of less concern. The whole workmanship installation and materials shall meet the criteria of Canadian wood council CSA 086 technical committee.

Rate

shall include all above specification with all labours, materials, coating, weather protections, using standard fastners, scaffolding, cutting, (chamfering, moulding if required) polishing, loading, unloading, wastages, testing of wood properties if required, at plinth and above plinth up to 10 mtr height etc complete with 5 years warranty.

Measurement shall be in Cubic meter basis of actual wood used. No wastages and cutting shall be counted.

17 Providing and laying polished Kota stone slab flooring over 20mm (Average) thick base of cement mortar 1:6 (1-cement : 6-coarse sand) or L.M. 1.1.5 (1-Lime putty :1.5 - coarse sand) laid over and jointed with grey cement slurry mixed with pigment to match the shade of slab including rubbing and polishing etc. complete. (A) 30mm thick

1.0 Materials :

1.1 Water shall conform M-1. Lime mortar shall conform to M-10. Cement mortar shall conform to M-11 polished kota stone shall conform to M-49.

2.0 Workmanship :

2.1 Each slab shall be cut to the required size and shape and fine chisel dressed at all the edges. The sides thus dressed shall have a full contact if a straight edge is laid along. The sides shall be table rubbed with coarse sand before paving. All angles and edges of the slabs shall be true square and free form chippings and giving plain surface. The thickness shall be 30 mm. (Average) as specified in the item but not less than 25 mm. at any place of the slab.

2.2 Bedding for the kota stone slabs shall be cement mortar 1:6 (1 cement : 6 coarse sand) or L.M. 1:1.5 of average thickness 30 mm. as given in the description of the item. Sub grade shall be cleaned, wetted and mopped. Mortar of the specified mix and thickness shall be then be spread on an area sufficient to receive one kota stone slab. The slab shall be washed clean before laying. It shall be laid on top pressed, tapped gently to bring it in level with the other slabs. It shall be lifted and laid a side. Top surface of the mortar shall then be corrected by adding fresh mortar at hollows or depressions. The mortar shall then be allowed to harden bit. Over this surface, cement slurry of honey like consistency shall be applied. The slab shall then be gently place in position and tapped with wooden mallet till it is properly pedded in level with and close to the adjoining slab. The joint shall be as fine as possible. The slabs fixed in the floor adjoining the wall shall enter not less then 10 mm. under the plaster skirting or dado. The junction between the wall floor shall be finished neatly. The finished surface shall be true to levels and slopes as directed.

1.1 The floor shall be kept wet for a minimum period of 7 days. So that bedding and joints set properly.

2.4 Polishing shall be normally commenced after 14 days of laying the stone slab. First polishing shall be done with ear corundum stones of 120 grade grit fitted in the heavy machine and then second polishing shall be done with carborundum stone of 220 of 350 grade grit fitted in heavy machine. Water shall be properly used during polishing. The stone shall then be washed clean with water. When directed by the Engineer-in-charge wax polish of approved quality shall be applied on the surface with the help of soft cloth over a clean and dry surface. Then the polish machine fitted with bobs shall be run over it.

2.5 The holes required for Nahni traps, pipes any other fittings shall be made without any extra cost.

3.0 Mode of measurements & payment :

3.1 The rate shall include the cost of all materials and labour involved in all the operations described above. The Kota stone flooring shall be measured in square meters correct to two places of decimal, length and breadth shall be measured correct to a centimeter and between the finished face of skirting dado or wall plaster and no deduction shall be made nor extra paid for any opening in floor of area upto 0.1 sq. mt.

3.2 The rate shall be for a unit of one sq. metre.

18 Providing and laying polished kota stone slab 30 mm thick in risers of steps,skirting Dedo and pillars laid on 10mm thick cement mortar 1:3 (1-Cement : 3 coarse sand) and jointed with gray cement slury mixed with pigment to match the shade of slab including rubbing and polishing etc. complete.

1.0 Materials :

Water shall conform to M-1. Cement mortar shall conform to M-11. Kota stone slab 30 mm. thick shall conform to M-49.

2.0 Workmanship :

2.1 The relevant specifications of item no. 31 shall be followed except shall that the kota stone shall be fixed for risers of steps, skirting or dado in C.M. 1:3 and the polishing shall be manually instead of machine polishing.

3.0 Mode of measurement & payment :

3.1 The risers of steps, skirting or dado shall be measured in sq. metre. Length shall be measured along the finished faces of risers, skirting or dado. Height shall be measured from finished level of treads or floor to top. Lining of pillar shall be measured under this item.

3.2 The rate shall be for a unit of 1 sq. metre.

19 Providing and laying Flame finish Granite 30 mm thk stone flooring in required design and patterns, in linear as well as curvilinear portions all complete as per the architectural drawings with 25 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with cement slurry admixed with pigment of matching shade including wastage,rubbing, cutting, curing and polishing etc all

complete as specified and as directed by the Engineering- Charge : Colour Jet Black, Cherry Red, Elite Brown, Cat Eye or equivalent.

1.0 Granite shall be free from flaws, injurious veins, cavities and similar imperfections that would impair its structural integrity and adversely affect its strength and appearance. The compressive strength shall not be less than 1000 kg/cm2. The specific gravity shall not be less than 2.6. The water absorption shall not be more than 0.50 percent. Structural Granite shall conform to IS 3316. Granite slabs shall be rectangular or square and of specified dimensions. The tolerance in length and breadth shall be ± 2 mm and thickness ± 1 mm. The bottom face may be rough but the top surface shall be fine dressed and joint faces shall be dressed back square with the topBsurface for at least 50 mm, without hollowness or spalling off. The dimensions of the blocks shall be as specified. The tolerances shall be allowed ± 5 mm for facing blocks. The edges of the blocks shall be dressed according to IS: 1129.

2.0 Materials :

2.1 Dressing of slab : Every stone shall be cur to required size and fine chisel dressed to give a smooth and even surface on all sides to the full depth. A straight edge laid along the sides of the stone shall be fully in contact with it. Chisel dressing shall also be done on top surface to remove any waviness. The sides and top surface to granite slabs shall be machine rubbed or table rubbed with bourse sand before using. All angles and edges of slabs shall be true square and free form chippings.

2.2 The thickness of stone shall be 30 mm. The allowable tolerance shall be 2 mm. allowable. The tolerance shall be 15 mm. in length and breath.

2.3 Bedding : Bedding of granite slabs shall eight be lime mortar 1:1.5 (1 Lime putty : 1.5 coarse sand) or cement mortar 1:4 (1 cement : 4 coarse sand) of average thickness 25 mm. thick as given in description of item. Minimum thickness at any place shall not be less than 10 mm.

2.4 Laying : The surface of sub grade shall be cleared wetted and mopped. Mortar of specified mix and thickness shall then be spread on an are sufficient to receive one granite slab, The slab shall be washed clean before laying. It shall be laid on top pressed and tapped gently to bring it in level with other slabs. It shall then be lifted and laid a side. The top surface of the mortar shall then be corrected by adding fresh mortar at hollows, or depressions. The mortar shall then be allowed to harden it over this surface cement slurry of honey like consistency at 4.4 Kg. Of cement per sq. meter. The edges of slabs already paved shall be buttered with gray cement. The slab shall then be gently placed in position and tapped with wooden mallet till it is properly bedded in level with and close to the adjoining slab. The joints shall be as fine as possible : Surplus cement on the surface of the slabs shall be removed. The slab fixed in the floor adjoining the walls shall enter not less 10 mm. under the plaster skirting or dado. The junction between the walls and floors shall be finished neatly. The finished surface shall be true to level and slopes as directed.

2.5 Curing : The floor shall be cured for minimum period of seven days.

2.6 Polishing and finishing: Unevenness at the meeting edges of slab shall be removed by fine chiseling. Finishing etc. shall be done as per relevant specifications of item no. kotah stone flooring except that cement slurry with/or without pigments shall not be applied on the surface before each polishing.

3.0 Mode measurements & payment:

3.1 Granite stone flooring with various kinds of granite shall measured in sq. meter. The length and breadth shall be measured between the finished face of skirting or dado or wall plaster. No deduction shall be made not extra shall be paid for any openings in the floor or area upto 0.05 sq. mt. Nothing extra shall be paid for laying stone at different levels in the same room. Treads and steps of stairs paved with granite stone slabs shall also be measured under flooring.

3.2 The rate shall be for a unit of one sq. meter.

20 Providing and fixing 20 mm thick gang saw cut, mirror polished, premoulded and prepolished, machine cut for kitchen platforms, vanity counters, window sills , facias and similar locations of required size, approved shade, colour and texture laid over 20 mm thick base cement mortar 1:2 (1 cement : 2 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edges to give high gloss finish etc. complete at all levels. Granite of any colour and shade

All the Relevant specification remains same as above item , except Mirror polished granite and for the work of platforms-windows sill etc with moulding, rubbing complete.
The rate shall be for as per unit of Running meter.

21 Providing and fixing of 25 mm thick EPDM flooring for Childrens play area in multi colour with 6mm thick EPDM granule top layer, 19 mm thick SBR rubber layer, applied with fast curing polyurathine binder including wastage and complete as per EIC (Brands Ecoflex, Koochieplay, Ebaco)

Material :

SBR Buffing (Styrene-Butadiene Rubber)

INSTALLATION :

Shall be on min 75-100 mm base layer of prepared IPS or PCC surface. While laying the materials no outside interference shall be allowd, surface shall be free of moisture for minimum 24 hrs after the laying. Total Thickness is 25 MM (First Layer of 19 MM Thick Black SBR & Second Layer of 6 MM Thick Color EPDM). Laying shall be with PU binder, and having excellent weather properties, water resistance. The whole installation shall be strickly done under vendors guide line and specification.

Measurement Shall be done on sqmtr basis of net area of laying. No wastages, or lapping shall be entitled for the mode of measurement. Sub base or PCC shall be paid separately.

Rate

shall include all the materials, labours, installation, PU binders, Glues, loading, unloading and standard 1 year warranty etc complete as per the requirement of the project.

22 Providing and applying Hot dip Galvanised coating with relevant Indian Standard specification. Zinc coating thickness to be 86 micron and before application of GI coating the material should be free from all dirt, grease, varnish, paint or any other foreign matter. Including touching of local exposed areas with Zinc metal spray paint with 2 coats to make the structure corrosion free

with cleaning thoroughly the applied surface making it free from grease, paint or any other foreign matter, sanding the surface before and after the paint to provide seamless aestheic look complete as per the instructions of the EIC including transport/loading/unloading the materials at plant for HDGC work

Material :

Zinc used for galvanizing shall conform to any of the grades specified in IS 209:
1992 'Zinc ingot' or IS 13229 : 1991 'Zinc for Galvanizing'. The molten metal in the galvanizing bath shall contain not less than 98.5 percent by mass of zinc.

Procedure :

Requirement for the mass of the zinc coating shall be as per the relevant IS:4759 -1996 of Table-1. The zinc coating shall be uniform, adherent, reasonably smooth and free from such imperfections as flux, ash bare patches, black spots, pimples, lumpiness, runs, rust stains, bulky white deposits and blisters.

The coating shall withstand the pivoted hammer and knife tests as prescribed in IS 2629 : 1985 for testing adhesion of zinc coatings on fabricated products and hardware respectively.

Rate shall include all the operations, loading, unloading of materials from plant and sites, total zinc coating process as per the above specs in standard approved plant, wastages, etc complete as per the engineer in charge.

Measurement shall be on the weight basis of the galvanized or steel members which has to be zinc coated.

Item List With Make (Civil Work)

Sr. No.	Item	Brands
1	**Concrete Work: PCC or RCC**	
a	Cement	Ambuja, Ultra Tech, ACC, Siddhi, JK Laxmi, Binani, Jaypee, Birla super, Raajshree, Vasavdatta
b	TMT Reinforcement Bar Fe - 415 or Fe - 500	Tata, SAIL, VIZAG, RINL, Jindal Confirming to IS – 1786:1985 (reaffirmed 2004) or IS 432 Part –I & II : 1982)
c	Sand	As per Mix design for concrete work or zone-II. For Masonary and plaster work zone – III
d	Concrete Additive, admixtures	Sika/ STP/CICO/Pidilite/ Fosroc/Fairmate/ MC Bouchemie
e	Precast RCC utility channels	Fuji Silvertech
f	Water Proofing Compounds, Plasticizer, Super Plasticizer, Grouts, Polymers, Polyexpanse, Other construction	ChowguleKoster, Fosroc, Sika, Huntsman (Ciba Geigy), Sunanda Specialty Coating, Shivalik Agro Poly Product Ltd.(Water Proofing liner).
2	**Masonary Work**	
a	Brick Masonary	Having crushing strength not less than 35 Kg/ Sqcm of Localy Available
b	Aerated Light Weight Concrete Block Masonary (AAC Block Masonary)	Aerocon, Cyporox, Magicrete, Ecolight
3	**Structural Steel Work**	
a	Structural Rolled Steel sections-beams (all forms of sections including all ISMb, H-section, Universal Column/beam), channels, tee, flats, angles, bars(round, square, hexagonal)	Tata, SAIL, RINL, Jindal
b	Structural Hollow steel sections (Square & Rectangular)	Tata, Asian, Jindal, Surya, Appolo
c	Structural tubular sections	Tata, Asian, Jindal, Surya, Appolo
d	Pressed Steel Doors Frame	West Wind Concepts Pvt. Ltd., Gurgaon/ Shiva Steel Pvt. Ltd. , NOIDA/ AGEW Steel Manufacturing, Ahmedabad/ Sukri/ Godjej/ Gurdian/ Navair
4	**Wood Work (Door, Window & Interior)**	
a	Teak Wood	Ghana, Nagpur (Indian Teak)
b	Sal Wood	Indian or Imported (First Class)

b-1	Canadian/Malaysian wood	Imported (First Class)
c	Flush Door (decorative / non decorative)	Green, Duro, Century, Swastik, Kit Ply, Anchor, Uniply, Archid ply, Bhutan Board, Hindustan Board/equivalent.
d	Ply Wood	
	Plywood/Block Board/ Soft Board	Anchor, Duro, Merino, Century, Kitply
	Shuttering plywood	Kitply, Anchor, Green, Pragati, Mayur.
	Water proof/Marine grade plywood as per – IS – 710 (BWP)	Green, Archid, Kitply, Anchor, Uniply
	Commercial Plywood – IS – 303 (BWR)	Green, Archid, Kitply, Anchor, Uniply.
e	Decorative ply (Veneer)	Green, Durian, Century, Archid
f	Natural Veneer	Timex, Durian, Century Ply
g	MDF	Nuwood, Duratuff (exterior grade only)
h	Prelam particle board	Novapan, Anchor, Merino, Bhutan. (exterior grade only)
i	Laminate sheet	Duro/ Century/ Greenlam/ Formica/ Decolam/ Euro,Sungolss, Sunmica, Backelite hylem
j	Liquor /Melamine /PU polish	MRF, Asian, ICI, Taralac
k	Wooden Adhesives	Fevicol, Blue coat, Araldite, Pidilite, Dunlop.
5	**Aluminum Work (Door, Window & Interior)**	
a	Aluminium Sections	Jindal, Indian Aluminium section, Hindalco (Indal), Banco, Royal touch, indal,Hindalco, Bhoruka, Pankaj, Alufit, Gulf extrusion.
b	Aluminium finish	
	Interior works	Super durable powder coated (Akzonobel, Jotun, Fuller AG)
	Façade exteriors	PVDF finish (Valspar, PPG, Akzonobel)
	Non visible surface	Chromatizing
c	Aluminum Window Locks , Handle, Friction Stays	Alualpha, Securestyle, Giessee, Roto, Geze, Savio, Frikstay, Kich, Orbit
d	Oxidised Aluminum Fitting	Dorma, Ebco, Doorline, Classic ,Kich, Orbit
e	Aluminum Operable Louvers	Technal, Domal
f	Anodising	Bhoruka alum, Alufit alum, Ajit India, Alufin
g	Gasket of infill panel for Aluminum	Amee Rubber, Gold Seal, Osaka rubber, Maharashtra Polymer, Maharashtra Tyre & Rubber Industries.

h	Rough ground for Aluminum works	IS 710 ply, 6mm to 8mm thick or Ghana teak.
6	Compact sheet	Alfiaca, Sundek, Vir, Bloom, Formica, Merino
7	Cement bonded particle board	Shera ,NCL (Bison board), Everest (Eternite).
8	Calcium silicate board / Gypsum Board.	Saint Gobain (India Gypsum), Hilux ,Lafartz, Aerolite.
9	Dead Locks/ Mortise locks/ Narrow stile dead locks/ Tubular locks	Kich, Dorma, Dorset, Yale, Godraj, Enerite, Sigma, Opel, Doorset, Europa
10	Glass Work	
a	Float Glass / Wired Glass, Mirror	Modi Guard, Saint Gobain, Float Glass India Ltd., Asahi, HNG.
b	Reflective Glass	Saint Gobain, PPG, Asahi, Emirates, Pilkington, Sejal.
c	Glass ProcessorFor HS/HT, Bulletproof, DGU, Toughness, lamination etc.	Impact Safety, Sejal, Glasstech, GSC, Asahi, FGGlass, Goldplus, Emirates
11	**Tile Work**	
a	Precast Terrazo Tiles (Mosaic)	Royal (Rajkot) ,Alcock, Vyara, Nitco
b	Ceramic Tiles	Asian, Euro, Bell Ceramic, Johnson, Somani, Nitco, Kajaria, Restiles, Varmora.
c	Glazed Tiles	Asian, Euro, Bell Ceramic, Johnson, Somani, Nitco, Kajaria, Restiles, Varmora.
d	Vitrified Tiles	Asian, Euro, Bell Ceramic, Johnson, Somani, Nitco, Kajaria, Restiles, Varmora, Pavit
e	Glass Mosaic	Bisazza, Palladio, Italia
f	Paver Block	Vyara, Basant Betton, Pavit, Pavcon
g	Grass Paver Block	Amdavad Enviro, Pavcon
h	Non-Metallic Floor Hardener	Ironite, Fosroc, STP, CICO, SIKA
i	Cement Concrete Tiles Designer Tiles	Ultra, Eurocon, Nitco, Modern Tiles Group of Industries
j	Tile Adhesives & Grouting material	BAL, Laticrete, Kerakoll
k	Ethylene propylene diene monomer rubber (EPDM) flooring	Ecoflex, Koochieplay, Ebaco
12	Paint Work	
a	Paint, Primer, Putty	Johnson & Nicholson,Asian, Berger, ICI, Birla (putty), JK (Putty) Nerolac

b	Synthetic Enamel Paints	Berger, Asain, Nerolac, Duco
c	Acrylic Distemper	Asian, Berger, Nerolac
d	Cement Paint	Snowcem Plus, Berger, Nerolac
e	Plastic Emulsion Paint	Asian, Nerolac, Berger/Asian
f	Low VOC Paint/ Emulsion Paint	Asian, Nerolac, Berger
g	Texture External Plaster	Spectrum, Coral, Terre Palette
h	Heritage Surface Texture	Bakelite Hylam
14	ACP (Aluminium Composite Panel)	Alu Décor, Flexibond, Durabuild, Indobond, Alstone, Viva, Eurobond
15	Construction Chemicals (Plasticisers, Bonding agents, , SBR Latex, Micro Concrete)	BASF, Fosroc, Sika India Pvt. Ltd., CICO Tech Ltd., MC Bauchemie , Sunanda chemicals, Pidilite
16	Water Proofing Chemicals	
a	Chemical Water proofing & Integral water proofing compound	Chryso, CICO, Fosroc, Kryton, Sika, Dr. FIXIT, Plastocrete plus , F Airmate, Pidilite Ind Ltd
b	Crystalline water proofing	Penetron or Kryton
17	Silicon Sealant/ Silicon Paint	Sika, Wacker, Dowcorning, GE, Soudal, Bostik, Chryso
18	Polysulphide Sealant	Pidilite, Chawksey
19	P.U sealant	Sika (Exterior grade - UV resistant)
20	PVC Water Stop	Arti Cables Baroda, Fixopan, Maruti
21	Door Window Hardware	Kich, Dorma, EPPW ,Palladium, Magnum
22	Floor Spring	Dorma, Mab, Hafle, Doorset, Everite, Omega, Hardwyn
23	Hydraulic Door Closer	Dorma, Yale, Hafle, Hardwyn, Trium, Everite,Hyper
24	Pre-coated Steel Roofing/ Walling Sheets 550 Mpa	Tata Bluescope, Interarch, Nippon Dendro (poly steel) Shree Precoated (Meta color)
25	Polypropylene Fibers	Nina Concrete, Reliance
26	Fire Door	Shaktimat, AGEW, Radiant
27	PVC Door	Rajshri, Sintex
28	Anchor Fasteners	Axel, Hilti, Fischer, Kundan, Mungo, Corroshield, Buildex
29	Spandrel Insulation	Glass Wool
30	Wool Felt/Weather Strip	Anand, Reddiplex Ltd.
31	Stainless Steel Railing/ Fittings	D Line, Dorma
32	Rust Remover/Converter	Feovert (Krishna Conchem), Roff Rust Clear (Pidilite Industries)
33	Non-shrink General Purpose Grout	Fosroc, BASF
34	Anchoring Chemical for Rebar Dowell Bar	Hilti, Fischer, Axel

35	Roll Down Mosquito Curtain	Netmos
36	SS clamps for cladding	Hilti, Axel.
37	MS Rolling Shutter	Sona, Sagar, Suryoday, Gandhi, stndard, swastik, shudhwar
38	Pre-cast RCC /Glass fiber reinforce street furniture	TDW Ahmedabad, Arya Precast Ahmedabad
39	Play /Gym equipments	Ok Play, Play Global, Koochie, Arihant
40	Street/ Building signages from Corten steel/ SS steel	Capsicum Wall ideas, Colourzone marketing, Chunilal Gandhi & Co.
41	Boom Barriers	Swaraj Secutech, New tech automation
42	Tensile roof structure	Divya Structure, Solanki Engineering works, Vintex tensile solutions

LIST OF APPROVED MAKES FOR WATER SUPPLY AND SANITARY WORKS

Sr. No.	Item	Brands
1	Vitreous China Sanitaryware	Jaquar, Hindware, Parryware, Cera, Kohler
2	Plastic W. C. Seat Cover	Jaquar, Hindware, Parry ware, Cera, Kohler, Commander
3	Stainless Steel sinks	Nirali, Jayna, Kingston, Neelkanth, Johnson, Prestige, Parry, Franke, Salem
4	C. P. Fittings & Accessories	Jaquar, Hindware, ESCO, Parco, Cera, MARC, PLUMBER
5	Ultra Violet Water Purifier	Alfa Waterpurifiers, Eureka Forbes
6	Hydro pneumatic System and Water Supply Pumps	Wilo, Grundfos, Calpeda
7	G. I. Fittings	RV' & 'R' Mark, Unik, DRP, UNCO, R BRAND, UNIK, ZOLOTO, TATA, BANSAL OR EQUIVALENT.
8	G. I. Pipe/M. S. Pipes	Tata, Jindal, Prakash, Zenith, Surya, Asian, Gujarat Steel Tube, Bansal
9	C. P. V. C. Pipes & Fittings	Astral, Supreme, Prince, Ashirvad, Finolex
10	U. P. V. C. Pipes & Fittings	Astral, Supreme, Prince, Ashirvad, Finolex
11	P. V. C. Pipes & Fittings	Astral, Supreme, Prince, Ashirvad, Finolex, Garware, Kissan
12	Gun metal valves	Zoloto, L & T, Leader, Sant, L & K, Premier, Aatco, VTC
13	CI Sluice Valves, Check valves	Kirloskar, IVC, Burn, William Jacks, Indian Valve(IVC), Advance, Leader, VTC
14	Ball Cocks/ BALL VALVES (Brass)	GPA, Sant, L & T, L & K., AUDCO,ZOLOTO,LEADER,VTC

15	UPVC Bore well Column pipe	Astral, Supreme, Prince, Ashirvad Pipes, Duke, Kissan, Precision
16	HDPE Pipes	Duralinr, Penwalt Agru, Nocil, Jain, Supreme.
17	Fiber reinforced R.C.C. Manhole Cover/ grating	Pratibha, CIDCO, THERMODRAIN,
18	C. I. Manholes Covers and Frames	Ashok Iron , Raj, Neco, R. I. F., B. C., Neer, GMGR Approved ISI Marked
19	Submersible Drainage Pumps	Wilo, Grundfos, Mather & Platt, Calpeda
20	Liquid Level Controllers Liquid Level Indicators	Hema, Minilec, Radar, TECHNIKA
21	Bore well Pump	Wilo, Grundfos , KSB, Calpeda
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/ZOLOTO/ INTERVALVE/VTC
27	Gunmetal Non Return Valve	Leader, Audco, Zoloto, AIP, Sant, VTC
28	Water Meter	Kranti, Sant, Kapstan Bombay, Voltas Kent, Calcutta
29	P.V.C. / H.D.P.E Water Tanks	Syntax, Reno, Ashirvad Pipes,Purvee,Kaveri, KAKA
30	SWR Pipe	Astral, Supreme, Prince, Finolex, Ashirvad Pipes, Jain, Kisan/KSR
31	Copper Pipe	IBP-Neco, Rajco
32	Hot Pipe Insulation	Armacel, Champion & Charminar, ARMAFLEX, THERMAFLEX
33	RCC Hume Pipe and Fittings	Patel Hume Pipes, Alcock, Indian Hume Pipe, PRANALI/ JK
34	Polyethylene Composite Pressure Pipe	KITEC/ASTRAL
35	Stoneware Pipes & Fittings	Mahavir, Taya & Unique
36	Pump Set	KSB, Kirlosker, Wasp, Crompton, Beacon, Grundfos, Beacon
37	PRESSURE REDUCING VALVE	ZOLOTO/ HONEYWELL
38	FOOT VALVE	ZOLOTO/ SANT
39	UNDER GROUND DRAIN PIPE	D-Rex/ Ashirvad(Foam core)/ Astral
40	STRAINER	ZOLOTO/ SANT
41	AIR RELEASE VALVES	VARIES, HONEYWELL, VB
42	BALL FLOAT VALVE	PRAYAG/ BEE
43	BALL FLOAT VALVE	PRAYAG/ BEE

NOTES:

Make of various items offered by the tenderer shall clearly be marked in the above list. However the final choice of the selection of particular make solely lies with Client / Consultant which shall mutually be agreed upon before finalization of order.

Approval must be needed for the all material; sample will be submitted to consultant along with detail catalogue.

Make of any other items required but not specifically mentioned shall be got approved by Client / Consultant.

LIST OF APPROVED MAKES FOR ELECTRICAL WORKS

SR. NO	ITEM DESCRIPTION	SPECIFIED MAKE
1	Rigid PVC Conduit	ISI & FIA approved & manufactured from virgin material, Vraj/ Precision
2	Accessories for conduit	Same make as of pipe
3	Flexible Copper Wires	FRLS type: Avocab/ Finolex/Polycab
4	Switches & its accessories	CLIPSAL (OPAL)/ Legrand (Mosaic)
5	Fan Box	Maxell
6	Switch fuse Units 60 Amps -AC 23 duty	L&T/ Schneider/ L&T
7	HRC Fuses	Schneider / L&T/ Indo-Asian.
8	MCCB/MCB/ELMCB/Iso/ SPDs & Accessories	Schneider/ L&T /Legrand (Lexic)/ Siemens/ GE/ABB/Hager
9	Distribution Boards	Schneider / L&T /Legrand (Lexic)/
10	PVC tape	Steel grip/ Anchor
11	LT Cables	Avocab/ RR Kabel/ Finolex/Polycab/ Anchor/, Havells/L&T
12	Glands : Double Compression type, Heavy duty and deep threading with rubber ring and double washers. (Sample to be approved)	HMI/ Comet
13	Cable Lugs	Dowels/ 3-D
14	Industrial Plug-socket	Legrand/ Indo-Asian
15	Connectors	Elmex/ Connect-well
16	Button holder, Angle Holder, ceiling rose	Anchor/ CPL
17	Multi-Function Meter	Schneider/ El Measure
18	Light Fixture	K Lite/Ligman/Schreder,Havell's/Bajaj/Wipro (Sample to be approved from the Electrical Consultant) **(all the Tube Lights shall be of 5star rating of BEE)**

19	Ceiling Fans	Crompton/ Bajaj **(all the Fans shall be of 5star rating of BEE & High Speed + type / equi.)**
20	Decorative Street Light Pole with Cast Iron Base.	K Lite/Ligman/Schreder,Havell's/Bajaj/Wipro
21	Exhaust Fan	Crompton/ Almonard
22	Call bell	Anchor Ding Dong type
23	Cable Tray	Indiana/ Power Control/ M.M. Engg
24	Panel Fabricators (Metallic)	Only approved & registered system house of Schneider/ L&T/ CPRI Approved
25	Panel Fabricators (Thermoplastic)	Hensel/Spelsberg/Havell's/Legrand/Schneider, Siemens
26	Anchor Fasters	Hilti
27	On Load Changeover	L&T/ Schneider
28	Meters(V,A,PF etc)	AE/ RISHABH/ ElMeasure
29	Timer	Legrand/ Schneider
30	Raceway	MK (Ega)/ Legrand
31	LT CT	KAPPA/ AE
32	DWC Pipes	Rex/ Dutron
33	Control Cables	Avocab/ Polycab
34	HT Breaker	Schneider/ Crompton
35	UPVC Raceway	Legrand/ MK

Note: - The Engineer-in-charge, reserves the right to add or delete any materials and Brands in the list of approved materials/brands.

LIST OF APPROVED MAKES FOR FIRE FIGHTING WORKS

S.NO.	DESCRIPTION	MAKES
	Wet Riser/Fire Hydrant/Sprinkler System/Fire Extinguishers:	
1.	Fire Pump	: Wilo/Grundfos/Calpeda
2	Main Control Panel (All electrical components)	: Siemens/L&T
3.	M.S. Black/G.I Pipes	: Tata/Jindal Hissar
4.	Forged Fittings	: V.S. Engg./J.K. Forging/Rapidrop
5.	Malleable Iron Fittings	: Crescent/`R' Brand/Rapidrop
6.	Butterfly Valve	: Audco/Advance/Intervalve/Kirloskar/Rapidrop

7.	Non Return Valves (CI)	: Audco/Advance/Intervalve/Kirloskar/Rapidrop
8.	Landing Valves	: Minimax/Newage/HD/Rapidrop
9.	Fire Brigade Inlets	: Minimax/Newage/Firex/HD/Rapidrop
10.	F.A. Hose Reel (Drum and Bracket)	: Minimax/Newage/Firex/HD/Rapidrop
11.	Rubber Hose for above	: Dunlop/Newage
12.	G.M. Gate/Globe/Check Valves	: Leader/Zoloto/Sant/Rapidrop
13.	Flax Canvas Hose	: Indian Rayon/Newage
14.	C.P. Hose	: Indian Rayon/Newage
15.	R.R.L Hose	: Indian Rayon/Newage
16.	Hose Couplings Branch Pipe & Nozzles	: Minimax//Newage/Indian Rayon (G.M.)
17.	Pressure Switches	: Danfoss/Switzer/Indfoss
18.	Pressure Gauge	: H. Guru/Fiebig
19.	Quartz Bulb Sprinkler Head	: Tyco/HD/Vikings/Rapidrop
20.	Alarm Valve and Hydraulic Alarm Motor with GONG	: Viking/HD
21.	PVC insulated and PVC Sheathed Aluminium Conductor Armoured Power Cable of 1.1 K.V. Grade	:Polycab/Gloster/National
22.	Flow Switch	: Potter/System Sensor
23.	Water Type (Gas Pressure): Portable Extinguishers	: Minimax/Ceasefire /Firex
24.	CO2 Portable and Trolley: Mounted Extinguishers	: Minimax/Ceasefire /Firex
25.	Portable ABC-Powder Type: Fire Extinguishers	: Minimax/Ceasefire /Firex
26.	Anticorrosive Tape (Pypkote)	: IWL India Limited
27.	Welding Rod	: Advani
28.	Anchor Fasteners	: Fischer, Hilti.

CONDITIONS OF CONTRACT SPECIFIC TO GREEN BUILDING PRACTICES

The contractor shall strictly adhere to the following conditions as part of his contractual obligations to the extent applicable to the site:

1.1 SITE

1.1.1 The contractor shall ensure that adequate measures are taken for the prevention of erosion of the top soil during the construction phase. The contractor shall implement the Erosion and Sedimentation Control Plan (ESCP) provided to him by the Engineer in Charge as part of the larger Construction Management Plan (CMP). The contractor shall obtain the Erosion and Sedimentation Control Plan (ESCP) Guidelines from the Engineer in Charge and then prepare "working plan" for the following month's activities as a CAD drawing showing the construction management, staging & ESCP. At no time soil should be allowed to erode away from the site and sediments should be trapped where necessary.

The contractor shall ensure that all the top soil excavated during construction works is neatly stacked and is not mixed with other excavated earth. The contractors shall take the clearance of the Engineer in Charge before any excavation. Top soil should be stripped to a depth of 20 cm (centimeters) from the areas to be disturbed, for example proposed area for buildings, roads, paved areas, external services and area required for construction activities etc. It shall be stockpiled to a maximum height of 40 cm in designated areas, covered or stabilized with temporary seeding for erosion prevention and shall be reapplied to site during plantation of the proposed vegetation. Top soil shall be separated from subsoil, debris and stones larger than 50 mm (millimeter) diameter. The stored top soil may be used as finished grade for planting areas.

1.1.2 The Contractor should follow the construction plan as proposed by the Architect / Engineer in Charge to minimize the site disturbance such as soil pollution due to spilling. Use staging and spill prevention and control plan to restrict the spilling of the contaminating material on site. Protect top soil from erosion by collection storage and reapplication of top soil, constructing sediment basin, contour trenching, mulching etc.

1.1.3 No excavated earth shall be removed from the campus unless suggested otherwise by Engineer in Charge. All subsoil shall be reused in backfilling/landscape, etc as per the instructions of the Engineer in Charge. A certificate of reuse as required by the Engineer-in-Charge shall be submitted by the contractor.

1.1.4 The contractor shall not change the natural gradient of the ground unless specifically instructed by the Engineer in Charge. This shall cover all natural features like water bodies, drainage gullies, slopes, mounds, depressions, etc. Existing drainage patterns through or into any preservation area shall not be modified unless specifically directed by the Engineer-in-charge.

1.1.5 The contractor shall not carry out any work which results in the blockage of natural drainage.

1.1.6 The contractor shall ensure that existing grades of soil shall be maintained around existing vegetation and lowering or raising the levels around the vegetation is not allowed unless specifically directed by the Engineer-in-charge

1.1.7 Contractor shall reduce pollution and land development impacts from automobiles use during construction.

1.1.8 Overloading of trucks is unlawful and creates the erosion and sedimentation problems, especially when loose materials like stone dust, excavated earth, sand etc. are moved. Proper covering must take place. No overloading shall be permitted.

1.2 CONSTRUCTION PHASE AND WORKER FACILITIES

1.2.1 The contractor shall specify and limit construction activity in pre-planned/designated areas and shall start construction work after securing the approval for the same from the Engineer in Charge. This shall include areas of construction, storage of materials, and material and personnel movement.

1.2.2 Preserve and Protect Landscape during Construction

a The contractor shall ensure that no trees, existing or otherwise, shall be harmed and damage to roots should be prevented during trenching, placing backfill, driving or parking heavy equipment, dumping of trash, oil, paint, and other materials detrimental to plant health. These activities should be restricted to the areas outside of the canopy of the tree, or, from a safe distance from the tree/plant by means of barricading. Trees will not be used for support; their trunks shall not be damaged by cutting and carving or by nailing posters, advertisements or other material. Lighting of fires or carrying out heat or gas emitting construction activity within the ground, covered by canopy of the tree is not to be permitted.

b The contractor shall take steps to protect trees or saplings identified for preservation within the construction site using tree guards of approved specification.

c Contractor should limit all construction activity within the specified area as per the Construction Management Plan (CMP) approved by Engineer in Charge.

d The contractor shall avoid cut and fill in the root zones, through delineating and fencing the drip line (the spread limit of a canopy projected on the ground) of all the trees or group of trees. Separate the zones of movement of heavy equipment, parking, or excessive foot traffic from the fenced plant protection zones.

e The contractor shall ensure that maintenance activities during construction period shall be performed as needed to ensure that the vegetation remains healthy.

1.2.3 Contractor shall be required to develop and implement a waste management plan, quantifying material diversion goals. He shall establish goals for diversion from disposal in landfills and incinerators and adopt a construction waste management plan to achieve these goals. A project-wide policy of “Nothing leaves the Site” should be followed, in such a case when strictly followed; care would automatically be taken in ordering and timing of materials such that excess doesn’t become “waste”. The Contractor’s ingenuity is especially called towards meeting this prerequisite/ credit (as per IGBC LEED India, GRIHA, MNRE). Consider recycling cardboard, metal, brick, acoustical tile, concrete, plastic, clean wood, glass, gypsum wallboard, carpet and insulation. Designate a specific area(s) on the construction site for segregated or commingled collection of recyclable material, and track recycling efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials. The diversion may include donation of materials to charitable organizations and salvage of materials on-site.

1.2.4 Contractor shall collect all construction waste generated on site. Segregate these wastes based on their utility and examine means of sending such waste to manufacturing units which use them as raw material or other site which require it for specific purpose. Typical construction debris could be broken bricks, steel bars, broken tiles, spilled concrete and mortar etc.

1.2.5 The contractor shall provide potable water for all workers

1.2.6 The contractor shall provide the minimum level of sanitation and safety facilities for the workers at site. The contractor shall ensure cleanliness of workplace with regard to the disposal of waste and effluent; provide clean drinking water and latrines and urinals as per applicable standard. Adequate toilet facilities shall be provided for the workman within easy access of their place of work. The total no. to be provided shall not be less than 1 per 30 employees in any one shift. Toilet facilities shall be provided from the start of building operations, connection to a sewer shall be made as soon as practicable. Every toilet shall be so constructed that the occupant is sheltered from view and protected from the weather and falling objects. Toilet facilities shall be maintained in a sanitary condition. A sufficient quantity of disinfectant shall be provided. Natural or artificial illumination shall be provided.

1.2.7 The contractor shall ensure that air pollution due to dust/generators is kept to a minimum, preventing any adverse effects on the workers and other people in and around the site. The contractor shall ensure proper screening, covering stockpiles, covering brick and loads of dusty materials, wheel-washing facility, gravel pit, and water spraying. Contractor shall ensure the following activities to prevent air pollution during construction:

- Clear vegetation only from areas where work will start right away
- Vegetate / mulch areas where vehicles do not ply.
- Apply gravel / landscaping rock to the areas where mulching / paving is impractical
- Identify roads on-site that would be used for vehicular traffic. Upgrade vehicular roads (if these are unpaved) by increasing the surface strength by improving particle size, shape and mineral types that make up the surface & base. Add surface gravel to reduce source of dust emission. Limit amount of fine particles (smaller than 0.075mm) to 10 – 20%
- Water spray, through a simple hose for small projects, to keep dust under control. Fine mists should be used to control fine particulate. However, this should be done with care so as not to waste water. Heavy watering can also create mud, which when tracked onto paved public roadways, must be promptly removed. Also, there must be an adequate supply of clean water nearby to ensure that spray nozzles don't get plugged.
- Water spraying shall be done on:
- 1.2.7.1 Any dusty materials before transferring, loading and unloading
- 1.2.7.2 Area where demolition work is being carried out
- 1.2.7.3 Any un-paved main haul road
- 1.2.7.4 Areas where excavation or earth moving activities are to be carried out
- The contractor shall ensure that the speed of vehicles within the site is limited to 10 km/hr.
- All material storages should be adequately covered and contained so that they are not exposed to situations where winds on site could lead to dust / particulate emissions.
- Spills of dirt or dusty materials will be cleaned up promptly so the spilled material does not become a source of fugitive dust and also to prevent of seepage of pollutant laden water into the ground aquifers. When cleaning up the spill, ensure that the clean-up process does not generate additional dust. Similarly, spilled concrete slurries or liquid wastes should be contained / cleaned up immediately before they can infiltrate into the soil / ground or runoff in nearby areas
- Provide hoardings of not less than 3m high along the site boundary, next to a road or other public area
- Provide dust screens, sheeting or netting to scaffold along the perimeter of the building
- Cover stockpiles of dusty material with impervious sheeting
- Cover dusty load on vehicles by impervious sheeting before they leave the site

1.2.8 Contractor shall be required to provide an easily accessible area that serves the entire building and is dedicated to the separation, collection and storage of materials for recycling including (at

a minimum) paper, corrugated cardboard, glass, plastics, and metals. He shall coordinate the size and functionality of the recycling areas with the anticipated collections services for glass, plastic, office paper, newspaper, cardboard, and organic wastes to maximize the effectiveness of the dedicated areas. Consider employing cardboard balers, aluminum can crushers, recycling chutes, and collection bins at individual workstations to further enhance the recycling program.

1.2.9 The contractor shall ensure that no construction leachate (e.g. cement slurry etc.), is allowed to percolate into the ground. Adequate precautions are to be taken to safeguard against this including, reduction of wasteful curing processes, collection, basic filtering and reuse. The contractor shall follow requisite measures for collecting drainage water run-off from construction areas and material storage sites and diverting water flow away from such polluted areas. Temporary drainage channels, perimeter dike/swale, etc. shall be constructed to carry the pollutant-laden water directly to the treatment device or facility (municipal sewer line).

1.2.10 Staging (dividing a construction area into two or more areas to minimize the area of soil that will be exposed at any given time) should be done to separate undisturbed land from land disturbed by construction activity and material storage.

1.2.11 The contractor shall comply with the safety procedures, norms and guidelines (as applicable) as outlined in the document Part 7 Constructional practices and safety, 2005, National Building code of India, Bureau of Indian Standards. A copy of all pertinent regulations and notices concerning accidents, injury and first-aid shall be prominently exhibited at the work site. Depending upon the scope & nature of work, a person qualified in first-aid shall be available at work site to render and direct first-aid to causalities. A telephone may be provided to first-aid assistant with telephone numbers of the hospitals displayed. Complete reports of all accidents and action taken thereon shall be forwarded to the competent authorities.

1.2.12 The contractor shall ensure the following activities for construction workers safety, among other measures:

- Guarding all parts of dangerous machinery.
- Precautionary signs for working on machinery
- Maintaining hoists and lifts, lifting machines, chains, ropes, and other lifting tackles in good condition.
- Durable and reusable formwork systems to replace timber formwork and ensure that formwork where used is properly maintained.
- Ensuring that walking surfaces or boards at height are of sound construction and are provided with safety rails or belts.
- Provide protective equipment; helmets etc.
- Provide measures to prevent fires. Fire extinguishers and buckets of sand to be provided in the fire-prone area and elsewhere.
- Provide sufficient and suitable light for working during night time.

1.2.13 The storage of material shall be as per standard good practices as specified in Part 7, Section 2 – Storage, Stacking and Handling practices, NBC 2005 and shall be to the satisfaction of the Engineer in Charge to ensure minimum wastage and to prevent any misuse, damage, inconvenience or accident. Watch and ward of the Contractor's materials shall be his own responsibility. There should be a proper planning of the layout for stacking and storage of different materials, components and equipment's with proper access and proper maneuverability of the vehicles carrying the materials. While planning the layout, the requirements of various materials, components and equipment's at different stages of construction shall be considered.

1.2.14 The contractor shall provide for adequate number of garbage bins around the construction site and the workers facilities and will be responsible for the proper utilization of these bins for any solid waste generated during the construction. The contractor shall ensure that the site and the workers facilities are kept litter free. Separate bins should be provided for plastic, glass, metal, biological and paper waste and labeled in both Hindi and English with suitable symbols.

1.2.15 The contractor shall prepare and submit 'Spill prevention and control plans' before the start of construction, clearly stating measures to stop the source of the spill, to contain the spill, to dispose the contaminated material and hazardous wastes, and stating designation of personnel trained to prevent and control spills. Hazardous wastes include pesticides, paints, cleaners, and petroleum products.

1.2.16 contractor shall collect & submit the relevant material certificates for materials with high recycled (both post-industrial and post-consumer) content, including materials like RMC mix with fly-ash, glass with recycled content, calcium silicate boards etc.

1.2.17 Contractor shall collect the relevant material certificates for rapidly renewable materials such as bamboo, wool, cotton insulation, agrifiber, linoleum, wheat board, strawboard and cork etc.

1.2.18 Where possible, the contractor shall select materials / vendors, harvested and manufactured regionally, within a 800-km radius of the project site.

1.2.19 Contractor shall adopt an IAQ (Indoor Air Quality) management plan to protect the HVAC system during construction, control pollutant sources, and interrupt pathways for contamination. He shall sequence installation of materials to avoid contamination of absorptive materials such as insulation, carpeting, ceiling tile, and gypsum wallboard. He shall also protect stored on-site or installed absorptive materials from moisture damage.

1.2.20 The contractor shall ensure that a flush out of all internal spaces is conducted prior to handover. This shall comprise an opening of all doors and windows for 14 days to vent out any toxic fumes due to paints, varnishes, polishes, etc.

1.2.21 Contractor shall make efforts to reduce the quantity of indoor air contaminants that are odorous or potentially irritating harmful to the comfort and well-being of installer and building occupants. Contractor shall ensure that the VOC (Volatile Organic Compounds) content of paints, coatings and primers used must not exceed the VOC content limits mentioned below:

Paints

Non-flat - 150 g/L
Flat (Mat) - 50 g/L
Anti corrosive/ anti rust - 250 g/L

1.2.22 **Coatings / Clear wood finishes**

Varnish - 350 g/L
Lacquer - 550 g/L
Floor coatings - 100 g/L
Stains - 250 g/L

Sealers

Waterproofing sealer - 250 g/L
Sanding sealer - 275 g/L
Other sealers - 200 g/L

The VOC (Volatile Organic Compounds) content of adhesives and sealants used must be less than VOC content limits mentioned:

Architectural Applications VOC Limit (g/l less water)

Indoor Carpet adhesives - 50 g/L
Carpet Pad Adhesives - 50 g/L

Wood Flooring Adhesive - 100 g/L
Rubber Floor Adhesives - 60 g/L
Sub Floor Adhesives – 50 g/L
Ceramic Tile Adhesives - 65 g/L
VCT and Asphalt Tile adhesives - 50 g/L
Dry Wall and Panel Adhesives - 50 g/L
Structural Glazing Adhesives - 100 g/L
Multipurpose Construction Adhesives – 70 g/L
Substrate Specific Application VOC Limit (g/l less water)
Metal to Metal - 30 g/L
Plastic Foams - 50 g/L
Porous material (except wood) - 50 g/L
Wood - 30 g/L
Fiber Glass – 80 g/L

1.2.22 Wherever required, Contractor shall meet and carry out documentation of all activities on site, supplementation of information, and submittals in accordance with IGBC LEED India, GRIHA program standards and guidelines. Towards meeting the aforementioned building environmental rating standard(s) expert assistance shall be provided to him up on request.

1.2.23 Water Use during Construction
Contractor should spray curing water on concrete structure and shall not allow free flow of water. Concrete structures should be kept covered with thick cloth/gunny bags and water should be sprayed on them. Contractor shall do water ponding on all sunken slabs using cement and sand mortar.

1.2.24 The Contractor shall remove from site all rubbish and debris generated by the Works and keep Works clean and tidy throughout the Contract Period. All the serviceable and non-serviceable (malba) material shall be segregated and stored separately. The malba obtained during construction shall be collected in well-formed heaps at properly selected places, keeping in a view safe condition for workmen in the area. Materials which are likely to cause dust nuisance or undue environmental pollution in any other way, shall be removed from the site at the earliest and till then they shall be suitable covered. Glass & steel should be dumped or buried separately to prevent injury. The work of removal of debris should be carried out during day. In case of poor visibility artificial light may be provided.

1.2.25 The contractor shall provide O & M Manuals wherever applicable.

1.2.26 The contractor shall make himself conversant with the Site Waste Management Program Manual and actively contribute to its compilation by estimating the nature and volume of waste generated by the process/installation in question.

1.2.27 MATERIALS & FIXTURES FOR THE PROJECT

a) Contractor will produce wherever feasible certificate regarding distance of the source of the relevant material.

b) Unless otherwise stated cement used at site for reinforced concrete, precast members, mortar, plaster, building blocks, etc shall be PPC (Portland Puzzolana Cement). The PPC must meet the

requirements of IS 1489 (Part I)as regards to fly ash content in cement The contractor shall obtain from the PPC manufacturer the certificate regarding fly ash content in the PPC in each batch of consignment.

The contractor has to comply as per MoEF issued notification 8.0.763(E) dated 14th Sept.1999 containing directive for greater fly ash utilization. Every construction agency engaged in the construction of buildings within a radius of 50 km radius of a Thermal Power Plant, have to use of 100% fly ash based bricks/blocks in their construction.

- The contractor shall ensure that all paints, polishes, adhesives and sealants used both internally and externally, on any surface, shall be Low VOC products. The contractor shall get prior approval from the Engineer in Charge before the application of any such material. Acknowledgement for NIT conditions as per the format provided in the NIT.

c) All plumbing and sanitary fixtures installed shall be as per the prescription of the Engineer in Charge and shall adhere to the minimum LPM (litres per minute) and LPF (litres per flush) mentioned. The contractor shall employ 100% zero ODP (ozone depletion potential) insulation; HCFC (hydro-chlorofluorocarbon)/ and CFC (chlorofluorocarbon) free HVAC and refrigeration equipments and/halon-free fire suppression and fire extinguishing systems.

d) The contractor shall ensure that all composite wood products/agro-fibre products used for cabinet work, etc do not contain any added urea formaldehyde resin.

1.2.28 RESOURCES CONSUMED DURING CONSTRUCTION

a) The contractor shall ensure that the water and electricity is not wasted during construction. The Engineer in Charge can bring to the attention any such wastage and the contractor will have to ensure that such bad practices are corrected.
b) The contractor shall install necessary meters and measuring devices to record the consumption of water, electricity and diesel on a monthly basis for the entire tenure of the project.
c) The contractor shall ensure that all run-off water from the site, during construction is collected and reused to the maximum.
d) The contractor shall use treated recycled water of appropriate quality standards for construction, if available.
e) No lights shall be turned on during the period between 6:00 AM to 6:00 PM, without the permission of the Engineer in Charge.

1.2.29 CONSTRUCTION WASTE

a) Contractor shall ensure that wastage of construction material is within 3%.
b) All construction debris generated during construction shall be carefully segregated and stored in a demarcated waste yard. Clear, identifiable areas shall be provided for each waste type. Employ measures to segregate the waste on site into inert, chemical, or hazardous wastes.

c) All construction debris shall be used for road preparation, back filling, etc, as per the instructions of the Engineer in Charge, with necessary activities of sorting, crushing, etc.
d) No construction debris shall be taken away from the site, without the prior approval of the Engineer in Charge.

e) The contractor shall recycle the unused chemical/hazardous wastes such as oil, paint, batteries, and asbestos.

f) If and when construction debris is taken out of the site, after prior permissions from the Engineer in Charge, then the contractor shall ensure the safe disposal of all wastes and will only dispose of any such construction waste in approved dumping sites.

1.2.30 Documentation

a) The contractor shall, during the entire tenure of the construction phase, submit the following records to the Engineer in Charge on a monthly basis:
- **i)** Water consumption in litres
- **ii)** Electricity consumption in 'kwh' units
- **iii)** Diesel consumption in litres
- **iv)** Quantum of waste (volumetric/weight basis) generated at site and the segregated waste types divided into inert, chemical and hazardous wastes.
- **v)** Digital photo documentation to demonstrate compliance of safety guidelines as specified here and in the Safety Code.

b) The contractor shall, during the entire tenure of the construction phase, submit the following records to the Engineer in Charge on a fortnightly basis:
- **i)** Quantities of material brought into the site, including the material issued to the contractor by the Engineer in charge.
- **ii)** Quantities of construction debris (if at all) taken out of the site
- **iii)** Digital photographs of the works at site, the workers facilities, the waste and other material storage yards, pre-fabrication and block making works, etc. as guided by the Engineer in Charge

c) The contractor shall submit a document after construction of the buildings, a brief description along with photographic records to show that other areas have not been disturbed during construction. The document should also include brief explanation and photographic records to show erosion and sedimentation control measures adopted. (Document CAD drawing showing site plan details of existing vegetation, existing buildings, existing slopes and site drainage pattern, staging and spill prevention measures, erosion and sedimentation control measures and measures adopted for top soil preservation during construction

d) The contractor shall submit to the Engineer in Charge after construction of the buildings, a detailed as built quantification of the following:
- i. Total materials used,
- ii. Total top soil stacked and total reused
- iii. Total earth excavated
- iv. Total waste generated,
- v. Total waste reused,
- vi. Total water used,
- vii. Total electricity, and
- viii. Total diesel consumed.

e) The contractor shall submit to the Engineer in Charge, before the start of construction, a site plan along with a narrative to demarcate areas on site from which top soil has to be gathered,

designate area where it will be stored, measures adopted for top soil preservation and indicate areas where it will be reapplied after construction is complete.

f) The contractor shall submit to the Engineer in Charge, a detailed narrative (not more than 250 words) on provision for safe drinking water and sanitation facility for construction workers and site personnel.

g) Provide supporting document from the manufacturer of the cement specifying the fly-ash content in PPC used in reinforced concrete.

h) Provide supporting document from the manufacturer of the pre-cast building blocks specifying the fly ash content of the blocks used in an infill wall system.

i) The contractor shall, at the end of construction of the buildings, submit to the Engineer in Charge, submit following information, for all material brought to site for construction purposes, including manufacturer's certifications, verifying information, and test data, where Specifications sections require data relating to environmental issues including but not limited to:

i) Source of products: Supplier details and location of the supplier.

ii) Project Recyclability: Submit information to assist Owner and Contractor in recycling materials involved in shipping, handling, and delivery, and for temporary materials necessary for installation of products.

iii) Recycled Content: Submit information regarding product postindustrial recycled and post-consumer recycled content. Use the "Recycled Content Certification Form", to be provided by the Competent Authority.

iv) Product Recyclability: Submit information regarding product and product's component's recyclability including potential sources accepting recyclable materials where ever applicable.

b) Provide final certification of well-managed forest of origin to provide final documentation of certified sustainably harvested status: Acceptable wood "certified sustainably harvested" certifications shall include:

a) Wood suppliers' certificate issued by one of the Forest Stewardship Council-accredited certifying agencies;

b) Suppliers' invoice detailing the quantities of certified wood products for project;
c) Letter from one of a certifying agency corroborating that the products on the wood supplier's invoice originate from certified well-managed forests.

i) Clean tech: Provide pollution clearance certificates from all manufacturers of materials.

ii) Indoor Air quality and Environmental Issues: Submit emission test data, sourced from the manufacturers, produced by acceptable testing laboratory listed in Quality Assurance Article for materials as required in each specific Specification section.

b) Certifications from manufacturers of Low VOC paints, adhesives, sealant and polishes used at this particular project site.

c) Certification from manufacturers of composite wood products/agro fibre products on the absence of added urea formaldehyde resin in the products supplied to them to this particular site.

d) Submit environmental and pollution clearance certificates for all diesel generators installed as part of this project.

Provide total support to Engineer in Charge and Green Building Consultants appointed by the Engineer in charge in completing all Green Building Rating related formalities, including signing of forms, providing signed letters in the contractor's letterhead whenever required.

1.2.31 EQUIPMENT

a) To ensure energy efficiency during and post construction all pumps, motors and engines used during construction or installed, shall be subject to approval and as per the specifications of the Engineer in Charge.

b) All lighting installed by the contractor around the site and at the labour quarters during construction shall be CFL bulbs of the appropriate illumination levels. This condition is a must, unless specifically prescribed.

The contractor is expected to go through all other conditions of the LEED & GRIHA rating stipulations. Failure to adhere to any of the above mentioned items, without approval of the Engineer in Charge, shall be deemed as a violation of contract and the contractor shall be held liable for penalty as per terms of the agreement.

SPECIAL CONDITIONS OF THE CONTRACT

SPECIAL CONDITIONS

SITE TO BE CLEAN:
The contractor undertakes to have the site clean, free from rubbish to the satisfaction of the Engineer-in-Charge. All surplus materials, rubbish, etc. will be removed to the place fixed by the Engineer-in-Charge and nothing extra will be paid.
Contractor shall divert/ remove/ maintain/ repair all the existing services like water supply, drainage, storm water, electric etc. at his own cost which will affect the construction activity up to end of the project. During excavation of any kind of activity, if any existing lines of any type come in a way throughout construction area, it is contractor responsibility to divert/repair/replace/provide new lines if required contractor has to take necessary approval from any authority for the same. No extra cost will be given for the same.

INCONVENIENCE TO'S ACTIVITIES:
The contractor shall not deposit materials on any site which will seriously inconvenience to any of the activities. The Engineer-in-Charge may require the contractor to remove any materials which are considered by him to be dangerous or inconvenient to the construction activities and get them removed at the contractor's cost.

EMPLOYMENT OF CERTIFIED PLUMBER:
Certified plumbers should be employed by the contractor on the work for main sewer, filtered and unfiltered main.

EMPLOYMENT OF LICENSED ELECTRICAL FOREMAN (FOR ELECTRICAL WORK ONLY):
The contractor should employ a licensed electrical foreman to supervise the Electrical works.

CONDITIONS RELATING TO THE EXECUTION OF ADDITIONAL WORK:
No deviation from specification stipulated in the contract of additional items shall be carried out by the contractor unless the rates of the substituted, altered or additional item have been approved in writing by the competent authority, failing which will not be bound to entertain any claim on this account.

ALTERNATIVE CONDITIONS FOR WATER SUPPLY & ELECTRICITY:
Contractor shall make his own arrangements for obtaining temporary water supply and electrical supply connections required for the work from relevant local authorities, at his own cost. The client shall render reasonable assistance to the contractor, if required, by means of recommendatory letter/ certificate, for obtaining temporary water and electrical supplies from the authorities concerned aforesaid. Extra water charges and sewerage charges if any required to be paid (based on the plinth area) for obtaining the construction water supply shall be borne by the contractor. All other charges for getting the construction water supply connections including incidental charges, anti-malarial treatment payable, conveyance, storage, consumption charges etc. shall be borne by the contractor.
Deposits if any to be paid towards consumption of water and electric supplies to be paid by the contractor and the same can be taken back by him after adjustment.
The contractor shall provide his own switches tested KWH Meter, earth station, earth leakage circuit breakers cable/lines of approved make and of adequate capacity from the aforesaid supply point to the various utilisation points and also be responsible to maintain the same in good and safe condition at all times as per relevant codes and electricity rules. He will also be fully responsible at all times for any accident/mishap in his electrical installation/appliances etc. (including the consequential aspects) if the same are found to be due to defective construction/maintenance etc. of his installation or negligence in observation of rules, or safety precautions. The layout and other details of these lines shall be got approved in advance by the Engineer in charge and no change in the same shall be subsequently carried

out without prior approval. The Electrical Engineer may any time summarily disconnect, in the interest of safety, the power supply without notice, if any dangerous situation is seen in the contractor's installation or if the contractor has failed to maintain the installation satisfactorily in-spite of a written notice served on him. The responsibility for such a disconnection will always be with the contractor who will have no claim whatsoever in this respect.
The contractor's electrical installation shall conform in all respects to the relevant rules, regulations, statutory provision and codes of practice as also are in accordance with the rules of the local license.
Undertaking (as the case may be) as existing new or as may be amended /enforced from time to time in the future. Installation test reports shall invariably be furnished by the contractor before any load is connected. Periodical test reports by every 3 months for the complete installation shall also be submitted by the contractor in accordance with I.E.E Rules for temporary installation.
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INSPECTION OF WORKS AND RECOMMENDATION BY CONSULTANT

(1) Materials, its sample approval, its procurement and storage: The Contractor should make his own arrangement to obtain all materials required for the work, except otherwise stated. All materials shall, so far as procurable, be of the respective kinds described in the Schedule of Items/Quantities and/or specifications and in accordance with the Architect's and Engineer In-charge instructions, and the Contractor shall upon the request of the Architect furnish him with all invoices, accounts, receipts and other vouchers to prove that the materials comply therewith. The Contractor shall at his own cost arrange for and/or carry out any test of any materials which the Architects may require.
The Contractor shall submit, samples of all the finishing materials, to the Architects/ Consultants, for approval, as directed by the Architects/Consultants much in advance, so as to avoid any complications regarding availability. Also, whenever samples are to be prepared for approval the same shall be prepared immediately on receipt of the drawings and got approved by the Architect.
Approval of the samples of various materials given by the Engineer-in-charge and Architects shall not absolve the Contractor from the responsibility of replacing defective material brought on site or materials used in the work found defective at a later date. The Contractor shall have no claim to any payment or compensation whatsoever on account of any such materials being rejected by the Engineer-in-charge and Architects. No collection of material shall be made before it is approved by the Engineer-in-charge and Architects.
The Architect shall, during the progress of the works, have to order in writing from time to time the removal from the works, within a period specified in the order, of any materials which in his opinion are not in accordance with the specifications or his instructions, the substitution of proper materials, and the removal and proper re-execution of any work executed with materials or workmanship not in accordance with the drawings, specifications or instructions; and the Contractor shall forthwith carry out such order at his own cost. In case of default on the part of the Contractor to carry out such order, the Employer shall have the power to employ and pay other persons to carry out the same; and all expenses consequent thereon, or incidental thereto, as certified by the Architect shall be borne by the Contractor, or may be deducted by the Employer from any moneys due, or that may become due, to the Contractor.
Inspect and approve, if found appropriate, samples (loose & installed) to be prepared as per the list already prepared during starting of work and subsequent to approval of same, give clearance for commencement of construction works at site.

(2) Undertake frequent visits for periodic inspection of the site to examine the work being executed and to provide clarification and guidance to the contractor in respect to the design, specifications, workmanship and overall performance of the work and inform the contractor under intimation to PWD, about defects, deficiencies and nonconformities with respect to the specifications and drawings. The architect will ensure that the contractor has complied with all the instructions in his subsequent visit. Any query related to drawing may be solved by architect/ consultant in co-ordination with PIU & contractor.

(3) Consultant will check that the work is done satisfactorily and the contractor has complied with all the remarks, comments, defects or deficiencies suggested by the team of architect/structural engineers of the consultant. For any noncompliance, PIU may recommend for retention of the total bill or part thereof. The work not complied with by contractor to the satisfaction of the consultant; retention kept will be subject to forfeiture. The contractor shall not be eligible to get any compensation for such retention or any benefit of extension of time limit.

RETENTION OF MONEY FOR NOT FOLLOWING SAFETY MEASURES:
Retention @ 1% of the work done of RA bill will be kept if it is observed that the contractor has not taken sufficient safety precaution. The retention of money is subjected to be forfeit if the contractor is found not to comply / intentionally not taking safety precaution after such notice / retention.

RATES SHALL BE FOR WORKING AT ALL FLOORS:
Unless otherwise specified the rates quoted in the Schedule B shall be for all floors / all levels / all heights / all shapes.

RATES INCLUDING COST OF CEMENT AND REINFORCEMENT STEEL:
Cement and Reinforcement Steel will be supplied by the contractor at site. **Rates to be quoted by the contractor shall be inclusive of the cost of cement, reinforcement and structural steel.** The structural steel rate shall in inclusive of all forms of steel sections, channels, boxes etc. inclusive of Universal columns, beams, H-sections, I-sections, C-sections

TAXES:
The rates shall also be firm and not subject to exchange variations, labor conditions, fluctuations in railway freights or any conditions whatsoever. It shall also include for (if applicable) sales tax, excise duty, VAT, OCTROI and any other taxes/duty or other levy levied by the Central or State Governments or local authorities, sales tax on works contract as on the date of signing of the tender document and may change with time to time. No claim in respect to the variation in above mentioned taxes shall be considered for payment, by the Employer, as an extra amount till the work is completed.

CONTRACTOR TO PROVIDE SITE OFFICE: (within 15 days after getting work order otherwise Rs. 10,000/- Per day penalty will imposed as penalty over and above L.D.)
Contractor shall provide **a permanent site office (Masonry & RCC structure) and portable stores** (Metal / Wood / PVC) at the location suggested by the Architect in the campus area.
The site office shall be utilized exclusively for the Engineer- In- Charge staff. Site office shall be fully furnished with AC, computer, internet, printer, fax, telephone, furniture, refrigerator, cooler and such necessary facilities. The site office shall room and conference facility with allied utilities like toilets, pantry etc. Intermediate shifting of portable structures (such as stores) may be required during any stage of project, hence contractor is abided to do so without any cost or time factor. Contractor should maintain the site office till the project tenure and hand it over to PIU without claiming any extra cost.

Following utility services shall be provided for PIU staff / engineer in charge with water supply, drainage, electricity and housekeeping services etc. free of cost up to finalization of the project within 15 days after getting work-order.

- Site office with two rooms and a conference room with size 5 X 4 sqm. or drawing given by Consultant with toilet block
- Office furniture:- 3 tables, 3 revolving chairs, 9 visitor chairs, 2 Cupboard, 2 rack, drawing stands, water cooler with RO plant, 3 laptops / computers of Dell, HP, Lenovo or Acer company with latest configuration and version, 1 printer with scanner and all type of office stationary.

- Computer operator cum clerk – 1 No
- Peon - 1 No.
- Internet connection with running services till the end of the project.
- Fax machine with connection and running services till the end of the project.
- 3nos. of AC & 3nos. of pedestal fan
- One no. of Security Guard for 24 hrs.

NO PERMANENT STRUCTURES TO BE CONSTRUCTED WITHIN CAMPUS AREA:
Since the campus is under full fledge utilization for Medical Services / Health Services and laying of infrastructure facilities may be taken up for any area at any time, contractor will not be permitted to construct any pucca structure (except site office) for any purpose within the Campus area for what so ever reason.

PRE-BID MEETING:
Bidders to submit their queries at least 3 days before the scheduled pre-bid meeting to PIU.

CONTRACTOR TO ARRANGE WATER BY OWN: The contractor shall have to make own arrangement for the water required for the construction purpose.

CONTRACTOR TO ARRANGE ELECTRIC POWER BY OWN: The contractor shall have to make their own arrangement for electric connection at work site.

CONTRACTOR'S RESPONSIBILITY TO FILL DAILY, WEEKLY, MONTHLY PROGRESS REPORT & CONCRETE POUR CARD ON DAY TO DAY BASIS: (Format shall be provided by the).
1. Daily Progress Report stating the information of work done of all items categorized labor strength, cement and steel consumption on day to day basis.
2. Concrete Pour Card as per standard engineering practice should be filled by contractor and after having signature of engineer in-charges, contractor may proceed for concreting
3. Cube testing register also to be maintained at site.
Contractor will have to submit filled and duly signed (Signed by Engineer-in-charge from side & from Contractor side) Daily Progress Reports on immediate next day & Concrete Pour Card before casting of any RCC elements. Contractor will be solely responsible and if failing to do so shall be liable for penalty which will be solely upon discrete on of Engineer-in-charge which shall be deducted from RA Bill.

CONTRACTOR'S RESPONSIBILITY TO GET APPROVAL ON MATERIAL SAMPLE / MOCK UP / SAMPLE ROOM:
Contractor shall have to get approval from Engineer in Charge and Architect on loose samples (i.e. flooring material, stone, sanitary ware fixtures, faucets, light fixtures etc.) prior to starting of any works (i.e. finishing, plumbing, firefighting, HVAC, False ceiling, etc.). Loose samples approval is required for the product conformity, specification and shade selection. A sample room, as per the layout proposed by Architect and specifications recommended by Architect, shall be prepared and up to date maintained in lock and key arrangement till completion of work awarded under the specific tender. Sample room approval is required for workmanship, fast process in repetitive work and save time for repetitive activity. Contractor will be solely responsible if failing to do so and shall be liable for penalty, which will be solely upon discretion of Engineer-in-charge, which shall be deducted from RA Bill. If contractor cannot show sample room within two months, firm shall be panelized by.

MACHINERY TO DEPLOY ON SITE:
Contractor shall have to deploy (Must owned or hired) following machinery/ equipment on site within 1 month from date of award of work. The machinery shall be of good working condition and relevant

certificates shall be submitted. The Contractor has to take necessary approval prior to shift / remove such machineries from Engineer – in – Charge.
a) Batching Plant – (min. 30 cum / hr) - minimum 1 nos
b) Concrete pump of capacity up to the required height - minimum 2 nos
c) Tower hoist (of requisite capacity) same as Bldg. height - minimum 2 nos
d) Tower cranes (40 Meter Boom Length) - minimum 1 nos
If above conditions cannot be fulfilled by contractor within one month of award of work,
Penalty of 50,000/day will be imposed on contractor over and above L.D.

SHUTTERING MATERIAL TO DEPLOY ON SITE:
Contractor to provide enough required shuttering material to complete the work in time. In case of single height or double height staging/false staging should be erected preferably with ACRO props and spans or H frames.

The form work used for shuttering shall be coated with chemical releasing agent. Any type of oil is strictly prohibited.

In case of form finish/ exposed concrete works only ply shuttering or fresh steel plates shuttering of approved pattern by Architect/ Engineer in charge shall be allowed with not more than 3 repetitions for ply wood formwork as per the discretion of the Architect.

SPECIAL CONDITIONS OF CONTRACT:

- During execution of work, any quantity shall be increased more than 30% than rate will be applicable as per SOR rate and where SOR rate is not available than estimated rate will be applicable. Contractor cannot misinterpret the meaning of word written in tender.

- Agency has to submit day to day computerized consumption statement of cement when using batching plant with cement purchase bill and challan of weigh-bridge.

- Bidders shall require referring detail specification as well as BOQ for complete understanding for through work. In case any additional clarification required, agency shall be put up discrepancy and ambiguity in writing to prior to pre-bid meeting. After award of work, not a single argument for discrepancy and ambiguity was accepted. For the same case, Contractor to execute the work as per the instruction given by EIC and Architect.

- Contractor is responsible to find out suitable site location (Non Objectionable Place) required for disposal of surplus excavated earth and/ or debris etc. with prior permission from competent authority.

- The contractor has to establish his own dedicated testing laboratory fully equipped and shall have to deploy a qualified quality Control Engineer (Minimum Qualification as B.E. with 10 years' experience of Q.C. / lab operation.
- All the bylaws of labor, labor arrangement, insurance, safety, as per the central Govt. and state Govt. shall be strictly followed.

- The compensation for any accident, causality etc. shall be the full responsibility of the contractor and shall be as per the law governing for the same.

- No sub- letting of the work is permitted, unless a written permission is obtained from the C. E./ Executive Engineer, PWD, Daman.

- No deviation from the approved list of makes shall be permitted. In case, certain items of equivalent is mentioned, the same shall be got approved from PWD, before ordering.

- On instructions from Engineer-in-Charge / PWD, the material, finished product, construction item, shall be immediately removed from the site within 72Hrs of written instruction without any compensation of whatsoever nature.

- All the drawings supplied by the consultant/Client to the contractor shall be carefully studied by the contractor before implementation and any discrepancy /changes /suggestions shall be brought to the notice of consultant for clearance.

- Any extra item shall be first got approved from the PIU before implementation.

- The contractor has to hand over a clear site to the client in a timely manner.

- Bid document is not submitted with duly signed by contractor, shall not allowed for the bid selection.

- The execution of the work may entail working in the monsoon also. The contractor must maintain labor force as may be required for the job and plan and execute the construction and erection according to the prescribed schedule. No special/ extra rate will be considered for such work in monsoon. The contractor's rate shall be considered inclusive of cost of dewatering required if any and no extra rate shall be payable on this account.

- In case of dewatering for any reason (including rain water logging) or of any sort, for construction is required, the contractor has to make his own pumping and disposal arrangement for which no claim shall be entertained.

- Dewatering of any type/sort shall not be payable.

- Contractor to acquaint himself with geotechnical conditions of site by conducting soil test at two different locations as suggested by Engineer in charge and take necessary provisions for construction activities accordingly

- Barricading all around the campus as per the safety norms is compulsory in order to avoid any disturbance/ deterioration/ damage to existing heritage structures and sand beds of beach, failing which the penalty @ 0.1% of the total cost, per week shall charge till the barricading is done.

"The contractor shall provide suitable barricading with suitably painted single row of Metal Pre-coated GI Sheets about 3'- 0" wide (90 cms.) nailed or bolted with wooden poles spaced 2 to 3 meter apart and each pole 1.6 m to 2 m long 8 cm. to 10 cm. dia. Total height of barricading should be 4.5 meter high as per drawing / direction of EIC. The poles will be embedded in mobile iron pedestal rings suitably framed for giving stable support as per direction of the Engineer-in-charge. All management (including watch and ward) of barricades shall be the full responsibility of the contractor. The barricades shall be removed only after completion of the work or part of the work. The contractor's rate shall include all above items of work and nothing extra shall be paid to the contractor over and above his quoted rates. It should also include writing and painting, arrangement for traffic diversion such as traffic signals during construction at site for day and night, glow lamps, reflective signs, marking, flags, and caution tape as directed by the Engineer-in- Charge. The barricading provided shall be retained in position at site

continuously i/c shifting of barricading from one location to another location as many times as required during the execution of the entire work till its completion. Rate includes its maintenance for damages, painting, all incidentals, labor materials, equipment and works required to execute the job. The barricading shall not be removed without prior approval of Engineer-in-Charge".

- Contractor has to complete the work in time limit & in no case time limit will be extended.

  In 25% time limit : work 10% to be completed.
  In 50% time limit : work 40% to be completed.
  In 75% time limit : work 80% to be completed.
  In 100% time limit : work 100% to be completed.
  Otherwise L.D. will be imposed 0.1% per day as per tender rules from the next bill.

- Contractor has to submit work schedule or bar chart/ progress report etc. in fortnight period.

- Contractor shall divert/ remove/ maintain/ repair all the existing services like water supply, drainage, storm water, electric etc. at his own cost which will affect the construction activity up to end of the project. During excavation of any kind of activity, if any existing lines of any type come in a way throughout construction area, it is contractor responsibility to divert/ repair/ replace/provide new lines if required contractor has to take necessary approval from any authority for the same. No extra cost will be given for the same.

- Contractor to provide necessary certificate where ever it is asked for in the items of BOQ or in specifications or elsewhere in the tender or as per requirement of EIC or Architect.

- The contractor has to make his own arrangement for labor colony outside the campus. It is strictly prohibited to stay inside the campus.

Material Specifications - Civil Works

M-1 Water

1.1 CPWD specifications clause no. 3.1.1 shall be followed.

1.2 CPWD specifications chapter 3 Mortars - List of Mandatory Tests shall be followed.

M-2 Lime

2.1 CPWD specifications clause no. 3.1.3 shall be followed.

M-3 Cement

3.1 CPWD specifications clause no. 3.1.2 shall be followed.

3.2 CPWD specifications chapter 3 Mortars - List of Mandatory Tests shall be followed.

3.3 Reduction of strength of cement with passage of time

Reduction of strength at 28 days of concrete made from fresh and stored cement

Sr.no.	Storage Period of Cement	Strength Reduction
1	Fresh	NIL
2	3 months old	20%
3	6 months old	30%
4	12 months old	40%
5	24 months old	50%

3.4 Stored cement can be used only upto the 3 months from the date of manufacture. After 3 months cement is to be used after prior permission of the consultant.

M-4 White Cement

4.1 The white cement shall conform to IS: 8042-E.

M-5 Coloured Cement

5.1 Coloured cement shall be with white or grey Portland cement mixed with pigments as specified in the item of the work.

5.2 The pigments used for coloured cement shall be of approved quality and its quantity shall not exceed 10% of the cement used in the mix. The mixture of pigment and cement shall be properly ground to have a uniform colour and shade. The pigments shall have such properties as to provide for durability for colour under exposure to sunlight and weather. 5.3 The pigment shall have the property such that it is neither affected by the cement nor detrimental to it.

M-6 Sand

6.1 CPWD specifications clause no. 3.1.4 shall be followed.

6.2 CPWD specifications chapter 3 Mortars - List of Mandatory Tests shall be followed.

M-7 Stone Dust

7.1 This shall be obtained from crushing hard black trap or equivalent. It shall not contain more than 8% of silt as determined by field test with measuring cylinder. The method of determining silt contents by fields test is given under:

7.2 A sample of stone dust to be tested shall be placed without drying in 200 mm. measuring cylinder. The quantity of the sample shall be such that it fills the cylinder upto 100 mm. mark.
Then clean water shall be added upto 150 mm. mark. The mixture shall be stirred vigorously and the contents allowed settling for 3 hours.

7.3 The height of silt visible as settled layer above the stone dust shall be expressed as percentage of the height of the stone dust below. The stone dust containing more than 8% silt shall be washed so as to bring the content within the allowable limit.

7.4 The fineness modulus of stone dust shall not be less than 1.80.

M-8 Stone Grit

8.1 Grit shall consist of crushed or broken **black trap stone** and be hard, strong, dense, durable clean of proper gradation and free from skin or coating likely to prevent proper adhesion of mortar. Grit shall generally be cubical in shape and as far as possible flaky elongated pieces shall be

avoided. It shall generally comply with the provisions of IS : 383 Unless special stone of particular quarries is mentioned, grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer-in-charge and Architects. The grit shall have no deleterious reaction with cement.

8.2 The grit shall conform to the following gradation as per sieve analysis:

IS Sieve Designation	% passing Through sieve	IS Sieve Designation	% by weight passing through sieve
12.50 mm.	100%	4.75 mm.	0-20%
10.00 mm.	85-100%	2.36 mm.	0- 5%

8.3 The crushing strength of grit will be such so as to allow the concrete in which it is used to build up the specified strength of concrete.

8.4 The necessary tests for grit shall be carried out as per the requirements of IS : 2386 (parts I to VIII), as per instructions of the Engineer-in-charge and Architect. The necessity of test will be decided by the Engineer-in-charge and Architect.

M-9 Cinder

9.1 Cinder is well burnt furnace residue which has been fused or centered into lumps of varying sizes.

9.2 Cinder aggregates shall be well burnt furnace residue obtained from furnace using coal fuel only. It shall be sound clean and free from clay, dirt ash or other deleterious matter.

9.3 The average grading for cinder aggregates shall be as mentioned below:

IS Sieve Designation	% Passing	IS Designation	% Passing
20 mm.	100	4.75mm.	70
10 mm.	86	2. 36 mm.	52

9.4 Density of cinder shall be 900 Kg / cum or as approved by structural consultant.

9.5 Material shall be non hazardous and suitable as per relevant IS code.

M-10 Lime mortar

10.1 CPWD specifications clause no. 3.2.1 shall be followed for lime mortar instead of cement mortar.

M-11 Cement Mortar

11.1 CPWD specifications clause no. 3.2.1 shall be followed.

M-12 Coarse Aggregate

12.1 CPWD specifications clause no. 4.1.1 shall be followed.

M-13 Murrum

13.1 Murrum or the selected earth shall be brought from outside, as indicated in the item. The selected earth shall be good yellow soil and shall be got approved from the Engineer-in-charge. In no case, Black cotton soil or similar expansive and shrinkable soil shall be used. It shall be clean and free from all rubbish and perishable materials, stones, or brick bats. The clods shall be broken to a size of 50 mm. or less. It shall be of good binding quality and of approved quality

obtained from approved pots/quarries of disintegrated rocks which contain silicones materials and natural mixture of clay of cal carious origin. Contractor shall make his own arrangement, at his own cost, for land for borrowing selected earth. The staking of the material shall be done as directed by Engineer-in-charge, in such a way as not to interfere with any constructional activities and in proper stacks.

M-14 Stone

14.1 The stone shall be of specified variety such as Granite/ Trap Stone/ Quartz or any other type of good hard stones.

The stones shall be obtained only from the approved quarry and shall be hard, sound, durable and free from defects like cavities, cracks, sand holes, flaws, injurious veins, patches of loose or soft materials etc. and weathered portions and other structural defects or imperfections tending to affect their soundness and strength. The stone with round surface shall not be used. The percentage of water absorption shall not be more than 5% of dry weight, when tested in accordance with IS : 1124. The minimum crushing strength of the stone shall be 200 Kg/cm2. Unless otherwise specified.

14.2 The samples of the stone to be used shall be got approved before the work is started.

14.3 The Khanki facing stone shall be dressed by chisel as specified in the item for Khanki facing in required shape and size. The face of stone shall be so dressed that the bushing on the exposed face shall not project by more than 40 mm. from the general wall surface and on face to be plastered it shall not project by more than 19 mm. nor shall it have depressions more than 10 mm. from the average wall surface.

M-16 Chemical Admixture

16.1 CPWD specifications clause no. 4.1.2 shall be followed.

M-17 Steel for reinforcement

17.1 CPWD specifications clause no. 5.1.3 shall be followed except chairs, separators etc. will be measured and paid under this item.

M-18 Mild Steel Binding Wire

18.1 The mild steel wire shall be of 16 gauge (1.63 mm), 18 gauge (1.22mm) or 20 gauge (1 mm) or as specified in the item conforming to IS: 280.

18.2 It shall be free from rust, oil paint, grease, loose mill scale or any other desirable coating which may prevent adhesion of cement mortar.

M-19 Polyurethane Foam Filler

19.1 Polyurethane from filler shall be Capcell HD-100 of Supreme or equivalent. It should comply with ASTM–D-3575/ Highway clause 1015/ BS-5628 Part-3. It should be semi-rigid, UV resistant, high performance laminated closed cell polyethylene foam joint filler in sheet form.

19.2 The density of polyurethane shall be 100Kgs/ cum. The water absorption should be 0.08% max. The operating temperature of foam filler should be between -40 c to +100 c.

19.3 It should be bitumen free and chemical resistant. It should possess excellent recovery after compression.

19.4 If gap of expansion joint should be more than 50mm, use two board of required thickness joint with adhesive by manufacturer's only.

M-20 Polysulphide Sealant

20.1 The polysulphide sealant shall be of Sika, Fosroc, Mccoy Soudal, Pidilite or equivalent as approved by the architect or engineer-in-charge. It shall conform to relevant IS codes.

20.2 It shall be a two component polysulphide sealant. The mix ratio of both the parts should be as per manufacture's specification. It should not contain chloride or other corrosive substance.

20.3 It shall be pourable or gungrade.

20.4 It shall be used for sealing joints in water retaining structures, buildings, roofs, external walls, cladding, concrete highways, airport runways, bridges, parking and cargo areas and buildings. It shall have excellent adhesion to wide range of building materials like Aluminium, Stainless Steel, Glass, Concrete, Marble, Stone, Brick, Masonry block, Plaster, Ceramic and quarry tiles, Timber etc.

20.5 It should accommodate continuous and pronounced cyclic movements. Material should be low in shrinkage, UV resistance, water resistant to bio-degradation. It should be water resistant to occasional spillage of dilute acids, alkalis, petrol, aviation fuels, diesel, kerosene, lubricating oils etc. It should be non-toxic.

20.6 The density of the material should be 1.58 ± 0.03 Kg / ltr. The pot life should be more than 2 hrs. at 30ºC. Shore A hardness should be 16 to 22 after complete curing. Movement accommodation should be 25% for butt joints and 50% for lap joints. Joint size should be 5 to 50 mm. and depth to width ratio should be 1:2 (min). For joints with skew movement the ratio shall be 1:1

M-21 Expansion Joints – Copper Strips & Hold Fasts

21.1 The item provided for expansion joints in RCC frame structure, for internal joint as well as for exposed joints, with the use of necessary copper strip and holdfasts.

21.2 Copper sheet shall be 1.25 mm. thick and 125 mm width and shall be of U shape in the middle. Copper strip shall have holdfast of 3 mm. diameter copper rod 25 cm long soldered on the strip at intervals of about 30 cm. or as shown in the drawing or as directed. The width of each flange (horizontal side), to be embedded in the concrete work shall be 25 mm. Depth of `U' to be provided in the expansion joint, in the copper plate shall be of 25 mm.

M-22 Shuttering Material

All shuttering materials which are in contact with concrete surfaces, used material brought from other projects shall not be permitted.

M-22A Timber / Wooden Planks

22A.1 Timber / wooden planks and timber bracing, scaffolding shall conform to IS: 883. The shuttering shall be either of wooden planking of 30 mm. minimum thickness with or without steel lining or steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical ballies properly cross braced together, so as to make the centering rigid. In place of ballie props, brick work of adequate section built in mud mortar may be used to support the arch after approval of EIC

22A.2 The form work shall be sufficiently strong and shall have camber, so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration, live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall not permit leakage of cement grout.

22A.3 If at any stage of work, during or after placing concrete in the structure, the form work sag or bulge out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequately rigid form work. The complete form work shall be got inspected by and got approved from the Engineer-in-charge and Architect, before the reinforcement bars are placed in position.

22A.4 The props shall consist of ballies having 100 mm. minimum diameter, measured at mid length and 80 mm. at thin end and shall be placed as per design requirement. These shall rest squarely on wooden sole plate 40 mm. thick and minimum bearing area of 0.10 m2. laid on sufficiently hard base.

22A.5 Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and easing of shuttering without jerking the concrete.

22A.6 The timber used in shuttering shall not be so dry as to absorb water from concrete and swell or bulge nor so green or wet as to shrink after erection. The timber shall be properly sawn and planned on the sides and surface coming in contact with concrete. Wooden form work with metal sheet lining or steel plates stiffened by steel angles shall be permitted.

22A.7 As far as possible, clamp and ties shall be used to hold the forms together and use of nails and spikes shall be avoided.

22A.8 The surface of timber shuttering that would come on contact with concrete shall be well wetted and coated with soap solution before the concreting is done. Alternatively coat of raw linseed oil or oil of approved manufacture may be applied in place of soap solution. In case of steel shuttering, either soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Under no circumstances, black or burnt oil shall be permitted.

22A.9 The shuttering for beams and slabs shall have camber of 4 mm. per meter (1 in 250) as per structural drawing or as directed by engineer-in-charge, so as to offset the subsequent deflection. For cantilevers, the camber at free end shall be 1/50 of the project length structural drawing or as directed by engineer-in-charge.

M-22B Concrete Shuttering Plywood (laminated or non-laminated)

22B.1 Plywood shall conform to IS 4990. It shall be made from strong and selected hard-woods. It shall be bonded with high quality Phenol Formaldehyde synthetic resin adhesive, hot pressed and then shall be further treated with a permanent type of preservative by vacuum-compressor impregnation.

22B.2 Due to the bonding with Phenol Formaldehyde, it shall be moisture and weather proof. The use of selected hard-woods renders hard and wear-resistant faces and thereby it shall be reusable several times. It shall be highly resistant to rot, termites and other wood inhabiting insects. Due to complete penetration of the preservative, it shall be exceedingly durable.

22B.3 It shall have high impact strength and therefore shall be used successfully in place of timber planks and steel sheets. It shall protect the concrete from rapid temperature changes and shall provide optimum conditions for setting of the concrete. As it shall possess remarkable design flexibility, it shall be ideal for curved formwork.

22B.4 Besides it shall be used as centering, shuttering and formwork of concrete columns, beams, slabs, walls, tanks, bridges, fly-overs, silos etc. It shall also be used for structural applications like external walling, roofing, flooring, curtain walls, work-site offices, in cabins of trucks, rail coaches etc.

M-22C Steel Shuttering and Steel Plates

22C.1 Steel shuttering plates shall conform to IS 8500, IS 2062, and IS 1977. Steel sheeting and steel plates should be free from crimps, twists, offsets, warps, etc. Their surface should be neat, clean and smooth. Before placing concrete, steel forms shall be thoroughly cleaned off of all rust, dust and loose materials. Colorless oil or grease of approved quality shall be applied before placing steel.

22C.2 The size of rolled steel sections, tubular steel section used for framing and bracing of steel plates should be sufficient to withstand the weight of concrete without forming crimps, twists, offsets, warps, etc. in the steel plates. Also, the gauge of steel sheeting used should not be less than 2 mm.

22C.3 Minimum two bracing angles should be provided along with angle framing while making the steel plates. It should be riveted for non exposed concrete or welded for exposed / fair finished concrete. Minimum two rivets should be provided at all Four Corners and at junction of angle framing and bracing.

22C.4 If the plates are to be welded, steel sheet and angle framing/bracing should be welded from sides and at back. Welding on sides should be buffed to make the sides smooth. Also, intermittent welding should be done to keep steel sheet and angle framing/bracing in one plane

M-38 Grouts

M-38A Cementitious grout

38A.1 The grout shall be of high quality, water resistant, cement based powder grout for grouting ceramic tile, vitrified tile, industrial tile, stone etc.

38A.2 It should be available in all colors to match the tile color. It should have high strength for maximum load bearing. It should be non shrink, non-bleeding and non segregating at fluid consistency.

38A.3 It should not contain any chlorides and or additives which may contribute the corrosion of the structure.

38A.4 It should be weather resistant, non cracking, non shrinking. The compressive strength, linear shrinkage, tensile strength and flexural strength should be according to the IS codes.

M-38B Epoxy Grout

38B.1 It should be hygienic, hard wearing, impervious, epoxy resin based ceramic tile grout with a high degree of resistance to chemical attack, abrasion and impact.

38B.2 The grout should not transfer taints to food stuffs and should not permit the entry of bacteria or dirt and easily maintained in a sterile condition.

38B.3 It should be available in all colors to match the color of the tile color. It should attain very good early strength. It should possess good chemical resistance to acid, alkalies etc.

38B.4 It should possess good tensile and flexural strength and it has a very good dynamic load resistance.

M-60 Structural Steel

60.1 CPWD specification clause no. 10.1.1 shall be followed.

M-69 Silicone paint

69.1 It shall be of the best quality like Wacker, GE Silicone, Pidilite, Dow Corning or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to the relevant IS Codes.

69.2 It shall be prepared by mixing Silicone and Epoxy. It shall be applied on dry as well as damp surfaces. It shall be non-toxic and odourless, so shall be suitable for drinking water structures also. It shall render the surface impervious to water and shall prevent water penetration. It itself shall penetrate into the structure and shall form a strong film on the pores of the structure surface, making the surface water-tight, non-toxic and erosion free.

69.3 It shall be water thinnable. Before use, the hardener of the Siliconate Epoxy shall be mixed with resin and thinned with water, in the proportions described by the manufacturer. It shall be applied with a suitable spray gun with a fine nozzle. An overlap of 25 to 30 cm. shall be preferred. It shall be semitransparent but on drying it shall become transparent.

M-86 Plywood

86.1 The plywood for general purpose shall conform IS : 303.

Plywood is made by cementing together thin boards or sheets of wood into panels. There are always an odd number of layers, 3,5,7,9 ply etc. The plies are placed so that grain of each layer is at right angles to the grain in the adjacent layer.

86.2 The chief advantages of plywood over a single board of the same thickness is that, plywood offers more uniform strength, along its length and width and also offers greater resistance to cracking and splitting with change in moisture content.

86.3 Usually synthetic resins are used for gluing, phenolic resins are usually cured in a hot press which compresses and simultaneously heats the plies between hot plates, which maintain a temperature of 900C to 1400C and a pressure of 11 to 14 Kg/cm2., on the wood. The time of heating may be anything from 2 to 60 minutes depending upon the thickness.

86.4 When water glues are used the wood absorbs so much water that the finished plywood must be dried carefully. When synthetic resins are used as adhesive, the finished plywood must be exposed to an atmosphere of controlled humidity until the proper amount of moisture has been absorbed.

86.5 According to IS: 303, the plywood for general purpose shall be of the grades namely BWR, WWR and CWR, depending upon the adhesives used for bonding the veneers, and it will be further classified into six types namely AA, AB, AC, BB, BC and CC based on the quality of the two faces, each face being of three kinds namely, A,B and C. After pressing, the finished plywood should be reconditioned to moisture content not less than 8% and not more than 16%.

86.6 Thickness of plywood boards: Plywood boards are available in thickness ranging from 3 to 25 mm. Tolerance in thickness shall be ± 10% for boards upto and including 5 mm; ± 7% for boards from 6 to 9 mm and ± 5% for boards above 9 mm thickness. The boards shall be of uniform thickness and the surfaces of the boards shall be sanded to a smooth finish.

Types of plywood:

M-86A Water Proof (Weather Proof) Plywood:

86A.1 The plywood shall be from Kitply, Wonder Wood, Anchor Board or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to IS : 710 and to the relevant Defence and Navy specifications.

86A.2 Plywood shall be made from veneers of hard wood timbers and bonded with high quality BWP type Phenol Formaldehyde Synthetic Resin Adhesive and hot pressed at high temperature and pressure, and further treated with a fixed type of preservative by vacuum-cum-pressure impregnation, to produce thin boards or sheets of wood panels. There are always an odd number of layers. The plies shall be placed, so that, grain of each layer is at right angles to the grain in the adjacent layer.

86A.3 Plywood shall be waterproof, weather proof, boilproof, and highly durable even against strenuous vulnerable uses. It shall resist the attack of termites, cockroaches, wood burrowers,

86A.4 The tensile strength of the plywood shall be minimum 600 kg/cm2. and bending strength above 400 kg/cm2. The swelling of plywood in water should be almost negligible. Specific gravity of plywood should be 0.7 to 0.75, having screw and nail holding strength normal to face, atleast 250 kg. and 60 kg., respectively.

86A.5 The moisture content shall be less than 10% and the plywood shall have high fire resistance and shall be free from any cracks, wraps, split etc., and shall have uniform strength all over the panel surface. It shall be used for marine structures, leather tanning tables, wall panelling, and underlayment for kitchen and other furniture, subjected to heat and moisture.

M-86B Commercial Ply :

86B.1 The plywood shall be from Mafatlal Plywood Industries Ltd. or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to IS 303.

86B.2 Plywood shall be made from hard wood timbers, finished with selected species of timber, suitable for veneers and bonded with strictly controlled and evenly spread adhesives.

86B.3 It shall be smooth and strong and shall be free from warping, cupping and twisting.

M-86C Prelaminated - Standard and Veneered :

86C.1 **Decorative Plywood**

86C.1.1 It shall be obtained from manufacturer as approved by the Architect and Engineer-in-charge. It shall conform to relevant IS Code.

86C.1.2 Plywood shall be made from hard wood timbers, finished with selected species of timber, suitable for veneers and bonded with strictly controlled and evenly spread adhesives. It shall be smooth and strong and shall be free from warping, cupping and twisting.

86C.2 **Decorative Veneers**

86C.2.1 Decorative veneered plywood shall be manufactured using veneers of the best quality timbers like Teak, Rosewood, Walnut, Laurel, White Cedar and many others.

86C.2.2 They shall be available in flitch form as well as in lay-on form, in sizes suitable to the furniture industry. They shall be available either flat or quarter sliced, varying in thickness from 0.2 mm. to 1.5 mm. Lengths shall vary upto 4 m.

M-86D Block Boards

86D.1 They shall be manufactured from well-selected and seasoned hardwood timbers, used in sturdy construction. They shall be usually bonded with Urea Formaldehyde, however against specific requirements, Phenol Formaldehyde bonded boards shall also be available.

86D.2 They shall be strong, weather and water proof and shall be ideally used for high quality furniture and exterior applications.

M-89 Admixtures for Mass Concrete and Mortar

M-89A Joint Sealant :

89A.1 The sealant shall be of best quality and from manufacturer like CICO, MC-BAUCHEMIE, PIDILITE, HMP or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.

89A.2 It shall be a two component polysulphide rubber joint sealant, based on a low molecular weight polymer. It should not contain chlorides or other corrosive substances.

89A.3 It shall be used for sealing joints in water retaining structures, roofs, external walls, cladding, floors, partitions, ceilings etc. It shall have excellent property to adhere most of building materials like Aluminium, Stainless Steel, Glass, Concrete, Marble, Stone, Brick, Masonry block, Plaster, Ceramic and quarry tiles, Timber etc. The modulus of elasticity of the sealant shall be less than 0.16 MPa, +10% at 100% elongation. The shore "A" hardness of the sealant shall be 22+3 @ 25OC. The operating temperature range for the sealant shall be -25OC to 800C. The permanent dynamic movement capability of the sealant shall be +25%. The tensile strength of the sealant shall not be less than 0.4 MPa. The optimum width/depth ratio shall be

2:1. The Sp.gr. of the sealant shall be 1.6 kg/lit. The sealant should be capable to resist attack of water, sunlight, oxidation, corrosive fumes, oils, petrol, diluted acids and alkalis, salt spray, aliphatic and aromatic solvents and shall not contain tar or bituminous ingredients.

89A.4 It shall posses the properties like 550% elongation at break, non-toxicity when fully cured, no staining and shrinkage less than 1%. The trafficable strength shall be achieved within 24 hours and full at 7 days (at 25OC & 250% RH). It shall possess excellent coverage capacity and more strength at low dry temperatures.

M-89B Abrasion Resistant Industrial Flooring Aggregate :

89B.1 The flooring aggregate, shall be of best quality and from manufacturer like CICO or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.

89B.2 The flooring aggregate shall be a factory processed and specially graded non-oxidising, nonmagnetic and chemically inert metallic flooring aggregate, free from oil and grease.

89B.3 It shall be used as a surface hardener to concrete floors. It is recommended for Factory floors, Warehouses, Hangers, Car parks and such other areas, subjected to heavy vehicular traffic. It shall also be used on open and continuously wet surfaces. The flooring aggregate shall build in wear resistance and shall produce high abrasion resistant floor surface. It shall impart extreme surface density and shall offer resistance to oil and water penetration. It shall provide a nonrusting floor surface which is easy to maintain.

89B.4 It shall be used with cement in the ratio, as per the manufacturer's instructions and spread evenly on the surface to be treated, at the rate depending on the type of floor. The flooring aggregate shall be spread when the surface of the concrete floor is still fresh, i.e. as soon as the surface water has evaporated and then trawled, in stages, to bring about an uniform and smooth finish.

M-89C Concrete Hardener and Dustproofer :

89C.1 The Concrete hardener and dustproofer, shall be of best quality and from manufacturer like CICO or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.

89C.2 It shall have a specific gravity of 1.18 and shall be applied on concrete floors, at the rate of atleast 25 lit.s per 100 m2. per coat. A total of three coats shall be applied for permanently hardened concrete floor, with increased abrasion resistance, increased surface density, increased resistance to chemical attack and to eliminate dust accumulation. Drying time of 4-6 hours for each coat shall be allowed before the floor is put to use or is applied with another coat of the product. Precautions shall be taken while using the product, to avoid contact with eyes and open wounds and to work in good ventilation. After application, the affected parts shall be washed copiously. It shall not be stored for a period of more than 2 months before use.

M-89D Water Repellent Coating :

89D.1 The Water repellent coating, shall be of best quality and from manufacturer like CICO or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.

89D.2 Water repellent coatings for exterior exposed surfaces shall be acrylic resin based, having a Flash point of approx. 400C and specific gravity of 0.95.

89D.3 It shall be suitably used for concrete, brick, stone and plastered surfaces preventing moisture penetration and thus any damage to the interiors. It shall be quick acting, long lasting, invisible i.e. colourless so as to maintain the original colour of the surface treated. It shall impart sealing characteristics so that the treated surface becomes stain and dust free. The coating itself shall not darken or turn yellow with age.

M-89E Accelerating, Water Reducing Admixture and Plasticiser :

89E.1 The Accelerating, Water reducing admixture and plasticiser, shall be of best quality and from manufacturer like CICO or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.

89E.2 It shall be in liquid state with a specific gravity of 1.30 and complying with ASTM C-494 Type E, IS : 9103 & IS : 2645. It shall accelerate the setting and hardening of the concrete mix, thereby

achieving higher early age strength. It shall reduce the water content of the concrete without affecting its workability. It is useful for pre-cast/pre-stressed works, structural concrete works, floors, roads, runways, paving etc. It shall be used at the rate instructed by the manufacturer, with cement, depending on the amount of acceleration of hardening required. It should be compatible to all types of cement.

M-89F Retarding, Water Reducing Admixture and Plasticiser :

89F.1 The Retarding, water reducing admixture and plasticiser, shall be of best quality and from manufacturer like CICO, Feb Roffe or equivalent, as approved by the Architect and Engineer-in-charge.

The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.

89F.2 It shall be in liquid state with a specific gravity of 1.22 and complying with ASTM C-494 Type B & D, IS : 9103, CRD-C87 Type B & D, BS 5075 Part 1. It shall be added to the concrete mix during the mixing process, at the same time as the water or the aggregates. No extension of normal mixing time is necessary. It shall extend the period of time as to placing the concrete and compacting, i.e. delay the initial and final setting time. It shall help to spread the heat of hydration over a longer period of time. It shall give a highly workable concrete with a low W/C ratio. It shall be used at the rate instructed by the manufacturer, with cement, depending on the amount of acceleration of hardening required. It should be compatible to all types of cement.

M-89G Water & Weather Proof Compound :

89G.1 The water & weather proof integral cement admixture shall be of best quality and from manufacturer like Cico, Sika, Pidilite, ConTech Chemicals or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.

89G.2 It shall be used as an excellent cement admixture in all types of concrete/plaster mortars, pointing mortars, masonry works, guniting works and pressure grouting works. It shall improve resistance of concrete surfaces to weathering and chemical attack. It shall be non-toxic so as to use for waterproofing water tanks, reservoirs, bio-gas tank, leaking ceiling, basements, tunnels, lift wells etc.

89G.3 It shall be mixed to concrete or plaster mortar, while mixing. First, water is added and then the admixture, at the rate instructed by the manufacturer. For use of the admixture, precaution shall be taken to use clean materials for preparation of mortar.

M-92 Fibreglass Reinforced Plastics (FRP)

92.1 Fibreglass Reinforced Plastic shall be from CEAT or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to relevant IS Code.

92.2 It shall be either unidirectional reinforced or sheet moulded or filament wound epoxy to match the purpose of work and item of tender. It shall have versatile chemical inertness, electrical resistance and mechanical strength, ease of processibility, repeatability and predictability. It shall have desirable characteristics like light weight, high strength, stiffness, toughness, thermal insulation properties, superior weather resistance, complete elasticity, fatigue, creep, resistance to corrosion, rot, swelling, insects, fungus etc.

92.3 There shall be no yield point beyond which buckling or denting of the FRP occurs, to reduce the possibility of irritating damages for minor stresses or impacts. The density, flexural strength and flexural modules shall not be less than 1.5 mg/m3., 1000 MPa and 40x103 MPa, respectively. It shall have minimum tensile strength, tensile modulus and compressive strength

of 1000 MPa, 40x103 MPa and 250 MPa, respectively. The FRP shall have thermal conductivity about 0.2 w/mOC. Thermal coefficient of expansion shall be less than 10x10-6 per OK.

92.4 The minimum glass content shall be 60%. The weight index for stiffness and tensile strength at yield shall not be less than 0.6 and 0.9 respectively. No damage should be there while testing at impact energy of 8 joules. The level of translucency should be greater than 80% of diffused transmission that of direct light. It shall provide superior aesthetic value with incorporated colour. It shall be good fire retardant, durable and impermeable to water.

M-93 Fly ash

CPWD specifications clause no. 3.1.5 shall be followed

Material Specifications – Water Supply and Sanitary Works

SECTION - 01: BASIS OF DESIGN AND INSTRUCTIONS

1. BASIS OF DESIGN

The Plumbing, Sanitary, Drainage & Rain water disposal System for the villa is designed keeping in view the following:

Requirement of adequate and equal pressure availability of water lines in Over head tanks of Villas.

Adequate storage of water in Over head water tanks, preferably for a day consumption.

Provision of Pressure pumps installation in case of uses of high end fixtures to be use.

The execution of works and materials used shall be as per the latest relevant I.S. specifications.

Wherever reference has been made to Indian Standard or any other specifications, the same shall mean to refer to the latest specification irrespective of any particular edition of such specification being mentioned in the specifications below or Schedule of Quantities.

2. CONCEPT OF THE SYSTEM

The following services are envisaged:

Domestic water and Flushing water shall be supply to Over head tank of each Villa by Central Pressure Pumping system.

Sewage and Sludge collection system based on IS: 1742 and applicable standards for domestic drainage.

Storm / Rain water drainage system from various levels of the building and disposal to available in the storm water system.

Separate Garden water supply hydrant taps from Flushing water lines at required distance.

3. WATER STORAGE & DISTRIBUTION SYSTEM

Water Requirement

The water requirement for the project is proposed to be based on the provisions of IS: 1172, SP 35 and prevalent practice. The estimated requirement of water per day for the Villas is based on the number of users. Landscape water demand based on Green area and water demand as per Landscape consultant.

Source of Water

Main source of water supply shall be Sardar Sarovar Narmada Nigam Ltd. (SSNNL) by Clients' own Pumping station. Water shall be supply 24x7.

Water Quality

Basic Supply water shall be treated by Society at Pump room or at Source water collection point. Treatment shall be done to remove heavy and floating particles.

Water Distribution

The water distribution for cold water supply for the Villa shall be designed on principle of availability of adequate residual head at Terminal. Provision of pressure reducing station and non-return valve shall be made for effective and efficient water distribution in the line if required.

Appurtenant

Following components shall be included in the water supply system for efficient functioning:

i. Automatic air vent at each of the high point.
iii. Pressure Release valve where abnormally high pressure is to be reduced.
iv. Water meter.
v. Pressure Gauge.

4. SEWAGE, SULLAGE AND STORM WATER

Soil & waste stacks of different line shall be diverted & connected to sewer network which will be terminated at STP. Every cluster has own STP which shall be allocated at different place, this STP shall be packaged type.

Design Limitations

The system is designed considering the following:

a. High thrust developed at soil & water pipe connections.
b. Termination of vent cowl at terrace level.
c. Provision of adequate slope for horizontal header pipes for achieving self-cleaning velocity in the pipes.
d. Provision of cleanout plug.

5. WORKMANSHIP

The workmanship shall be best of its kind and shall conform to the specifications, as below or Indian Standard Specifications in every respect or latest trade practices and shall be subject to approval of the Owner's Site Representative. All materials and/or Workmanship which in the opinion of the Owner's Site Representative / Architect / Consultant is defective or unsuitable shall be removed immediately from the site and shall be substituted with proper materials and/or workmanship forthwith.

6. MATERIALS

All materials shall be best of their kind and shall conform to the latest Indian Standards.

All materials shall be of approved quality as per samples and origins approved by the Owner's Site Representative / Architect / Consultants.

As and when required by the Owner's Site Representative / Consultant, the contractor shall arrange to test the materials and/or portions of works at his own cost to prove their soundness and efficiency. If after tests any materials, work or portions or work are found defective or unsound by the Owner's Site Representative / Consultant, the contractor shall remove the defective material from the site, pull down and re-execute the works at his own cost to the satisfaction of the Owner's Site Representative / Consultant. To prove that the materials used are as specified the contractor shall furnish the Owner's Site Representative with original vouchers on demand.

7. PRECEDENCE

Any conflict between the technical requirements stated in the Data sheet or Purchase Order and the technical requirements of this specification shall be referred to Owner for clarification. The precedence of purchase documents is as follows:

- This specification / Data Sheet
- Documents referenced in this specification

The technical requirements specified in the Data sheet or Purchase Order including terms, conditions and legal requirements.

8. TEST CERTIFICATE

The contractor shall submit test certificates for all the relevant material / system installed. These shall be issued by a government recognized inspection office certify that all equipment, materials, construction and functions are in agreement with the requirements of these specifications, ISI and when ISI is not applicable other approved certify agencies.

9. INSTRUCTION MANUAL:

The contractor shall prepare and produce instruction, operation and maintenance manuals in English for the use, operation and maintenance of the supplied equipment and installations, and submit hard copy to client.

10. PRODUCTS SAMPLES AND CATALOGUE:

Before ordering the material necessary for these installations, the contractor shall submit to consultant / client for approval, a sample of every material such as pipes, valves, accessories etc., along with the catalogues.

Prior to ordering any plumbing equipment/material/system, the contractor shall submit catalogues, along with the samples, at least from 2-3 different manufacturers to consultant / client. After the selection of manufacturer by consultant / client, the contractor shall arrange inspection and testing at the manufacturer's factory or assembly shop for final approval. No material shall be procured prior to the approval of the consultant / client.

11. SHOP DRAWINGS:

The contractor shall prepare and submit Shop drawing to Consultant/Client, for his approval, two sets of detailed drawings of all water supply drainage pipe route, valve arrangement, connection details, support details etc to be provide with respect to site condition by the contractor, or other vendor within 15 days of signing of the contract.

The consultant / client reserve the right to alter or modify these drawings if they are found to be insufficient or not complying with the established technical standards or if they do not offer the most satisfactory performance or accessibility for maintenance.

12. AS BUILT DRAWINGS

At the completion of work and before issuance of certificate of virtual completion the contractor shall submit to consultant / client., three sets of layout drawing drawn at appropriate scale indicating the complete wiring system "as installed" duly approved by Consultant. These drawings must provide with plan, elevation and section.

SECTION-02 : SANITARY FIXTURES & FITTINGS

SCOPE:

Work under this section shall limited up to receiving , unloading, shifting, testing, safe keeping, storing, installing & commissioning etc. and all labor 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.

1.0 EUROPEAN W.C:

1.1.1. 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.

1.1.2. 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.

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

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

1.1.5. 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.

1.1.6. 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.

2.0 INDIAN WATER CLOSET:

1.1.1. Indian water closet W.C. pan shall be of vitreous china of approved quality and color and shall be Madurai or Orissa pattern and shall be of similar quality as specified above.

1.1.2. The pan shall be 675/575 mm in length with 'S' or 'P' trap of the same material as of the pan. The W.C. with the trap shall be fitted & fixed in position and build round solid with brick and cement to required level after all connections are made.

1.1.3. The finished floor of the water closet shall be of 25mm below the level of the room or passage in front of it. The W.C. shall be provided with 10 Lit. low level flushing cistern or flush valve as mentioned in Schedule of Quantities.

1.1.4. Water closet should conform to the requirements of I.S: 771 – 1963 for glazed vitreous china sanitary appliances. The flush pipe/bend shall be connected to the W.C. by means of a suitable rubber adopter.

3.0 WASH BASINS:

1.1.1. 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.

1.1.2. Wash basin shall be of required size, shape, type as specified in detailed BOQ shall be supported on a pair of C.I. brackets of approved design.

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

1.1.4. URINALS:

1.1.1. 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.

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

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

a) G.I. Pipes
b) Rigid PVC/High density polyethylene.

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

4.0 KITCHEN /PANTRY/ LAB SINKS:

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

1.1.2. 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.

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

1.1.4. 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.

5.0 FLUSH TANK

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

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

6.0 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.

7.0 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.

8.0 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 flanges of 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.

9.0 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 hand basin as described in Bill of quantity.

10.0 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.

11.0 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.

12.0 TOILETS FOR THE DISABLED

1.1.1. There shall be a provision in wash room/toilets facilities designed to accommodate physically handicapped, accessories should be provided as per BOQ.

1.1.2. For the physically handicapped the provision of stainless steel grab bars of non slip gripping surface of required size suitable for concealed or exposed mounting shall be provided in wash rooms/toilets as per BOQ.

13.0 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.

14.0 MEASUREMENTS:

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, and nothing 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.

SECTION-03 : WATER SUPPLY

1. SCOPE

The scope of this section comprises the supply, installation, testing and commissioning of piping network for water supply for external services as follows:

Domestic Water Supply – Cold
Flushing Water Supply – Cold

2. PIPING MATERIALS

The piping system shall also consist of uPVC pipes Sch-40/80 conforming to ASTM D-1785, for flushing water supply & expose pipe with solvent /screwed based fittings conforming to ASTM D-2467.

Outside the building the piping shall be installed at least 1.0 m below the finished grade level.

2.1 CPVC Pipes & Fittings

The pipes shall be CPVC (Chlorinated Poly Vinyl Chloride) material for hot & cold water supply piping system wth pipes as per CTs SDR -13.5 at a working pressure of 320 PSI at 23 deg C and 80 PSI at 82 deg.C, using solvent welded CPVC fittings i.e. Tees, Elbows, Couplees, Unions, Reducers, Brushing etc. including transition fittings (connection between CPVC & Metal pipes / GI) i.e. Brass adapters (both Male & Female threaded and all conforming to ASTM D-2846 with only CPVC solvent cement conforming to ASTM F-441, with clamps / structural metal supports as required /directed at site including cutting chases & fitting the same with cement concrete / cement mortar as required, including painting of the exposed pipes with one coat of desired shade of enamel paint. All termination points for installation of faucets shall have brass termination fittings. Installation shall be to the satisfaction of manufacturer & Project Manager. The material shall have to be gotten approved from Chief Fire Officer.

i. Joining Pipes & Fittings

a. Cutting:
Pipes shall be cut either with a wheel type plastic pipe cutting or hacksaw blade and care shall be taken to make a square cut which provides optimal bonding area within a joint.

b. Deburring / Beveling:
Burrs and fittings should be removed from the outside and inside of pipe with a pocket knife or file otherwise burrs and fittings may prevent proper contact between pipe and fittings during assembly.

c. Fitting preparation:
A clean dry rag/cloth should be used to wipe dirt and moisture from the fitting sockets and tubing end. The tubing should make contact with the socket wall 1/3 or 2/3 of the way into the fitting socket.

d. Solvent Cement Application:
Only CPVC solvent cement confirming to ASTM-F493 should be used for joining pipe with fittings. An even coat of solvent cement should be applied on the pipe end and a thin coat inside the fitting socket, otherwise too much of cement solvent can cause clogged water ways.

e. Assembly:
After applying the solvent cement on both pipe and fitting socket, pipe should be inserted into the fitting socket within 30 seconds, and rotating the pipe ¼ to ½ turn while inserting so as to ensure even distribution of solvent cement with the joint. The assemnbled system should be held for 10 seconds (approximately) inorder to allow the joint to set up.

An even bead of cement should be evident around the joint and if this bead is not continuous remake the joint to avoid potential leaks.

Set & Cure times:

Solvent cement set and cure times shall be strictly adhered to as per the below mentioned table.

Minimum Core prior to pressure testing at 150 PSI

Ambient Temperature during Core period	Pipe Size	
	½ " - 1"	1.¼" - 2"
Above 15 deg. C	1 Hr	2 Hrs
4-15 deg.C	2 Hrs	4 Hrs
Below 4 deg C	4 Hrs	8 Hrs

Special care shall be exercised when assembling flow guard systems in extremely low temperature (below 4°C) or extremely high temperature (above 45°C) In extremely hot temperatures, make sure that both surfaces to be joined are till wet with cement solvent when putting them together.

f. Testing

Once an installation is completed and cored as per above mentioned recommendations, the system should be hydrostatically pressure tested at 150 psi (10 Bar) for one hour. During pressure testing, the system should be fitted with water and if a leak is found, the joint should be cut out and replacing the same with new one by using couplers.

ii. Transition of Flow guard CPVC to Metals

When making a transition connection to metal threads, special Brass / plastic transition fitting (Male and female adapters) should be used. Plastic threaded connections should not be over torqued Hard tight pluts one half turn should be adequate.

iii. Threaded Sealants

Teflon tape shall be used to make threaded connections leak proof.

iv. Solvent Cement

Only CPVC solvent cement conforming to ASTMF 493 should be used for joining pipe with fittings and valves. Flowguard CPVC cement solvents have a minimum shelf life of 1 year. Aged cement solvent will often change colour or being to thicken and become gelatinous or jelly like and when this happens, the cement should not be used. The cement solvent should be used within 30 days after opening the company's seal and tightly close the seal after using inorder to avoid its freezing. The freezed cement solvent should be discarded immediately and fresh one should be used. The CPVC solvent cement usage should be adhered to as given in table below

Diameter of pipe in inch (flowguard)	½"	¾"	1"	¼"	1½"	2"
Approx Approx. nos. of joints which can be mode per litre of solvent cement.	200 Nos	180 Nos	150 Nos	130 Nos	100 Nos	70 Nos

v. Hangers and supports

For Horizontal runs, support should be given at 3 foot (90 cm) intervals for diameters of one inch and below and at 4 foot (1.2m) intervals for larger sizes.

Hangers should not have rough or sharp edges which come in contact with the tubing.

Supports should be as per the below mentioned table:

Size of Pipe	21°C	49°C	71°C	82°C
Inch	Ft.	Ft.	Ft.	Ft.
½"	5.5	4.5	3.0	2.5
¾"	5.5	5.0	3.0	2.5
1"	6.0	5.5	3.5	3.0
1¼"	6.5	6.0	3.5	3.5
1½"	7.0	6.0	3.5	3.5
2"	7.0	6.5	4.0	3.5

2.2 UPVC Pipes & fitting:

I. General Specifications for Execution

a. The pipes shall be UPVC (Ultra Poly Vinyl Chloride) material for cold water supply piping system.

b. uPVC Sch. 80 pipes and fittings for cold water supply shall be conforming to ASTM D 1785 for pipe at a working pressure of 19.3 Kgf/cm2 at 23 deg C.

c. Solvent welded uPVC fittings i.e. Tees, Elbows, Couplers, Unions, Reducers, Brushing etc. including transition fittings (connection between uPVC & Metal pipes / GI) i.e. Brass adapters (both Male & Female threaded) conforming to ASTM D-2467 to be used.

d. U PVC solvent cement conforming to ASTM F-2564 shall be used.

e. G.I. Heavy class pipe sleeves of specified diameter corresponding to the pipe size shall be provided wherever the pipes are crossing the fire rated walls/floors slab and sealing the sleeves with glass wool in between and fire sealant compound on either end, all as per E-I-C's requirement.

f. Expansion Loop shall be provided for the thermal expansion and contraction for all the long straight runs above 15 meters in the piping system.

g. The pipes shall be fixed / installed with clamps / structural metal supports as required /directed at site including cutting chases & fitting the same with cement concrete / cement mortar as required, including painting of the exposed pipes with one coat of desired shade of enamel paint.

h. All pipes and fittings for the entire project shall be sourced from the single manufacturer (one of the approved manufacturer)

i. All termination points for installation of faucets shall have brass termination fittings.

j. Installation shall be to the satisfaction of Engineer in charge.

II. Joining Pipes & Fittings

a. Cutting –

Pipes shall be cut either with a wheel type plastic pipe cutting or hacksaw blade and care shall be taken to make a square cut which provides optimal bonding area within a joint.

b. Deburring / Beveling –

Burrs and fittings should be removed from the outside and inside of pipe with a pocket knife or file otherwise burrs and fittings may prevent proper contact between pipe and fittings during assembly.

c. Solvent Cement Application –

Only uPVC solvent cement confirming to ASTM F-2564 should be used for joining pipe with fittings. An even coat of solvent cement should be applied on the pipe end and a thin coat inside the fitting socket, otherwise too much of cement solvent can cause clogged water ways.

d. Assembly:

After applying the solvent cement on both pipe and fitting socket, pipe should be inserted into the fitting socket within 30 seconds, and rotating the pipe ¼ to ½ turn while inserting so as to ensure even distribution of solvent cement with the joint. The assembled system should be held for 10 seconds (approximately) in order to allow the joint to set up.
An even bead of cement should be evident around the joint and if this bead is not continuous remake the joint to avoid potential leaks.

e. Set & Cure times

i. Solvent cement set and cure times are a function of pipe size, temperature and relative humidity. Curing time is shorter for drier environments, smaller sizes and higher temperatures.

ii. It requires 10 to 20 minutes for a perfect joint.

iii. Special care shall be exercised when assembling flow guard systems in extremely low temperature (below 4°C) or extremely high temperature (above 45°C) In extremely hot temperatures, make sure that both surfaces to be joined are till to wet with cement solvent when putting them together.

III. Transition of Flow guard CPVC to Metals:

a. When making a transition connection to metal threads, special Brass / plastic transition fitting (Male and female adapters) should be used.
b. Plastic threaded connections should not be over torque Hard tight pluts one half turn should be adequate.
c. The place at which the transition is to be done shall be pre-approved by the engineer in charge.

IV. Threaded Sealants:

Teflon tape shall be used to make threaded connections leak proof.

V. Solvent Cement

a. Only uPVC solvent cement conforming to ASTM F-2564 should be used for joining pipe with fittings and valves.

b. Aged cement solvent will often change colour or being to thicken and become gelatinous or jelly like and when this happens, the cement should not be used.

c. The cement solvent should be used within 30 days after opening the company's seal and tightly close the seal after using in order to avoid its freezing.

d. The freeze cement solvent should be discarded immediately and fresh one should be used.

e. The uPVC solvent cement usage should be adhered to as given in table below

Diameter of pipe in inch	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	6"
Approx. nos. of joints which can be made per liter of solvent cement.	1200 Nos	75	500 Nos	450 Nos	325 Nos	22	50 Nos	40	30 Nos	10

VI. Hangers and supports

a. For Horizontal runs, support should be given at 3 foot (90 cm) intervals for diameters of one inch and below and at 4 foot (1.2m) intervals for larger sizes.

b. Hangers should not have rough or sharp edges which come in contact with the tubing.

c. Vertical Supports for all the pipe should be as per the below mentioned table:

Size of Pipe	21°C	49°C	71°C	82°C
Inch	Ft.	Ft.	Ft.	Ft.
½" (15mm)	5.5	4.5	3.0	2.5
¾" (20mm)	5.5	5.0	3.0	2.5
1" (25mm)	6.0	5.5	3.5	3.0
1¼"(32mm)	6.5	6.0	3.5	3.5
1½"(40mm)	7.0	6.0	3.5	3.5
2" (50mm)	7.0	6.5	4.0	3.5
2½" (65mm)	8.0	7.5	4.5	4.0
3" (75mm)	8.0	7.5	4.5	4.0
4" (100mm)	9.0	8.5	5.0	4.5
6" (150mm)	10.0	9.0	5.5	5.0

3. FERRULES

The ferrules for connection with main shall generally conform to IS: 2692. It shall be of non-ferrous materials with a bell mouth cover and shall be of nominal bore as specified. The ferrule shall be fitted with a screw and plug or valve capable of completely shutting of the water supply to the communication pipe, as and when required.

i. Fixing Ferrules

For fixing ferrule in cast iron mains, the empty main shall be drilled and tapped at 45 deg to the vertical and the ferrule screwed in. The ferrule must be so fitted that no portion of the shank shall be left projecting within the main into which it is fitted.

4. WATER METERS

Water meters of approved make and design shall be supplied for installation at locations as shown. The water meters shall meet with the approval of local supply authorities.

I. Working pressure of 16 Bars and test pressure 1.5 times the working pressure.

II. The water meters shall have Aluminium Alloy housing material and Carbon Steel drive shaft.

III. The water meter shall be capable to communicate with other controllers following MODBUS-RTU or BACNET Class-2 protocol through RS485 port and pre-equipped with cyble for remote reading. The technology allows clear and exact duplication of the volume increment and shall not be disturbed / influenced by external magnetic fields.

IV. The meters shall conform to Indian Standard IS: 779 and IS: 2373.

V. Water meters shall be able to withstand pressures up to 20 bars and it suitable for indoor or outdoor installation

VI. Water meters shall be suitable for installation in underground pits and ability to work in floded pits up to depth of 3 meters.

VII. The pressure drop across water meter shall be very nominal subject to maximum of 0.02 bars at normal capacity.

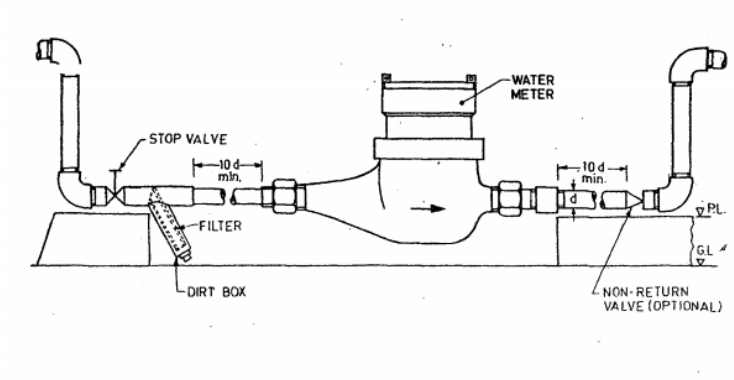
VIII. Provision shall also be made to lock the water meter. The provision shall be such that the lock is conveniently operated from the top.

IX. Where the provision is designed for use in conjunction with padlocks, the hole provided for padlocks shall be a diameter not less than 4mm.

X. Suitable valves and chambers or wall meter box to utility the meters shall also be provided along with the meters.

4.1 Installation of Water Meter and Stop Cock

The G.I. Lines shall be cut to the required lengths at the position where the meter and stop cock are required to be fixed. Suitable fittings shall be attached to the pipes. The meter and stop cock shall be fixed in a position by means of connecting pipes, jam nut and socket etc. The stop cock shall be fixed near the inlet of the water meter. The paper disc inserted in the ripples of the meter shall be removed. And the meter installed exactly horizontal or vertical in the flow line in the direction shown by the arrow cast on the body of the meter. Care shall be taken that the factory seal of the meter is not disturbed. Wherever the meter shall be fixed to a newly fitted pipe line, the pipe line shall have to be completely washed before fitting the meter.



d = nominal size of water meter.

FIG. 1 POSITIONING OF WATER METER

5. TESTING

i. The Contractor shall notify the Engineer in charge ten days in advance of any test so that the Engineer can witness the tests if he so wishes.

ii. All water supply system shall be flushed before testing and tested to hydrostatic pressure test of at least one and a half (1.5) times the maximum pressure but not less than 20 bars for a period of not less than 8 hours.

iii. All leaks and defects in joints revealed during the testing shall be rectified and got approved at site by retest. Piping required subsequent to the above pressure test shall be retested in the same manner.

iv. System may be tested in sections and such sections shall be entirely retested on completion.

v. The Contractor shall make sure that proper noiseless circulation of fluid is achieved through the entire piping network of the system concerned. In case of improper circulation, the contractor shall rectify the defective connections. He shall bear all expenses for carrying out the above rectifications including the tearing up and refinishing of floors and walls as required.

vi. In addition to the sectional testing carried out during the construction, contractor shall test the entire installation after connections to the overhead tanks or pumping system or mains. He shall rectify all leakages and shall replace all defective materials in the system. Any damage done due to carelessness, open or burst pipes or failure of fittings, to the building, furniture and fixtures shall be made good by the contractor during the defects liability period without any cost.

vii. After commissioning of the water supply system, contractor shall test each valve by closing and opening it a number of times to observe if it is working efficiently. Valves which do not effectively operate shall be replaced by new ones at no extra cost and the same shall be tested as above.

viii. A test register shall be maintained and all entries shall be signed and dated by Contractor(s) and Owner's site representative.

6. DISINFECTION OF PIPING SYSTEM AND STORAGE TANKS

i. Before commissioning the water supply system, the contractor shall arrange to disinfect the entire system as described in the succeeding paragraph.

ii. The water storage tanks and pipes shall first be filled with water and thoroughly flushed out. The storage tanks shall then be filled with water again and disinfecting chemical containing chlorine added gradually while tanks are being filled to ensure thorough mixing. Sufficient chemical shall be used to give water a dose of 50 parts of chlorine to one million parts of water.

iii. If ordinary bleaching powder is used, the proportions will be 150 gm of powder to 1000 liters of water. The powder shall be mixed with water in the storage tank. If a proprietary brand of chemical is used, the proportions shall be specified by the manufacturer.

iv. When the storage tanks are full, the supply shall be stopped and all the taps on the distributing pipes are opened successively working progressively away from the storage tank. Each tap shall be closed when the water discharged begins to smell of chlorine. The storage tank shall then be filled up with water from supply pipe and added with more disinfecting chemical in the recommended proportions.

v. The storage tank and pipe shall then remain charged at least for three hours. Finally the tank and pipes shall be thoroughly flushed out before any water is used for domestic purpose.

vi. The pipe work shall be thoroughly flushed before supply is restored.

7. STERILIZATION OF MAIN

After the pipework has been tested and approved, but before it is coupled, it shall be sterilized with a solution of chloride of lime.

8. CUTTING CHASES IN MASONARY WALLS

i. Cold water distribution pipes to fixtures and equipment exposed to view in the bathrooms, kitchens, and sanitary compartments shall be chased into walls or floors or placed in wall cavities. The Contractor shall be responsible for cutting all notches, chases, and recesses in walls and floors and only a diamond cutter shall be used. The maximum size of conduit or pipe permitted to be concealed in floor slabs shall be 32 mm diameter unless otherwise approved by the Architect.

ii. The chases up to 7.5 x 7.5 cm shall be made in the walls for housing GI pipes etc. These shall be provided in correct positions as shown in the drawings or directed by the Architects. Chases shall be made by chiseling out the masonry to proper line and depth. After the pipes etc are fixed in chases, the chases shall be filled with cement mortar 1:2:4 or as may be specified, and made flush with the masonry surface. The concrete surface shall be roughened with wire brush to provide a key for plastering.

iii. Where pipes pass through beams or structural walls, subject to the approval of the Structural Consulting Engineer, the Contractor shall ensure that sizes and locations of openings required are formed in when the relevant beams or walls are cast.

9. VALVES

i. The scope of this section comprises the supply, installation, testing and commissioning of various valves – butterfly, gate, globe, check, safety, ball, sluice, float valves etc. on all the water supply pipe lines.

ii. Schedule of Rates shall also be read in conjunction with this technical specification so as to have a complete view of the specifications for the particular item.

iii. Necessary unions shall be provided on both ends of the valves for easy replacement.

iv. The joints between fittings and pipes shall be leak-proof when tested to desired pressure rating. The defective fittings and joints shall be replaced or redone.

v. Different piping materials for the water supply are used in the project and so based on the type and material of pipe used; the material of valves shall be selected.

vi. Tail pieces as required shall be supplied along with valves.

9.1 Ball Float valve

i. The ball float valve shall be of cast Brass as specified conforming to IS 1703 The ball float Valve shall be of following two classes:—
ii. High pressure float valves are indicated by the abbreviation 'HP' and are designed for use on mains having pressure of 0.175 MPa or above.
iii. The copper ball shall have bronze welded seams. The closing/opening mechanism incorporating the piston and cylinder shall be non-corrosive metal and include washers.
iv. Valves shall either be of screwed type or flanged type, as specified, with suitable flanges and non-corrosive bolts and gaskets.
v. Tail pieces as required shall be supplied along with valves.
vii. Where called for brass valves shall be supplied with brass hexagonal back nuts to secure them to the tanks and a socket to connect to supply pipe.

S.No	Type of Valve	Size	Construction	Ends
a.	Ball Valve (Isolation valve)	15 mm to 50 mm	Brass/ Bronze	Screwed
b.	Butterfly Valve	65 mm and above	Cast Iron	Flanged
c.	Non return valve	15 mm to 50 mm 65 mm above	Gun metal Gun Metal	Screwed Flanged
d.	Flap Type – Non return valve	65 mm and above	Cast Iron	Flanged

All valves shall be suitable for the working pressure involved.

9.2 Pressure Reducing Valve Set

i. Each pressure reducing valve set for cold and hot water supply shall comprise of 3 nos GM / brass ball valves on inlet, outlet, and bye-pass,1 No Gun metal pressure reducing valve with flanged connection, 1 No. `Y' strainer, 2 Nos Pressure 'gauge on inlet & outlet, and 1 No. 15 mm dia safety valve. The upstream pressure will be up to 16 Bars and the downstream pressure may be as low as 1.0 Bars.
ii. Each pressure reducing valve shall contain loading neoprene diaphragm and a full floating, self aligning, ignition resistant seat and shall be of the single stage, pressure reduction type with provision for manually adjusting the delivery pressure. The valve shall fail safe to the low pressure.

iii. Valves shall be capable of operating at the maintaining automatically the respective delivery pressure and flow rates as indicated and shall not be liable to creep. Valves shall also be capable of maintaining the pre-set down stream pressure under static condition.
iv. The filter on each inlet to a pressure reducing valve shall be of replaceable porous sintered metal type.
v. For pipe sizes 15 mm to 32 mm dia direct acting pressure reducing valves shall be provided with integral strainer and have an adjustable pressure range from 1.0 Bar to 16 bars.
vi. Automatic diaphragm actuated, pilot controlled, hydraulically operated pressure reducing valve shall be provided for pipe sizes 40 mm dia and above
vii. Suitable insulation shall be provided, wherever required, when used for hot water applications.

9.3 Air release Valve

i. Double acting, of approved make, having 2 chambers with ebonite ball, small and large orifices with isolating stop screw down valve, GM seats, high tensile brass spindle with cap.
ii. At least 501 m^3/hr of air is released when fully open.
iii. Released air volume is at least 0.026 m^3/hr at 5 psi with 225.

9.4 Pressure Relief Valves

NA

9.5 Pressure Gauge

NA

10. WATER FITTINGS

Unless otherwise specified all Gunmetal fittings such as gate, globe, check & safety valves shall be fitted in pipe line in workman like manner. Necessary unions shall be provided on both ends of the valves for easy replacement. The joints between fittings and pipes shall be leak-proof when tested to desired pressure rating. The defective fittings and joints shall be replaced or redone.

11. CONNECTIONS TO VARIOUS MECHANICAL EQUIPMENT SUPPLIED BY OTHER AGENCIES

All inlets, outlets, valves, piping and other incidental work connected with installation of mechanical equipment supplied by other agencies all be carried out by the contractor in accordance with the drawings, requirements for proper performance of equipment, manufacturers instructions and the directions of the Owner's site representative / Architect. The equipments to be supplied by the other agencies consist mainly for Kitchen, Back-of-the-House area and other similar areas. The work of connections to the various equipments shall be effected through proper unions and isolating valves. The work of effecting connections shall be executed in consultation with and according to the requirement of equipment suppliers, under the directions of the Owner's site representative / Architect. The various aspects of connection work shall be executed in a similar way to the work of respective trade mentioned elsewhere in these specifications.

12. CONNECTIONS TO RCC WATER TANKS

The contractor shall provide all inlets, outlets, washouts, vents, ball cocks, overflows control valves and all such other piping connections including level indicator to water storage tanks as called for. All pipes crossing through RCC work shall have puddle flanges fabricated from MS/GI pipes of required

size and length and welded to 6/8 mm thick MS plate. All MS puddle flanges must HOT dip galvanized and fixed in true alignment and level to ensure further connection in proper order.

Full way gate valves of a approved make shall be provided as near to the tank as practicable on every outlet pipe from the storage tank except the overflow pipe. Overflow and vent pipes shall terminate with mosquito proof grating.

The overflow pipe shall be so placed to allow the discharge of water being readily seen. The overflow pipe shall be of size as indicated. A stop valve shall also be provided in the inlet water connection to the tank. The outlet pipes shall be fixed approximately 75mm above the bottom of the tank towards which the floor of the tank is sloping to enable the tank to be emptied for cleaning.

13. MEASUREMENTS

The length above ground shall be measured in running meter correct to a cm for the finished work, which shall include pipe and fittings such as coupling, bends, tees, elbows, reducers, crosses, plugs, sockets, nipples and nuts, unions. 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.

All pipes below ground shall be measured per linear meters (to the nearest cm) and shall be inclusive of all fittings e.g. coupling, tees, bends, elbows, unions, deduction for valves shall be made rate quoted shall be inclusive of all fittings, excavation, back filling and disposal of surplus earth, cutting holes and chase and making good all item mentioned in Bill of Quantities.

14. LAWN/ GARDEN HYDRANTS

Lawn hydrants shall be of 15mm size unless otherwise indicated. All hydrants shall be provided with ball valves and threaded nipple to receive hose pipes. Lawn hydrant valves shall be of approved make and design. Where called for lawn hydrants shall be located in masonry chambers of appropriate size. Hydrant shall be provided Note board “NO DRINKING WATER” to prevent use Sewage treatment plant recycled water for drinking.

15. PIPE PROTECTION (FOR COLD WATER PIPES BURIED IN TRENCHES / GROUND / EARTH)

All buried pipes shall be cleaned with zinc chromate primer and bitumen paint, wrapped with three layers of fibre glass tissue, each layer laid in bitumen and placed on concrete blocks with PUF saddles dipped in bitumen at every 2 meters. The pipes where laid under floor shall be encased with 100 mm thick jamuna sand all around in addition to protective coating as described above.

16. THRUST BLOCKS

In case of bigger pipes (80 mm dia and above), thrust blocks of cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate of 20 mm nominal size) shall be constructed on all bends as directed by the Owner’s site representative.

17. MASONRY CHAMBER

i. All masonry chambers for stop cocks, sluice valves and meter etc. shall be built as per supplied drawings.

ii. The excavation for chambers shall be done true to dimension and level indicated on plans or as directed by the Owner's site representative.

iii. Concrete shall be having cement concrete 1:5:10 (1 cement : 5 coarse sand: 10 graded stone aggregate 40 mm nominal size.

iv. Brick shall be of class designation 75 in cement mortar 1:4 (1 cement: 4 fine sand)

v. Inside & outside Plastering not less than 12 mm thick shall be done along with water proof compound in cement mortar 1:3 (1 cement : 3 fine sand) finished with a floating coat of neat cement.

18. SHIFTING OF EXCAVATED SURPLUS MATERIAL

Contractor shall make his own arrangement to shift the surplus excavated material within the site limits as directed by Owner's site representative at free of cost within time limit.

SECTION-04: EXTERNAL DRAINAGE (SEWAGE & STORM WATER DISPOSAL)

1. SCOPE

The scope of this section comprises the supply, installation, testing and commissioning of external drainage & sewage disposal services.

1.1 General Scheme

The contractor shall install a drainage system to effectively collect; drain and dispose all soil and waste water from various parts of the buildings, appurtenances and equipment. The piping system shall finally terminate and discharge into the STP. The piping work mainly consists of laying of Foam core pipes or reinforced cement concrete pipes as called for on the drawings. All piping shall be installed at depth greater than 80 cm below finished ground level. The disposal system shall include construction of gully traps, manholes, intercepting chambers as indicated. The piping system shall be vented suitably at the starting point of all branch drains, main drains, and the highest/lowest point of drain and at intervals as shown. All ventilating arrangements shall be unobstructive and concealed. The work shall be executed strictly in accordance with IS: 1742. The sewage system shall be subject to smoke test for its soundness as directed by the Project Manager. Wherever the sewerage pipes run

above water supply lines, same shall be completely encased in cement concrete 1:2:4 all round with the prior approval of the Project Manager.

Without restricting to the generality of the foregoing, the drainage system shall inter-alia include:

a. Sewer lines including earth work for excavation, disposal, back filling and compaction, pipe lines, manholes, drop connections and connections to the municipal or existing sewer.
b. Storm water drainage, earth works for excavation, disposal, backfilling and compaction, pipe lines, manholes, catch basins and connections to the STP or existing municipal storm water drain or connected as indicated by the Project Manager.

General Requirements

All materials shall be new and of quality conforming to specifications and subject to the approval of the Owner's site representative. Wherever particular makes are mentioned, the choice of selection shall remain with the Architect / Consultant / Owner's site representative.

Drainage lines and open drains shall be laid to the required gradients and profies.

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

Contractor shall obtain necessary approval and permission for the drainage system from the municipal or any other competent authority.

Location of all manholes, etc shall be got confirmed by the Project Manager before the actual execution of work at site. As far as possible, no drains or sewers shall be laid in the middle of road unless otherwise specifically shown on the drawings or directed by the Project Manager in writing.

All materials shall be rustproofed; materials in direct or indirect contact shall be compatible to prevent electrolytic or chemical (bimetallic) corrosion.

2. TRENCHING FOR PIPES AND DRAINS

2.1 General

All the material shall be new of best quality conforming to specifications and subject to the approval of the Architects. Drainage lines shall be laid to the required gradients and profiles. All drainage work shall be done in accordance with the local municipal by-laws.

Contractor shall obtain necessary approval and permission for the drainage system from the municipal or any other competent authority. Location of all manholes, catch basins etc. shall be finalized and shown in approved shop drawings before the actual execution of work at site. All work shall be executed as directed by the Project Manager.

2.2 Alignment & Grade

The sewer and storm water drainage pipes shall be carefully laid to levels and gradients shown in the plans and sections but subject to modifications as shall be ordered by the Architects from time to time to meet the requirements of the works. Great care shall be taken to prevent sand etc. from entering the pipes. The pipes between two manholes shall be laid truly in straight lines

without vertical or horizontal undulations. The body of the pipes shall rest on an even bed in the trench for its length and places shall be excavated to receive collar for the purpose of jointing. No deviations from the lines, depths of cuttings or gradients as called for on the drawings shall be permitted without the written approval of the Architect. All pipes shall be laid at least 60cms below the finished ground level or as called for on the drawings.

2.3 Setting out Trenches

The contractor shall set out all trenches, manholes, chambers and such other works to true grades and alignments as called for. He shall provide the necessary instruments for setting out and verification for the same. All trenches shall be laid to true grade and in straight lines and as shown on the drawings. The trenches shall be laid to proper levels by the assistance of boning rods and sight rails which shall be fixed at intervals not exceeding 10 meters or as directed by the Project Manager.

2.4 Trench Excavation

The trenches for the pipes shall be excavated with bottoms formed to level and gradients as shown on the drawings or as directed by the Project Manager. In soft and filled in ground, the Project Manager may require the trenches to be excavated to a greater depth than the shown on the drawings and to fill up such additional excavation with concrete (1:4:8) consolidated to bring the excavation to the required levels as shown on the drawings.

All excavations shall be properly protected where necessary by suitable timbering, piling and sheeting as approved by the Project Manager. All timbering and sheeting when withdrawn shall be done gradually to avoid falls. All cavities be adequately filled and consolidated. No blasting shall be allowed without prior approval in writing from the Architect. It shall be carried out under thorough and competent supervision, with the written permission of the appropriate authorities taking full precautions connected with the blasting operations. All excavated earth shall be kept clear of the trenches to a distance equal to 75 cms.

2.5 Timbering of Sewer and Trenches

The Contractor shall at all times support efficiently and effectively the sides of all the trenches and other excavations by suitable timbering, piling and sheeting and they shall be close timbered in loose or sandy starta and below the surface of the sub soil water level.

All timbering, sheeting and piling with their wallings and supports shall be of adequate dimensions and strength and fully braced and strutted so that no risk of collapse or subsidence of the walls of the trench shall take place.

The Contractor shall be held responsible and shall be accountable for the sufficiency of all timbering, bracings, sheeting and piling used and also for, all damage to persons and property resulting from improper quality strength placing, maintaining or removing of the same.

2.6 Shoring of Buildings

The Contractor shall shore up all buildings, walls and other structures, the stability of which is liable to be endangered by the execution of the work and shall be fully responsible for all damages to persons or property resulting from any accident.

2.7 Obstruction Road

The contractor shall not occupy or obstruct by his operation more than one half of the width of any road or street and sufficient space shall then be left for public and private transit. He shall

remove the materials excavated and bring them back again when the trench is required to be refilled. The contractor shall obtain the consent of the Project Manager in writing before closing any road to vehicular traffic and the foot walks must be clear at all times.

2.8 Protection of Pipes etc.

All pipes, water mains, cables etc. met in the course of excavation shall be carefully protected and supported. Care shall be taken not to disturb the cables, the removal of which shall be arranged by the contractor with the written consent from the Project Manager.

2.9 Trench Back Filling

Refilling of the trenches shall not be commenced until the length of pipes therein has been tested and approved. All timbering which may be withdrawn safely shall be removed as filling proceeds. Where the pipes are unprotected by concrete haunching, selected fine material shall be carefully hand-packed around the lower half of the pipes so as to buttress them to the sides of the trench.

The refilling shall then be continued to 150mm over the top of the pipe using selected fine hand packed material, watered and rammed on both sides of the pipes with a wooden hammer. The process of filling and tamping shall proceed evenly in layers not exceeding 150mm thickness, each layer being watered and consolidated so as to maintain an equal pressure on both sides of the pipe line. In gardens and fields the top solid and turf if any, shall be carefully replaced.

2.10 Contractor to restore settlement and Damages

The contractor shall at his own costs and expenses, make good promptly during the whole period for the works in hand if any settlement occurs in the surfaces of roads, beams, footpaths, gardens, open spaces etc. in the public or private areas caused by his trenches or by his other excavations and he shall be liable for any accident caused thereby. He shall also, at his own expense and charges, repair (and make good) any damage done to building and other property. If in the opinion of the Project Manager he fails to make good such works with all practicable despatch, the Project Manager shall be at his liberty to get the work done by other means and the expenses thereof shall be paid by the contractor or deducted from any money that may be or become due to him or recovered from him by any other manner according to the laws of land.

The contractor shall at his own costs and charges provide places for disposal of all surplus materials not required to be used on the works. As each trench is refilled, surplus soil shall be immediately removed, the surface shall be properly restored and roadways and sides shall be left clear.

2.11 Removal of Water from Sewer, Trench etc.

The contractor shall at all times during the progress of work keep the excavations free from water which shall be disposed by him in a manner as will neither cause injury to the public health nor to the public or private property nor to the work completed or in progress nor to the surface of any road or streets, nor cause any interference with the use of the same by the public.

If any excavation is carried out at any point or points to a greater width of the specified cross section of the sewer with its cover, the full width of the trench shall be filled with concrete by the contractor at his own expense and charges to the requirements of the Project Manager.

2.12 Removal of Filth

All night soil, filth or any other offensive mater met with during the execution of the works, shall not be deposited on the surface of any street or where it is likely to be a nuisance or passed into any sewer or drain but shall be immediately, after it is taken out of any trench, sewer or cess pool, put into the carts and removed to a suitable place to be provided by the Contractor.

2.13 Width of Trench

The Project Manager shall have power by giving an order in writing to the Contractor to increase the maximum width/depth for excavation and backfilling in trenches for various classes of sewer, manholes and other works in certain length to be specifically laid down by him, where on account of bad ground on other unusual conditions, he considers that such increased width/depths are necessary in view of the site conditions.

3. PIPING MATERIAL

3.1 Reinforced Cement Concrete (RCC) Hume Pipes NP2 class

i. All pipes shall be centrifugally spun RCC pipes NP2. 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.

ii. The pipes shall be with or without reinforcement as required and of the class as specified. These shall conform to IS: 458-1971.

iii. 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.

3.1.1 Laying

RCC spun pipes shall be laid on cement concrete bed of cradles as specified and shown on the detailed drawings. The cradles may be precast and sufficiently cured to prevent cracks and breakage in handling. The invert of the cradles shall be left 12 mm 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 Engineer in charge.

3.1.2 Jointing

i) Semi flexible type collar joint.

ii) 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 two part of sand and with minimum water content but on no account soft or sloppy, shall be carefully inserted, punched and caulked into the collar and more cement mortar added until the space of the collar has been filled completely with tightly caulked mortar. Provision of rubber sealing ring in the collar joint shall also be made. The joint shall then be finished off neatly outside the socket at an angle of 45 deg.

3.1.3. Curing:

The joint shall be cured for at least seven days. Refilling at joints will be permitted only on satisfactory completion of curing period.

3.1.4. Cement Concrete for Pipe Supports:

i) Unless otherwise directed by the Engineer in charge cement concrete for bed, all round or in haunches shall be in the mix 1:4:8 (1cement : 4 coarse sand :8 graded stone aggregate 40 mm nominal size):

Description	Up to 1.4 m Depth (5')	Up to 3 m Depth (10')	Beyond 3 m Depth (10')
Pipes in open ground (no sub soil water)	all round	in haunches	all round
RCC/C.I pipes in sub soil water	all round	in haunches	in haunches
RCC/C.I pipes (in all Conditions)	all round	in haunches	in haunches
RCC/C.I pipes under Road or building	all round	all round	all round

ii) R C C pipes or CI pipes may be supported on brick masonry or precast RCC or in situ cradles. Cradles shall be as shown on the drawings.
iii) Pipes in loose soil or above ground shall be supported on brick or stone masonry pillars as shown on the drawings.

3.1.5. Measurement:

i) Excavation
Measurement for excavation of pipes trenches shall be made per linear meter.
ii) 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 up to 1.5 meter or as given in the Bill of Quantities.
iii) 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 up to 1.5 m.
iv) RCC Hume pipes shall be measured for length of the pipe line per linear meter.
v) Length between manholes shall be recorded from inside of one manhole to inside of other manhole.
vi) Length between gully trap and manhole shall be recorded between socket of pipe near gully trap and inside of manhole.

3.2 Cast Iron Class (LA) Pipe:

NA

3.3 Under Ground Drainage Double Wall Corrugated HDPE Pipes:

All underground sewer lines where specified Double wall corrugated pipes SN8 for general. Pipes shall be true and straight with uniform bore throughout. Cracked, wraped, Bend 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.

These shall conform to IS: 16098 Part II and ISO – 21138 Part III of Stifness class SN 8. Pipes shall be Rodent prevent.

All pipes shall be true to shape, straight, perfectly sound and free from cracks, Bend and flaws. The external and internal surface of the pipes shall be smooth and hard.

3.3.1. Laying:

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.

3.3.2. Jointing:

Pipes shall be one time joint by interlocking jointing system with Rubber ring, all joints shall be water tested.

3.3.3. Pipe Supports:

a) 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 depth (5')	**Upto 3m depth (10')**	**Beyond 3m depth (10')**
Pipes in open ground (no sub soil water)	all round (1:5:10)	in haunches (1:3:6)	all round (1:5:10)
Pipes in sub soil water	all round (1:3:6)	in haunches (1:3:6)	in haunches (1:3:6)
Pipes (in all conditions)	all round (1:3:6)	in haunches (1:3:6)	in haunches (1:3:6)
Pipes under road or building	all round (1:3:6)	all round (1:3:6)	all round (1:3:6)

b) Pipes may be supported on brick masonry or pre-cast RCC or in situ cradles. Cradles shall be as shown on the drawings.

c) Pipes in loose soil or above ground shall be supported on brick or stone masonry pillars as shown on the drawings.

3.3.4. 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 metres 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.

3.3.5. Measurement:

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

b) 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.

c) Pipes shall be measured for the length of the pipe line per linear meter i.e.:

i. Length between manholes shall be recorded from inside of one manhole to inside of other manhole.

ii. Length between gully trap and manhole shall be recorded between socket of pipe near gully trap and inside of manhole.

3.4 S.W. Gully Trap

Gully trap shall be stoneware pipe and fittings conforming to IS: 651. These shall be sound and free from visible defects such as fire cracks, or hair cracks. The glaze of the traps shall be free from cracks. They shall give a sharp clear note when struck with light hammer. There shall be no broken blisters. Each gully trap shall have one CI grating of square size corresponding to the dimensions of inlet of gully trap. It will also have a water tight R.C.C. cover with frame inside dimensions 300 x 300mm the cover weighing not less than 2.5 kg and the frame not less than 7 kg. The grating cover and frame shall be of good casting and shall have truly square machined seating faces.

3.4.1. Fixing of S.W. Gully Trap

The excavation for gully traps shall be done true to dimensions and levels as indicated on plans or as directed by the Project Manager /Consultant / Architect. The gully traps shall be fixed on cement concrete foundation 65cm square and not less than 10cm thick. The mix for the concrete will be 1:3:6. The jointing of gully outlet to the branch drain shall be done

similar to the jointing of S.W. Pipes described earlier. After fixing and testing gully and branch drain, a brick work of specified class in cement mortar 1:4 shall be built with a half brick masonry work round the gully trap from the top of the bed concrete upto ground level. The space between the chamber and trap shall be filled in with cement concrete 1:2:4. The upper portion of the chamber i.e. above the top level of the trap shall be plastered inside the cement mortar 1:3 finish with a floating coat of neat cement. The corners and bottom of the chamber shall be rounded off so as to slope towards the grating.

Pre-cast R.C.C. cover with frame 300 x 300 mm (inside) shall then be fixed on the top of the brick masonry with cement concrete 1:2:4 and rendered smooth. The finished top cover shall be so as to prevent the surface water from entering the gully trap.

3.4.2. 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, C I grating and R.C.C cover and frame.

4. MANHOLES:

4.1. Construction of Manhole:

At every change of alignment, gradient or diameter of a drain, there shall be a manhole or inspection chamber. Bends and junctions in the drains shall be grouped together in manhole as far as possible.

The maximum distance between manholes shall be 30 m. Manholes of different types and sizes as specified shall be constructed in the sewer line at such places and to such levels and dimensions as shown in the drawings or as directed by the Engineer-in-Charge. The size specified shall indicate the inside dimensions between brick faces of the manholes.

Where the diameter of the drain is increased, the crown of the pipe shall be fixed at the same level and necessary slope given in the invert of the manhole chamber. In exceptional cases and where unavoidable, the crown of the branch sewer may be fixed at lower level but in such cases the peak flow level of the two sewers shall be kept the same.

Sewers of unequal sectional area shall not be jointed at the same invert in a manhole. The invert of the smaller sewer at its junction with main shall be at least 2/3 the diameter of the main above the invert of the main. The branch sewers shall deliver sewage in the manhole in the direction of main flow and the junction must be made with care so that flow in main is not impeded.

No drain from house fittings, e.g. gully trap or soil pipe, etc. to manhole shall normally exceed a length of 6 m unless it is unavoidable.

Where manholes are to be constructed, the excavation, filling back and ramming, disposal of surplus earth, preparation of bottom and sides etc. shall be carried out as described earlier under trench excavation. Manhole shall be sized and depths as called for in the drawings and Bill of Quantities.

4.1.1. Excavation

The excavation for manhole shall be true to dimensions and levels shown on the plans or as directed by the Engineer-in-Charge.

4.1.2. Bed Concrete

The manhole shall be built on a bed of concrete 1:3:6 (1 cement: 3 coarse sand: 6 graded stone aggregate 40 mm nominal size). The thickness of bed concrete shall be at least 150 mm for manholes up to 0.9 m in depth, at least 200 mm for manholes from 0.90 m up to 2.5 m in depth and at least 300 mm for manholes of greater depth.

4.1.3. Brick Work

The brick work shall be with class 75 bricks in cement mortar 1:4 (1 cement: 4 coarse sand). The external joints of the brick masonry shall be finished smooth, and the joints of the pipes with the masonry shall be made perfectly leak proof. For circular manholes, brick masonry in arches and arching over the pipes shall be in cement mortar 1.3 (1 cement: 3 fine sand). In the case of manholes of circular type the excess shaft shall be corbelled inwardly on three sides at the top to reduce its size to the cover frame to be fitted. The thickness of walls shall be considered as per following thickness.

Depth of the Chamber	*Thickness of Wall*
a) Upto 2.25 m	200 mm (one brick length)
b) From 2.25 m upto 3.0 m	300 mm (one and half brick length)
c) From 3.00 m upto 5.0 m	400 mm (two brick length)
d) From 5.00 m upto 9.0 m	500 mm (two and half brick length)
e) Above 9.00 m	600 mm (three brick length)

4.1.4. Plaster and Pointing

The walls of the manholes shall be plastered inside with 12 mm thick cement plaster 1:3 (1 cement: 3 coarse sand) finished smooth. In the case of arched type manhole the walls of the manhole shall be plastered inside all-around only up to the crown level, and flush pointed for the shaft with cement mortar 1:2 (1 cement: 2 fine sand). Where the saturated soil is met with, also the external surface of the walls of the manhole shall be plastered with 12 mm thick cement plaster 1:3 (1 cement: 3 coarse sand) finished smooth up to 30 cm above the highest sub-soil water level with the approval of the Engineer-in-Charge.
The plaster shall further be water proofed with addition of approved water proofing compound in a quantity as per manufacturer's specifications. In case Local Authorities/Bye Laws specify richer specifications, the same shall be adopted. For earth work excavation, bed concrete brick work, plaster and pointing, R.C.C. work and refilling of earth, respective specifications shall be followed.

4.1.5. Benching

The channels and benching shall be done in cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) and rendered smooth with neat cement. The depth of Channels and benching shall be as given in following Table.

Sizes of drain *mm*	*Top of channel at the centre above bed concrete* *cm*	*Depth of benching at side walls above bed concrete* *cm*
100	15	20
150	20	30
200	25	35
250	30	40
300	35	45
350	40	50
400	45	55
450	50	60

4.1.6. Rungs

Rungs shall be provided in all manholes over 0.8 m in depth and shall be of preferably of cast iron and of suitable dimensions, These rungs may be set staggered in two vertical rungs which may be 300 mm apart horizontally as well as vertically and shall project a minimum of100 mm beyond the finished surface if the manhole wall. The top rung shall be 450 mm below the manhole cover and the lowest not more than 300 mm above the benching.

4.1.7. Measurements

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.

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. The following are inclusive in the cost of manhole viz;

i. Bed concrete
ii. Brick work.
iii. Plastering (inside & outside)
iv. R C C top slab, benching and channeling including drop connections.
v. Supply and fix foot rests.
vi. Keeping holes and embedding pipes for all the connections.
vii. Excavation, refilling, necessary de-watering and disposing off surplus soil to a place as directed by Project Manager.
viii. Curing.
ix Cost of angle frame and embedding the frame in concrete bed.
X Testing.
xi De-watering of chambers.

4.2. Drop Connection

Drop connection shall be provided between branch sewer and main sewer in the main sewer itself in steep ground when the difference in invert level of two exceeds 60 cms of the required sizes. Drop connections from gully traps to main sewer in rectangular shall be made inside the manholes and shall have special type's door bend on to top and heel rest bend at bottom connected by a pipe. The pipe shall be supported by holder bat clamps at 180 cms intervals with at least one clamp for each drop connection. All joints shall be lead caulked joints 25mm deep.

Drop connections from branch sewer to main sewer shall be made inside the manhole wall with PVC 6 kg/cm2 pipe, connection, vertical pipe and bend at the bottoms. The top of the tee shall be up to the maximum level and provided with an Open able door.

Drop connection made from vertical stacks directly into manholes shall not be considered as drop connections.

4.3 Making Connections

Contractor shall connect the new sewer line to the existing manhole by cutting the walls benching and restoring them to the original condition. A new channel shall be cut in the benching of the existing manhole for the new connection. Contractor shall remove all sewage and water if encountered in making the connection without additional cost.

5. GREASE TRAP

NA

6. PRE CAST R.C.C.MANHOLE COVERS AND FRAMES:

The covers and frames shall conform to IS 12592 and shall be of the following grades and types:

6.1 Materials

Cement: Cement used for the manufacture of pre-cast concrete manhole covers shall be 43 grades Portland cement conforming to IS-8112.
Aggregates: The aggregates used shall be clean and free from deleterious matter and shall conform to the requirements of IS-383. The aggregates shall be well graded and the nominal maximum size of coarse aggregate shall not exceed 20 mm.
Concrete: The mix proportions of concrete shall be determined by the manufacturer and shall be such as will produce a dense concrete without voids, honey combing etc. The minimum cement content in the concrete shall be 410 kg/m3 with a maximum water cement ratio of 0.45. Concrete weaker than grade M- 30 (design mix) shall not be used. Compaction of concrete shall be done by machine vibration.

6.2. Reinforcement

(a) The reinforcement steel shall conform to IS 1786. Reinforcement shall be clean and free from loose mill scale, loose rust, and mud, oil, grease or any other coating which may reduce or destroy the bond between the concrete and steel. A light film of rust may not be regarded as harmful but steel shall not be visibly pitted by rust.
(b) Fibers Steel: The diameter/equivalent diameter of steel fibers where used, shall not be greater than 0.75 mm. The aspect ratio shall be in the range of 50 to 80. The minimum volume of fibers shall be 0.5 percent of the volume of concrete.

The reinforced concrete manhole cover and frame shall be designed in accordance with the provisions of IS 456. Clear cover to reinforcement shall not be less than 15 mm.

6.3. Shapes and Dimensions:

Shape, dimensions and tolerance of pre-cast concrete manhole covers and frames shall conform to IS 12592. Outside dimension of cover at top shall match with corresponding frame so that the maximum clearance at top between the frame and the cover all round the periphery is not more than 5 mm and the top surface of the frame and covers, is in level within a tolerance of +5 mm.
For facility of removing the cover from the frame, suitable taper matching with taper given for the frame shall be provided to the periphery of the cover.

6.4. Lifting Device:

The minimum diameter of mild steel rod used as lifting device shall be 12 mm for light and medium duty covers and 16 mm for heavy and extra heavy duty covers. The lifting device shall be protected from corrosion by hot galvanizing or epoxy coating or any other suitable treatment.

6.5. Finishing & Coating:

To prevent any possible damage from corrosion of steel the underside of the covers shall be treated with anticorrosive paint. The top surface of the covers shall be given a chequered finish.
In order to protect the edges of the covers from possible damage at the time of lifting and handling it is necessary that the manhole covers shall be cast with a protective mild steel sheet of minimum 2.5 mm thickness around the periphery of the covers. Exposed surface of mild steel sheet shall be given suitable treatment with anticorrosive paint or coating. To prevent the top outer edge of frame from possible damages, it shall be protected by 25 mm X 3 mm mild steel flat as part of the frame.

6.6. Physical Requirements

(a) General: All units shall be sound and free from cracks and other defects which interface with the proper placing of the unit or impair the strength or performance of the units. Minor chipping at the edge/surface resulting from the customary methods of handling during delivery shall not be deemed for rejecting.

(b) Load Test: The breaking load of individual units when tested in accordance with the method described in IS 12592 shall be not less than the values specified in Table.

Grade of Cover	*Type*	*Load in Tonnes*	*Diameter of Blocks in mm*
EHD - 35	Circular, Square or Rectangular	35	300
HD - 20	Circular, Square or Rectangular	20	300
MD - 10	Circular or Rectangular	10	300
LD - 2.5	Rectangular, Square or Circular	2.5	300

6.7. Fixing:

The frames of manhole shall be firmly embedded to correct alignment and level in RCC slab or plain concrete as the case may be on the top of masonry which shall be paid as extra unless specified otherwise.

6.8. Measurements:

The manhole covers shall be enumerated under relevant items.

6.9 Rates:

The rate shall include the cost of materials and labour involved in all the operation described above except fixing of frames and covers which shall be paid as extra unless specified otherwise in the item.

7. FRP MANHOLE COVER AND FRAME

The FRP Manhole Cover and Frame shall conform to IS 1q2726 and BS EN 124 1991, and the grade and types have been specified in the Bill of Quantities. The cover and frames shall be cleanly cast and they shall be free from air and sand holes and from cold shuts. They shall be neatly dressed and carefully trimmed. All castings shall be free from voids whether due to shrinkage, gas inclusion or other causes. Covers shall have a raised checkered design on the top surface to provide an adequate non-slip grip.

The sizes of covers specified shall be taken as the clear internal dimensions of the frame.

The covers and frames shall be coated with a black bituminous composition. The coating shall be smooth and tenacious. It shall not flow when exposed to a temperature of 63° C and shall not brittle as to chip off at a temperature of 0° C.

8. TESTING

All rights of the sewer and drain shall be carefully tested for water tightness by means of water pressure maintained for not less than 30 minutes. Testing shall be carried out from manhole to manhole. All pipes shall be subject to a test pressure of 1.5 meter head of water. The test pressure will however, not exceed 6 meters head at any point. The pipes shall be plugged preferably with standard design plugs or with rubber plugs on both sides, the upper end shall, however, be connected to a pipe for filling with water and getting the required head poured at one time.

Sewer lines shall be tested for straightness by:

i. Inserting a smooth ball 12 mm less than the internal diameter of the pipe. In the absence of obstructions such as yarn or mortar projecting at the joints the ball shall roll down the invert of the pipe and emerge at the lower end.

ii. Means of a mirror at one end a lamp at the other end. If the pipe is straight the full circle of light will be seen otherwise obstructions or deviations will be apparent.

iii. The contractor shall give a smoke test to the drain and sewer at his own expense and charges, if directed by the Owner's site representative.

iii. A test register shall be maintained which shall be signed and dated by contractor and Owner's site representative.

SECTION-5 : COMMISSIONING & GUARANTEE

1. SCOPE OF WORK

Work under this section shall be executed without any additional cost. The rates quoted in this tender shall be inclusive of the works given in this section.

Contractor shall provide all tools, equipment, metering and testing devices required for the purpose.

On award of work, Contractor shall submit a detailed proposal giving methods of testing and gauging the performance of the equipment / systems to be supplied and installed under this contract.

All tests shall be made in the presence of the Architect or his representative or any inspecting authority. At least five working days notice in writing shall be given to the inspecting parties before preforming any test.

Water flow rates of all equipment and in pipe lines through valves shall be adjusted to design conditions. Complete results of adjustments shall be recorded and submitted.

Contractor shall ensure proper balancing of the hydraulic system and for the pipes / valves installed in his scope of work by regulating the flow rates in the pipe line by valve operation. The contractor shall also provide permanent Tee connection (with plug) in water supply lines for ease of installing pressure gauge, temperature gauge & rotameters. Contractor shall also supply all required pressure gauge, temperature gauge & rotameter for system commissioning and balancing. The balancing shall be to the satisfaction of Consultant / Project Manager.

Four copies of all test results shall be submitted to the Engineer in A4 size sheet paper within two weeks after completion of the tests.

2 PRECOMMISSIONNIG

On completion of the installation of all pumps, piping, valves, pipe connections, insulation etc. the Contractor shall proceed as follows:

a. Prior to start-up and hydraulic testing, the Contractor shall clean the entire installation including all fitments and pipework and the like after installation and keep them in a new condition. All pumping systems shall be flushed and drained at least once through to get rid of contaminating materials. All pipes shall be rodded to ensure clearance of debris, cleaning and flushing shall be carried out in sections as the installation becomes completed.
b. All strainers shall be inspected and cleaned out or replaced.
c. When the entire systems are reasonably clean, a pre-treatment chemical shall be introduced and circulated for at least 8 hours. Warning signs shall be provided at all outlets during pre-treatment. The pre-treatment chemical shall:

- Remove oil, grease and foreign residue from the pipe work and fittings;
- Pre-condition the metal surfaces to resist reaction with water or air.
- Establish an initial protective film;
- After pre-treatment, the system shall be drained and refilled with fresh water and left until the system is put into operation.

- Details and procedures of the pre-treatment shall be submitted to the Architect for approval.

d. Check all clamps, supports and hangers provided for the pipes.
e. Check all the equipment, piping and valves coming under hot water system and operate each and every valve on the system to see if the valves are functioning properly. Thereafter conduct & hydrotest of the system as for (b) above.
f. Fill up pipes with water and apply hydrostatic pressure to the system as given in the relevant section of the specification. If any leakage is found, rectify the same and retest the pipes.

3 STATUTORY AUTHORITIES' TESTS AND INSPECTIONS

As and when notified in writing or instructed by the Architect, the Contractor shall submit shop drawing and attend all tests and inspections carried out by Local Authorities, Water Authority and other Statutory Authorities, and shall forthwith execute free of charge any rectification work ordered by the Architect as a result of such tests and inspections where these indicate non-compliance with Statutory Regulations. Some of these tests may take place after the issue of Practical Completion of the Main Contract and the Contractor shall make all allowances in this respect.

The Contractor shall be responsible for the submission of all necessary forms and shop drawings to the Statutory Authorities which shall conform in layout to the latest architectural plans submitted to and kept by these Authorities.

The submission shall comply with the requirements set forth in the current Codes of Practice and circular letters of the Statutory Authorities. The shop drawings to be submitted shall be forwarded to the Architect for checking before submission.

The Contractor shall allow for at least two submissions of complete sets of shop drawings to the Authorities, one to be made within six months after the award of the Contract but not less than six weeks before the inspection. The Architect may at his discretion instruct the Contractor for additional submissions to the Local Authorities whenever necessary.

The Contractor shall notify the Architect at least seven days in advance of his application for local Authority tests and inspections. On receipt of a confirmed date for test and inspection the Contractor shall inform the Architect without delay.

4 FINAL ACCEPTANCE TESTS

Following commissioning and inspection of the entire installation, and prior to issue of the Completion Certificate, the Contractor shall carry out final acceptance tests in accordance with a programme to be agreed with the Architect.

Should the results of the acceptance tests show that plant, systems and/or equipment fail to perform to the efficiencies or other performance figures as given in this Specification, the Contractor shall adjust, modify and if necessary replace the equipment without further payment in order that the required performance is obtained.
Where acceptance tests are required by the relevant Authorities having jurisdiction, these tests shall be carried out by the Contractor prior to the issue of Completion Certificate to the acceptance of the Authorities.

5 REJECTION OF INSTALLATION / PLANT

Any item of plant or system or component which fails to comply with the requirements of this Specification in any respect whatsoever at any stage of manufacture, test, erection or on completion at site may be rejected by the Architect either in whole or in part as he considers necessary/appropriate. Adjustment and/or modification work as required by the Architect so as to comply with the Authority's requirements and the intent of the Specification shall be carried out by the Contractor at his own expense and to the satisfaction of the Authority/Architect.

After works have been accepted, the Contractor may be required to carry out assist in carrying out additional performance tests as reasonably required by the Architect/Employer.

6 WARRANTY AND HANDOVER

The Contractor shall warrant that all plant, materials and equipment supplied and all workmanship performed by him to be free from defects of whatsoever nature before handover to the Owner.

7. HANDING OVER OF DOCUMENTS

All testing and commissioning shall be done by the Contractor to the entire satisfaction of the Owner's site representative and all testing and commissioning documents shall be handed over to the Owner's site representative.

The Contractor shall also hand over all maintenance and operation manuals, all certificates and all other documentation as per the terms of the contract to the Owner's site representative.

8. COLOUR CODING & LABELING

Pipe Work Identification:

All pipes and the like shall be identified in accordance with Indian Standard IS:2379-1990.

Circumferential bands of standard ground colours shall be not less than 100mm wide on pipes up to 50mm nominal diameter and not less than 150mm wide on pipes greater than 50mm nominal diameter.

Supplementary colours shall be displayed as bands not less than 25mm wide in the centre of the ground colour bands.

Where lettering is required it shall be painted in contrasting colours in accordance with the Indian Standard, in block letters not less than 15mm high for pipes up to 50 mm nominal diameter, and in block letter not less than 40mm high for larger pipes.

Identification bands shall be located where they are clearly visible in each room or compartment through which the pipe runs, and shall be placed at centres not exceeding 6m.

Direction of flow shall be indicated by an arrow painted on the pipe adjacent to each colour band. Arrows shall be 75mm long on pipes up to 50mm nominal diameter, and 150mm long on large pipes.

The pipe colour:

Code shall be in accordance to IS: 2379,

Sr.No.	Contents	Ground Color	First Color Band	Second Color Band
1	Potable	Sea Green	French Blue	Signal red
2	Non potable	Sea Green	Light Green	----
3	Fire Water	Fire Red	Crimson red	----
4	Raw water	Sea Green	White	
5	Soft Water	Sea Green	Light Brown	Signal red
6	Sprinkler & Hydrant Water	Sea Green	White	Signal red
7	Waste Water	Sea Green	Canary Yellow	Signal red
8	Drainage / soil water	Black	----	----
9	Light Diesel Fuel	Light Brown	Brilliant Green	----
10	High speed diesel fuel	Light Brown	----	----

Labelling:

All plant and equipment provided under this Specification shall be labelled in English as to duty or services, all such labelling to correspond to schedules, diagrams, and the like to be provided as part of the as-fitted drawings. Labels shall be of traffolyte with black engraved lettering not less than 20mm high or as otherwise required and approved by the Architect.

Manufacturers' nameplate shall generally be provided for all plant and equipment and shall show serial and model numbers and date of manufacture.

The following refer to specific items (but not be limited to) requiring labelling:

- All valves, motor starters, distribution boards, gauges, contractors, cable terminals in switchboards, circuit breakers.

- Labels shall be attached to valves (or pipe adjacent thereto) with a light gauge metal band or alternatively to be screwed to the insulated valve boxes where provided. The labels shall state the valves number.

Material Specifications – Electrical Works

SUMMARY PAGE

ELECTRICAL ITEM SPECIFICATIONS

1.9 INTERNAL WIRING

1.1 Point wiring

1 Material
Shall confirm to E – 1.

2 Workmanship

1) Installation
A) 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 1.5 sq.mm. copper or 2.5 sq.mm. aluminium.

Nominal Dia of wires	**Nominal Cross sec. Area**	**20 mm**		**25 mm**		**32 mm**		**38 mm**	
(mm)	**(mm2)**	**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°.

B) 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 telephone, TV & Computer piping.

C) Separate conduits/raceways shall be used for :
1. Normal lights and 5 A 3 pin sockets on lighting circuit.
2. Separate conduit shall be laid from D.B. to switch board or point.
3. Power outlets - 15 A 3 pin 20 A/30 A, 2 pin scraping earth metal clad sockets.
4. Emergency lighting.
5. Telephones.
6. Fire alarm system.
7. Public address system & Music system.
8. For all other voltages higher or lower than 230 V.
9. T.V. Antenna.
10. Water level guard.

11. Computer Wiring

D) Call bell wiring layout of conduits shall be generally as indicated on drawings and the layout shall be supplemented and complemented by contractor on site with the approval of the Engineer.

E) 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.

F) Conduits run on surfaces shall be supported on GI 12 mm. thick 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.

G) 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 final finish will be done by the building contractor.

H) Conduits buried in concrete structure shall be put in position and securely fastened to the reinforcement and got approved by the Engineer, 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.

I) 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 perspex plate truly cut and fixed with cadmium plated brass screws. These junction boxes shall form part of point wiring or conduit wiring as the case may be including the cost of removing the perspex cover for painting and re-fixing. No separate charges shall be allowed except where specially mentioned.

J) 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.

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

2) Lighting & Power Wiring :

A) All final branch circuits for lighting and appliances shall be flexible copper wire of appropriate size run inside conduits. The conduit shall be properly connected or jointed into sockets, bends, junction boxes.

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

C) All circuits shall preferably be kept in a separate conduit upto 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, of the same phase.

D) 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 Engineer's approval.

E) 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.

F) 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.

G) 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.

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

3) Testing

The entire installation shall be tested for :
a) Insulation resistance.
b) Earth continuity.
c) 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 guage) when laid in ground the PVC pipe will be Heavy gauge & with 650v / 1100v grade PVC insulated flexible copper condutor wire. The switches should be modular with moulded cover plates, blank plates for outlet boxes. The accessories, connectors, sockets, should be fixed with brass crome / cadmium plated machine screw. For fan points the rates should be inclusive of 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 switch board and outlet points. The size of the wire shall be as per the specification. Colour code shall be strictly followed. Heavy guage PVC pipe shall be laid for ground.

The size of wires shall as follow :

10 Amp. metal clad points:
Phase / Neutral 2.5 mm2
Earth 1.5 mm2

6 Amp. out let points :
Phase / Neutral 1.5 mm2
Earth 1.5 mm2

Two nos. of 16 Amp. socket out let connected in parallel from DB to first outlet
Phase / Neutral 4.0 mm2
Earth 2.5 mm2

Two nos. of 16 Amp. socket out let connected in parallel from first outlet to second outlet.
Phase / Neutral 2.5 mm2
Earth 1.5 mm2

Light, fans, exhaust fan, 5 Amp. plug point, two way light point, bell point etc.
Distribution Board to SB
Phase / Neutral 2.5 mm2
Earth 1.5 mm2
SB to outlet (P/N/E) 1.5 mm2

15/20 Amp. Socket outlet for appliances / AC (Single Phase/Three Phase) / Geyser
Phase / Neutral 4.0 mm2
Earth 2.5 mm2

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.
All wires shall have proper size Cu. Lugs when connected to any MCB, Plug etc…

CONDUIT WORKS :

CEILING / WALL OUTLET BOXES FOR LIGHTS / FANS :

Outlet boxes shall be of steel with cover and so installed as to maintain continuity throughout. These shall be protected at the time of laying by filling with jute / earth / cotton etc. so that no cement mortar finds its way inside during concerning or plastering etc. In beams conduit socket shall be provided in place of outlet boxes. The same shall be used for installation of luminaries.

For fixing light fixtures / brackets, outlet boxes complete with knock out for holding conduits shall be used. For lighting fixture suitable for 40/20 watts fluorescent tubes / incandescent lamps / mercury vapour lamps, only one outlet box is required.

For fixing ceiling fans, circular outlet boxes, 100 mm. diameter, complete with 12 mm. dia. Mild Steel rod 300 mm. long, for holding 12 mm. dia. Mild Steel cover 125 mm. dia. at bottom shall be used.

DRAW OUT JUNCTION BOXES :

Steel drawout boxes at angle dimensions shall be provided at a convenient points on walls / ceilings to facilitate pulling of long runs of cables / wires. The location of these boxes is to be decided prior to fixing, as per site requirement and following should be treated as general guidance for deciding the location of these :

(a) These should be provided at a place where these are not in direct view. Recommended place is 400 / 450 mm. below ceiling, if conduits are running vertically.
(b) Junction box in the offset of bottom of RCC beam and vertical wall should not be provided.
(c) If junction boxes are coming side by side for two or more conduits, one common M.S. box of proper size can be used to act as junction box.
(d) If junction box is to be provided in ceiling, its position should be so located that it is in line with other light / fan points.
(e) Junction boxes should never be used for splitting one conduit into two or more. Junction box for such functions is avoidable and for this, number of conduits to be connected to one switch board should be calculated correctly as per drawing before laying conduits in ceiling.
(f) Locating junction boxes on outer surface of exterior walls of building should be avoided as these are in direct view and are also exposed to weather.

SWITCH BOXES :

Steel boxes of required sizes, shall be provided to house speed regulators of fans, switches for lights, fans, plug sockets etc. as per requirement of drawings. These should be so designed that accessories on sheet could be mounted with tapped holes and brass machine screws, leaving ample space at the back and on the sides for accommodating wires and check nuts at conduit entries. These shall be attached to conduits by means of check nuts on all walls of the boxes through which the conduits are entering. These shall be completely connected leaving edges flush with finished wall surfaces. Cover should be fixed to these switch boxes by means of brass chrome plated machine screws and cup washers. Utmost care shall be taken by contractor to ensure that all switch boxes are in line and level.

Inside each switch box, one bolt shall be welded to receive earthing wire.

SWITCH AND SOCKET :

Switches shall be installed at 900 mm above finished floor level unless otherwise indicated on the drawings.

The switch controlling the light point or fan shall be connect on to the phase wire of the circuit and neutral shall be continuous, having no fuse or switch installed in the line except at the D.B. All fan regulators shall be fixed inside the switch boxes

The cover plates to the switch box shall be fixed by means of sunk head brass cadmium screws.

Where two or more switches and fan regulators are installed together, they shall be provided with one gang cover plate with knockouts to accommodate required number of switches, sockets and regulators.

The switch controlling the socket outlet shall be on the phase wire of the circuit. The third pin of the socket shall be connected to the earth continuity conductor of the circuit

The switch boxes, installed back-to-back in the same wall shall be offset from each other, 150 mm horizontally, to preclude noise transmission.

CLEANING AND PROTECTION OF CONDUIT SYSTEM :

The entire conduit system including outlet boxes, junction boxes and switch boxes shall be thoroughly cleaned after completion of erection and tested for not blockage by air / sound or steel

wire prior to finishing of building by air / sound or steel wire prior to finishing of building and before drawing in of cables / wires to safeguard conduit system against filling up with the plaster / cement slurry / water etc. all the outlet and switch boxes will have to be provided with temporary jute / cotton filling, covers and plugs etc.. Within tendered cost which shall be replaced later on by hylem / sheet cover after wiring as required.

TESTING OF INSTALLATION :
Before a completed installation is put into service, the following tests shall be complied with:

(a) INSULATION RESISTANCE :
The insulation resistance shall be measured by applying 500 volt megger with all fuses in places, circuit breaker and all switches closed.

The insulation resistance in gegohms of an installation, measured shall not be less than 50 megohms divided by the number of points on the circuit.

The insulation resistance shall be measured between
EARTH TO PHASE
EARTH TO NEUTRAL
PHASE TO NEURAL
PHASE TO PHASE

(b) EARTH CONTINUITY PATH :
The earth continuity conductors shall be tested for electrical continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance or earth leakage circuit-breaker, measured from the connection, with the earth electrode to any point in the earth continuity conductor in the completed installation and shall not exceed one ohm.

(c) POLARITY OF SINGLE POLE SWITCHES :
A test shall be made to verify that every no-linked, single pole switch is connected to one of the phase of the supply system.

(d) COMPLETION CERTIFICATES :
All the above tests shall be carried out in presence of client and the results shall be recorded in a prescribed form. Any default during the testing shall be immediately rectified and that section of the installation shall be re tested. The completed test result from shall be submitted to the client for approval.

On completion of an electric installation a certificate shall be furnished by the contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out. This certificate shall be in a prescribed form as required by the local electric supply authority.

3 **Mode of measurement**

The unit rate shall include:
1) Making zari in the wall & semi finishing the surface.
2) Ball and socket joints where ever required
3) Earthing of fittings

4) Electrical connection to the fixtures from the outlet point/ ceiling rose
5) Supply and Installation and interconnection of electronic regulators for ceiling fan
6) Circuit Mains shall not be paid extra. Rate for the point shall consist of wiring from the out let point to the switch board as required with a connector/ plate/ ceiling rose fan box with hook socket with switch. The point rate shall include in addition to phase and neutral wire a PVC insulated earth continuity wire from switch to outlet.The unit rate for the point shall consist of the circuit wiring form LDB to outlet point through switch and/or socket, switch board as required and including the outlet points with connector, fan hook box or sockets. A point shall include in addition to phase and neutral wire a PVC insulated Earth continuity wire from LDB to the final termination at outlet points. No extra rate shall be paid for circuit mains for looping switch board to switch board.

1.2 Raceways & Junction Box :

1 Material :
As per item 1.1 above
In Junction box every wire should be taken out in a Flxible pipe with Flexible pipe gland properly installed & Pipe & Gland should be part of the J.B.

2 Workmanship
As per item no 1.1 above & Junction Box Should be as per Drawing.

3 Mode of measurement
For Raceways per Mtr. Basis & For Junction Box per no. basis

1.3 MAINS :

A) The mains is considered from the meter/sub panel to the individual distribution boards.

1 Material:
As per item 1.1 above

2 Workmanship:
As per item no 1.1 above

3 Mode of measurement
The mains shall be paid on per mtr basis which shall include cost of wires, pipe, bends and junction and accessories for mounting and jarri work. The length shall be certified by the engineer in charge from Clients side.

2.0 DISTRIBUTION BOARD

Supplying, assembling, grouting, leveling, Connecting & testing D.B of specified make :

2.1 VTPN Distribution Board :

Supplying, assembling, grouting, leveling, Connecting & testing various types of Three phase and neutral distribution boards of desired ways of specified make :

1 Material
Should confirm to E – 2

2 **Workmanship:**

1) All the D.B. should have adaquate Capacity three phase busbar with main neutral links.
2) The D.B. should be provided with 2 separate insulated earth links.
3) The D.B. should be concealed type having sheet metal enclosure with double door unless or otherwise specified.
4) The D.B. should be Powder coated.
5) The D.B. shall have top and bottom plates openable.
6) The D.B. Shall be provided with necessary cable end junction box

2 **Mode of measurement**

3 The rate shall be for one unit of D.B.

2.2 TPN Distribution Board :

Supplying, assembling, grouting, leveling, Connecting & testing various types of Three phase and neutral distribution boards of desired ways of specified make :

1 **Material**
Should confirm to E – 2

2 **Workmanship :**

1) All the D.B. should have separate neutral link per phase with main neutral link i.e. four neutral link of appropriate nos. of way.
2) The D.B. should be provided with 2 separate insulated earth links.
3) The D.B. should be concealed type having Thermoplastic enclosure with double door unless or otherwise specified.
4) The D.B. shall have top and bottom plates openable.
5) The D.B. Shall be provided with necessary cable junction box

3 **Mode of measurement**

The rate shall be for one unit of D.B.

3.3 S.P. Distribution Board

Supplying, assembling, grouting, leveling, Connecting & testing various types of Single phase and neutral distribution boards of desired ways of specified make :

1 Material
As per item no 2.2 above

2 Workmanship:
As per item no 2.2 above.

3 Mode of measurement
As per item no 2.2 above.

2.4 M.C.B. :

Supplying, Assembling, levelling, connecting & testing MCBs/ELCBs/ELMCBs/Isolators of various rating in boards as specified in 2.1, 2.2, 2.3.

1 **Material**

Should Confirm to E-3

2 **Workmanship**

Should mount all the MCBs/ELCBs/ELMCBs/Isolators and other accessories in the D.B. as per the MCB chart furnished by consultant and also do the necessary connections. Should check for any faulty connections and reconnect the same. Also check for the loading once complete installation of fixtures and other equipments is completed.

3 **Mode of measurement**

As per item 2.1 but for MCBs/ELCBs/ELMCBs/Isolators and accessories.

3.0 CABLE TRENCH

3.1 Excavation and back filling of cable trenches required for laying the cables directly buried in the ground. This includes supplying and providing cable markers at an interval of 10 meters. The depth shall be app 1mtr and the width shall be as per requirement.

1 **Material :**

All the tools and tackels required for the excavation shall be provided by the contractor. Cable markers shall be provided.

2 **Workmanship**

Excavation shall be done as per the route specified in the plan of the consultant. Also the depth as specified in the item shall be strictly maintained. Cable markers shall be installed at length specified in the item.

3 **Mode of measurement :**

The item shall be paid in running Mtr. and the measurement shall be certified by the engineer in charge from the Clients side.

3.2 Supplying and spreading fine sand for a thickness of 100 mm. and providing and laying bricks for cable protection. on all the three sides.

1 **Material :**

All the tools and tackels required for the spreading fine sand and back filling shall be provided by the contractor. Bricks of 2nd class or higher quality shall be used.

2 **Workmanship**

Bricks shall be laid on all the three sides of the cable as per the drawing of the consultant. Proper thickness for the fine sand as specified in the item shall be strictly maintained. After back filling proper levelling shall be done and lumps of soil should not be visible. The trench should give a levelled look.

3 **Mode of measurement :**

The item shall be paid in runing Mtr. and the mesurement shall be certified by the engineer in charge from the Clients side.

5.0 CABLES

Supply, Installation, Testing, Laying, Commissining of following 1100 volt grade XLPE insulated PVC sheathed aluminium / Copper conductor armoured cables as per specification in trenches, cable trays, ducts, over bed of sand, clamped to wall with suitable clamps including, saddles fixing bolts, connecting testing and commissioning with identification tags at every 10 mtr. & Both ends. with All the fixing accessories, excavation Back filling & Cable protection with Bricks as per the drawing (If required)..

1 **Material**

Should confirm to E – 5

2 **Workmanship**

Installation

A) 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 Architect/Consultant 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.

B) Cables, running indoors shall be laid on walls, ceiling, inside shafts or trenches. Single cables laid shall be laid in GI/PVC pipe and not to fix on wall slab directly or drawn through GI / PVC pipes fixed on wall or ceiling and supported at not more than 500 mm. Where number of cables are run, necessary perforated cable trays shall be provided wherever shown. Perforated trays shall be mild steel or Aluminum as specified in the schedule of work and supported on mild steel frame work as shown on drawings or as approved. Cables laid in built-up trenches shall be on steel supports. Plastic / Aluminum identification tags shall be provided at every 30 m. All cables laid shall be properly dressed and atleast 50 mm space shall be kept between the cables.

C) 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.

D) In the case of cables buried directly in ground, the cable route shall be parallel or perpendicular to roadways, walls etc. 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 20 meters and at all loop points.

E) The general arrangement of cable laying is shown on drawings. 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 upto 4 sq.mm. may be insertion type and all higher sizes shall have tinned copper compression 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 armoring shall be earthed at both ends.

F) 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 rain water 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 of water light.

G) All cables shall be provided with stainless steel/Aluminum cable identification tags at a maximum distance of 10 m.

H) All cables to be laid should be properly dress and atleast 50 mm space should be kept between the calbes.

INSTALLATION OF CABLE NETWORK :

Cable network shall include power, control and lighting cables which shall be laid in underground trenches, cable trays, G.I. pipes, or on building structures as detailed in the relevant drawings, cable schedules or as per the client / consultant's instructions. Supply & installation of cable trays, G.I. pipes / conduits, cable glands and sockets of both end isolators, junction boxes, remote push button stations, etc. shall be under the scope of the contractor.

a. General requirements for handling cables :

Before laying cables, this shall be tested for physical damage, continuity, absence of cross phasing, insulation resistance to earth and between conductors. Insulation resistance tests shall be carried out with 500 / 1000 V megger.

The cables shall be supplied at site, wound on wooden drums as far as possible. For smaller length and sizes, cables in properly coiled form can be accepted. The cables shall be laid by mounting the drum of the cable on drum carriage. Where the carriage is not available, the drum shall be mounted on a properly supported axle, and the cable laid out from the top of the drum. In no case the cable will be rolled on as it produces kinks which may damage the conductor.

Sharp bending of cable shall be avoided. The bending radius for PVC insulated and sheathed, armoured cable shall not be less than 10 D, where "D" is overall diameter of the cable.

While drawing cables through G.I. pipes, conduits, RCC pipes, ensure that size of pipe is such that, after drawing cables, 40% area is free. After drawing cables, the end of pipe shall be sealed with cotton / bituminous compound.

High voltage (11 kV and above), medium voltage (240 V and above) and other control cables shall be separated from each other by adequate spacing or running through independent pipes / trays.

Armoured cables shall never be concealed in walls / floors / roads without G.I. pipes, conduits or RCC pipes.

Joints in the cable throughout its length of laying shall be avoided as far as possible and if unavoidable, prior approval of site engineer shall be taken. If allowed, proper straight through epoxy resin tight joint shall be made, without any additional cost.

A minimum loop of 3 mtr. shall be provided on both ends of the cable, and on both ends of straight through cable joint. This additional length shall be used for fresh termination in future. Cable for this loop shall be paid for supply and laying.

Cable shall be neatly arranged in the trenches / trays in such manner so that criss-crossing is avoided and final take off to the motor / switchgear is facilitated. Arrangement of cable within the trenches / trays shall be the responsibility of the contractor.

All cable routes shall be carefully measured and cable cut to the required lengths and undue wastage of cables to be avoided. The routes indicated in the drawings is indicative only and the same may be rechecked with the client / consultant before cutting of cables. While selecting cable routes interference with structures, foundations, pipelines, future expansion of buildings etc. should be avoided.

All temporary ends of cables must be protected against dirt and moisture to prevent damage to the insulation. For this purpose, ends of all PVC insulated cables shall be taped with an approved PVC or rubber insulating tapes. Use of friction type or other fabric type tape is not permitted. Lead sheathed cables shall be plumbed with lead alloy.

Wherever cable rises from underground / concrete / masonry trenches to motors / switchgears / push buttons, these shall be taken in G.I. pipes of suitable size, for mechanical protection upto 300 mm. distance of concerned cable gland or as instructed by the client / consultant.

The cable pass through foundation / walls of other underground structures, the necessary ducts for opening will be provided in advance for the same. However, should it become necessary to cut holes in existing foundation of structures the electrical contractor shall determine the location and obtain approval of the client / consultant before cutting is done.

b. LAYING OF CABLES (UNDERGROUND SYSTEM)

- Cables shall be so laid in trench that this will not interfere with other underground structure. All water pipes, sewage lines or other structures which become exposed by excavation shall be properly supported and protected from injury until the filling has been rammed solidly in places under and around them. Any telephone or other cables coming in the way are to be properly shielded / diverted as directed by the owner / consultant.

- Cable shall be laid at minimum depth of 750 mm. in case of L.T. and 1200 mm. in case of H.T. from ground level. Excavation will be generally in ordinary soil. The width of trench shall be sufficient for laying of required no. of cables.

- Sand bedding 75 mm. thick shall be made below and above the cables. Layer of bricks (full size) shall be laid above sand bedding on the sides and above the cables to cover cables completely. More than one cable can be laid in the same trench. However, the relative location of cables in trench shall be maintained till termination. The surface of the ground after back filling the earth shall be made good so as to confirm in all respects to the surrounded ground and to the entire satisfaction of the client / consultant.

- For all underground cables, route markers should be used :
  a) Separate route markers should be used for LT, HT and telephone cables.
  b) Route markers should be grounded in ground with 1:2:4 cement concrete pedestal size 230 x 230 x 300 mm..
  c) Cable markers should be installed at an interval not exceeding 30 mtr. along the straight routes of cables at a distance of 0.5 mtr. away from centre of cable with the arrow marked on the cable marker plate indicating the location of cable. Cable markers should also be used to identify change in direction of cable route and for location of every joint in underground cable.

- RCC Hume pipe for crossing road in cable laying shall be provided by employer. No deduction shall be made for cable laying in Hume pipe for not providing bricks, sand and excavation. RCC hump pipe at the ends shall be sealed by bituminous compound after laying and testing of cables by electrical contractor without any extra charge.

c. LAYING OF CABLE IN MASONRY TRENCHES

Masonry / concrete trenches for laying of cables shall be provided by employer. However, steel members such as M.S. angles / flats etc. shall be provided and grouted by electrical contractor to support the cables without any extra charge. Cables shall be clamped to these supports with minimum saddles / clamps. More than one tier of cables can be provided in the same trench if the no. of cables are more.

Entry of cables in trenches shall be sealed with bituminous MASTIC compound to stop entry of water in trenches.

d. LAYING OF CABLES IN CABLE TRAYS

Cable trays and steel members such as M.S. angle / channel / flats etc. shall be provided and fixed by the contractor.

Cable shall be fixed in cable trays in single tier formation and cables shall be clamped with flat clamps and galvanised bolts / nuts.

Earthing flat / wire can also be laid in cable tray alongwith cables.

After laying of cables, minimum 20% area shall be spare.

e. TESTING OF CABLES :

i. Before energising, the insulation resistance of every circuit shall be measured from phase to ground. This requires 3 measurements if one side is grounded and 6 measurements for 3 phase circuits.
ii. Where splices or terminations are required in circuits rated above 650 volts, measure insulation resistance of each length of cable before splicing and/or terminating. Repeat measurements after splices and/or terminations are complete.
iii. DC high voltage test shall be made after installation on the following :
  a) All 1100 volts grade cables in which straight through joints have been made.
  b) All cables above 1100 V grade.

For record purpose test data shall include the measured values of leakage current versus time.
The DC high voltage test shall be performed as detailed below :
Cables shall be installed in final position with all the straight through joints complete. Terminations shall be kept unfinished so that motors, switchgear, transformer etc. are not subjected to test voltage.
The test voltage and duration shall be as per relevant codes and practices of Indian Standards Institution.

iv. PROFORMA FOR TESTING CABLES :

DATE OF TEST

a) Drum No. from which cable taken.
b) Cable from to
c) Length of run of this cable meter

Insulation resistance test

i)	between core-1 to earth	mega-ohm
ii)	between core-2 to earth	mega-ohm
iii)	between core-3 to earth	mega-ohm
iv)	between core-1 to core-2	mega-ohm
v)	between core-2 to core-3	mega-ohm
vi)	between core-3 to core-1	mega-ohm
vii)	duration used : 1 kV	

e) High voltage test

	Voltage	Duration
i)	between core an earth.	
ii)	between individual cores	

[This proforma shall be jointly signed by the CLIENT / CONSULTANT and the contractor in duplicate].
All test readings shall be recorded and shall form part of the completion documentation.

3 **Mode of measurement**

The cable shall be measured in per mt. Basis and the rates shall include ;

1) Cables and clamps
2) Installation, Commissioning and testing
3) Cable marking and all the accessories for the cable if at all to be installed on walls.

Cable length shall be certified by engineer in charge from Clients side.

6.0 CABLE TERMINATION

Supplying & fixing heavy gauge compression type Brass glands & making joint with necessary crimping socket of long nack type connecting the same to various equipment like sectionpillar, switch, starter, motor etc. sizes of cables specified in BOQ CUPAL washers shall be provided for copper busbars to aluminum connection:

1 **Material**

Should confirm to E – 5

2 **Workmanship**

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.

TERMINATION AND JOINTING OF CABLES :

i. a) For HT cables suitable size of push on type termination kit shall be used.
   b) Use of glands :

All PVC cables upto 1.1 kV grade, armoured or Unarmoured shall be terminated at the equipment / junction box / isolators / push buttons / control accessories, etc. by means of suitable size single compression type cable glands. Armour of cable shall be connected to earth point. The contractor shall drill holes for fixing glands wherever necessary. Wherever threaded cable gland is to be screwed into threaded opening of different size, suitable galvanised threaded reducing bushing shall be used of approved type.

In case of termination of cables at the bottom of the panel over a cable trench having no access from the bottom, a close fit holes should be drilled in the bottom plate for all the cables in one line, then bottom plate should be split in two parts along the centre line of holes. After installation of bottom plate and cables with glands, it shall be sealed with cold sealing compound.

ii. USE OF LUGS / SOCKETS :

All cable leads shall be terminated at the equipment terminals, by means of crimped type solderless connectors unless the terminals at the equipment ends are suitable for direct jointing without lugs / sockets.

The following is the recommended procedure for crimped joints and the same shall be followed:

a) Strip off the insulation of the cable and with every precaution, not in severe or damage any strand. All insulation's to be removed from the stripped portion of the conductor and ends of the insulation should be clean and square.

b) The cable should be kept clean as far as possible before assembling it with the terminal / socket. For preventing the ingress of moisture and possibility of re-oxidation after crimping of the aluminium conductors, the socket should be filled with corrosion inhibiting compound. This compound should also be applied over the stripped potion of the conductor and the palm surface of socket.

c) Correct size and type of socket / ferrule / lug should be selected depending on size of conductor, and type of connection to be made.

d) Make the crimped joint by suitable crimping tool.

e) If after crimping the conductor in socket / lug, some portion of the conductor remains without insulation the same should be covered sufficiently with PVC tape.

f) For HT cable the manufacturer's recommendation should be followed.

iii) DRESSING OF CABLE INSIDE THE EQUIPMENT :

After fixing of cable glands, the individual cores of cable shall be dressed and taken along the cable ways (if provided) or shall be fixed to the panels with polyethylene straps. Cable shall be dressed in such a manner that small loop of each core is available inside the panel.
For motors of 20 HP and above, terminal box if found not suitable for proper dressing of aluminium cables, the erector shall modify the same without any additional cost.
Cables inside the equipment shall be measured and paid for on lug to lug basis.

iv) IDENTIFICATION OF CABLES / WIRES / CORES :

Power cables shall be identified with red, yellow and blue PVC tapes. For trip circuits identification, additional red ferrules shall be used only in the particular cores of control cable at the termination points in the switchgear / control panels and control switches.
In case of control cables all cores shall be identified at both ends by their wire numbers by mean of PVC ferrules or self sticking cable markers, wire numbers shall be as per schematic / connection drawing. For power circuit also, wire numbers shall be provided if required as per the drawings of switchgear manufacturer / supplier.

3 Mode of measurement

Rate shall be considered for 1 nos of joint.

7.0 MV SWITCH GEAR & POWER PANELS

7.1 to 7… Supplying, unloading at site, shifting to site, assembling, leveling, grouting, erecting, Testing, & Commissioning main L.T. panel board, fabricated from M.S. sheet & folded channel totally enclosed cubical type compartmentalized.

1 **Material**
Should Confirm to E – 7
2 **Workmanship:**
1) Main busbar should be electrolytic tin copper type.
2) All internal wiring and all connection shall be with copper wires and strips as required. Use copper flexible wire for below 100 Amps and copper strips for over 100 Amps.
3) All component, frame etc shall be earthed. A common internal earth bar with two separate earthing leads to be provided.
4) Powder coating to be done on all sheet metal works as required.
5) Panel shaould have MS base frame for floor mounting unless otherwise specified.
6) The board should be front operated and extensible type.
7) Compression type brass glands and crimping lugs for incomer and outgoing ends.
8) All ammeters to be provided with C.T.'s and selector switch and voltmeter with selector switch and control fuses.
9) Panel components shall be as specified
10) The design and location of all panels to be approved by the architect/consultant before fabrication and installment.
11) All panels should be dust and vermin proof.

12) All panels should be fabricated out of 14 gauge sheet The door should be made from 14 gauge (2 mm) and the other parts should be made from 14 gauge sheet metal.

All meters should be digital type only unless and otherwise specified.

The metering on main panels shall be LOAD MANAGER type unless and otherwise specified.

15) The board should meet with the requirement of IS2147/1962. Internal wiring, busbar making etc. shall confirm to IS 375/1963.

16) All the Switches used should be capable of withstanding the AC23 duty for motor operation. The Switches should have quick make quick break. The contacts should be silver plated double break type. The switch should confirm to IEC 947-III.

17)Main LT Panel,Emergency Panel, Bus coupler and APFCR panel should be fabricated in the approximate length of 1 meter and depth of 1 meter compartment.

18)The board should withstand the system prospective fault current

19)The switches shall confirm to IS : 4047. the fuses shall confirm to IS : 220. the fuses shall be of HRC type.

20)Engraved plastic labels shall be provided indicating the feeder details, capacity, cable size, load in KW and danger signs.

21)The entire panel board should be with adequate height width & depth as per relevant prevailing I.S. code and Installation include foundation bolts of suitable size as per requirement.

22)All compartment doors should be concealed hinged type & handles of feeders to be interlocked mechanically with the doors such that door cannot be opened when the switch is in 'ON' position & switch cannot be 'ON' when the door is in open position.

(a) ERECTION:

Electrical panels his own arrangement for safe transportation of all the items to the erection site and also carry out complete loading / unloading during transportation. The contractor shall be responsible for final assembly and interconnection of busbars / wiring. Foundation channel shall be delivered in convenient shipping section by the manufacturer. The contractor shall make shall be grouted in the flooring by the contractor. Switchgear shall be aligned and levelled on their base channels and bolted to them as per the instructions of the client / consultant. The earth bus shall be made continuous throughout the length. Loosely supplied relays and instruments shall be mounted and connected on the switchgear. The contacts of the drawout circuit breaker shall be checked for proper alignment and inter changeability.

After erection, the switchboard shall be inspected for dust and vermin proof. Any hole which might allow dust or vermin etc. to enter the panel shall be plugged suitably at no extra cost. If the instrument transformers are supplied separately, they shall be erected as per the direction of the client / consultant. The contractor shall fix the cable glands after drilling the bottom / top plates of all switchboards with suitable holes at no extra cost.

Range of overload relays / timers etc. shall be checked with requirement of motor actually to be connected at site and if the same is undersized / oversized, it shall be brought to the notice of the client / consultant, who shall arrange procurement of corrected components. However, the contractor shall not charge anything extra for labour for such replacements.

(b) TESTING:

Before electrical panel is energised, the insulation resistance of each bus shall be measured from phase to ground. Measurement shall be repeated with circuit breakers in operating positions and contacts open.
Before switchgear is energised, the insulation resistance of all control circuits shall be measured from line to ground.

The following tests shall be performed on all circuit breakers during erection.

- Contact alignment and wipe shall be checked and adjustment where necessary in accordance with the breaker manufacturer's instructions.
- Each circuit breaker shall be drawn out of its cubicles, closed manually and its insulation resistance measured from phase to phase and phase to ground.
- All adjustable direct acting trip devices shall be set using values given by the consultant/ manufacturer.
- The dielectric strength of insulating oil wherever applicable, shall be checked.
  Before switchgear is energised, the following tests shall be performed on each circuit breaker in its test position.
- Close and trip the circuit breaker from its local control switch push button or operating handle. Switchgear control bus may be energised to permit test operation of circuit breaker with A.C. closing with prior permission of the client / consultant.
- Test tripping of the electrically operated circuit breaker by operating mechanical trip device.
- Test proper operation of circuit breakers latch, check carriage limit switch if provided. Test proper operation of lockout device in the closing circuit. Wherever provided by simulating conditions which would cause a lockout to occur.
- Trip breaker either manually or by applying current or voltage to each of its associated protective release.
- Before switchgear is energised, the tests covered above shall be repeated with each breaker in its normal operating position.
- Capacitor banks shall be tested as per manufacturer's instructions. In addition, test for output and/or capacitance, insulation resistance test and test for efficiency of discharge device shall be carried out.
- All electrical equipment alarms shall be tested for proper operation by causing alarms to sound under simulated abnormal conditions.

(c) PROFORMA FOR PCC, MCC, DB, CONTROL PANEL TEST :

- Circuit breaker or contactor module designation / bus no.
- Insulation resistance test (contacts open, breaker racked in position)
  a) between each phase of bus : Mega ohm
  b) between each phase and earth : Mega ohm
  c) DC and AC control and auxiliary circuits : Mega ohm
  d) between each phase of CT / PT and between CT

& PT circuit if any : Mega ohm

- CT checks :
  a) CT ratio
  b) CT secondary resistance
  c) CT polarity check
- Check for contact alignment and wipe.
- Check / test all releases / relays.
- Check mechanical interlocks.
- Check electrical interlocks.
- Check switchgear / control panel wiring.
- Check breaker / contactor circuit for :
  a) Closing - local & remote (wherever applicable)
  b) Tripping - local & remote (wherever applicable)
- Opening time of breaker / contactor.
- Closing time of breaker / contactor.

[This proforma shall be jointly signed by the CLIENT / CONSULTANT and the contractor in duplicate].

3 Mode of measurement :

The rate shall be for one unit of panel.

8.0 LIGHT FIXTURES & FANS

8.1 Supply, Installing, Testing , commissioning of Light fixtures of various types and of specified make:

1 **Material**

Should confirm to E – 8

2 **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
INSTALLATION OF LIGHTING FIXTURES / FANS :

i) INSTALLATION OF LIGHTING FIXTURES :

Scope of work under this item shall start from light point, with 3 nos. 1.5 mm.^{2} PVC insulated wires from connector to the connector inside the lighting fixture, connections, fixing of lighting fixture complete with all accessories, lamps on wall / roof / steel truss etc. testing the lighting

fixture and commissioning. If wire length of light point is enough to reach connector of light fitting, connector in light point can be deleted.

iii) INSTALLATION OF EXTERNAL LIGHT FIXTURES :

Street lighting installation shall be carried out as per details shown in the drawing.

The poles shall be erected in perfect plumb with concrete foundation at a location shown in the drawing. The foundation shall be designed to withstand the static load as well as wind velocity and bending moment of the pole and shall be approved by the client prior to execution.

The junction box shall then be clamped to the erected pole as per details shown in the drawing.

The luminaires shal also be installed on the pole and be electrically wired to the respective junction box.

The cable lay out shall follow the tentative route as shown in the drawing. In case of any constraint on the cable route the same shall be brought to notice of the client.

The cable lay out shall be carried out in an underground manner and the said installation complete with electric connections.

Earthing installation shall follow the details for the same shown in the drawing.

The earthing station (coil type) and the earthing grid installation shall be carried out as per the specification for the said works given in section under title “Earthing” of this tender document.

On completion of the installation, the street light poles shall be painted with two coats of metal primer (Red Oxide) followed by two coats of Synthetic enamel of the shade as approved by the Engineer-in-charge.

The brackets shall be made of 38 mm. NB MS class “B” pipe approx. 1.8 mtr. long bent at the centre at an angle 120° C. with necessary holding brackets, hold fasts etc. with special reducer at the end to accommodate type of street light fitting to be fixed. Bracket shall have 1 coat of anti-corrosion paint before despatch to site and 2 coats of approved make and shade of aluminium paint. This bracket shall also be provided with one M.S. water tight box complete with the connector, neutral link, rewireable fuse etc.. See enclosed drawings of street light poles.
Installation of poles shall be done as per enclosed drawings of street light poles. The depth of pole to be burried in ground shall be 1/5th of the total pole length or as specified in drawing, whichever is more. Special care shall be taken in erecting poles so that these are not strained or damaged during erection and are firmly stayed till the foundation are secured. The pole shall be grouted inside ground pit (cross-section 600 x 600 mm.) with cement concrete 1:2:4. Before the placement of concrete around pole in the pit, necessary conduit pipes (not less than 25 mm. dia.) shall be placed for facilitating drawing of cables. Separate conduit shall be provided for incoming and outgoing cables. The cement concrete shall be protected from

prematured drying by curing for atleast 7 days after pouring. All concrete surface from 150 mm. below ground level to top shall be finished smooth with cement mortar 1:4.

This includes fixing of street light fittings complete with accessories and lamps at the end of the pole / bracket, connecting it with 3 x 2.5 mm.² aluminium conductor, PVC insulated cable from water tight M.S. box, testing, commissioning. Third core shall be connected with earthing point of light fitting at one end and earthing point of marshalling box at the other end.

3 **Mode of measurement**

The unit rate shall be considered for Supplying and fixing one fixture. The rate shall include following

a) All fixing accessories, mounting bracket, ballast condensers and control gear wherever applicable.
b) Supplying and fixing Ball and socket joints wherever required.
c) Earthing of fittings.
d) Electrical connections to fittings/fans from the junction box/ceiling rose.
e) Installation and interconnection of Electronic regulators for ceiling fans.

Per Unit for Supplying, assembling, installing, connecting ,testing and commissioning of fluorescent/ incandescent luminaries fixture, ceiling fan, exhaust fan etc.

Refer General Instruction for Electrical work – Basic Rates for Light Fixtures also.

8.2 Supply, Installing, Testing , commissioning of ceiling fan of various types and of specified make:

1) **Material :**
   Should confirm to E – 8
2) **Workmanship :**
   As per item no 8.1 above
3) **Mode of measurement :**
   As per item no 8.1 above

8.3 Supply, Installing, Testing , commissioning of Exhaust fans of various types and of specified make:

1) **Material :**
   Should confirm to E – 8
2) **Workmanship :**
   As per item no 8.1 above
   i. INSTALLATION OF EXHAUST FANS :
   Scope of work under this system shall start from exhaust fan point, with a ceiling rose, 2 core 2.5 mm.² PVC insulated wire from ceiling rose to connector of exhaust fan, connections, making fan opening in walls including repair / finishing fixing of exhaust fan complete with accessories and louvers on walls with hold-fasts, testing the exhaust fans and commissioning.

3) Mode of measurement :
As per item no 8.1 above

9.0 EARTHING

9.1 Providing earthing stations for equipment earthing as shown and specified in IS:3043 and drawing for equipment complete with :

9.1.1) 600 x 600 x 3 mm tinned cu. plate.
9.1.2) 450 x 450 x 3 mm tinned cu. plate.
9.1.3) Chemical Earthig

1 **Material**
Shall be as per E - 9

2 **Workmanship**
Following activities shall be carried out for the earthing station
a) Excavation in hard murrum.
b) laying Watering pipe.
c) brick masonry with hinged covers.
d) Charcoal and Salt fill.
e) Earth station should be 1 mt. away from building.
f) Keep minimum 2 mt. distance between two earth pits.
g) The pit should be minimum 4 mt. deep.
h) The earth resistance should not exceed 1 ohm.
i) All earth pits of same category shall be interlinked with strip.

Following points shall be followed strictly.

A) The plate \ pipe electrode, as far as practicable, shall be buried below permanent moisture level but in no case not less than 2.5 M below finished ground level.

B) The plate \pipe electrode shall be kept clear of the building foundation and in no case, it shall be nearer by less than 2 M from outer face of the respective building wall \ column.

C) The plate electrode shall be installed vertically and shall be surrounded with 150 mm. thick layers of Charcoal dust and Salt mixture.

D) 20 mm. dia. G.I. pipe for watering, shall run from top edge of the plate \ pipe electrode to the mid level of block masonry chamber.

E) Top of the pipe shall be provided with G.I. funnel and screen for watering the earth \ ground through the pipe.

F) The funnel with screen over the G.I. pipe for watering to the earth shall be housed in a block masonry chamber as shown in the drawing.

G) 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.

H) Construction of the earthing station shall in general be as shown in the drawing and shall confirm to the requirement on earth electrodes mentioned in the latest edition of Indian Standard IS : 3043, Code of Practice for Earthing Installation.

I) The earth conductors (Strips / Wires copper/ Hot dip G.I.) 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.

J) 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.

K) Over lapping of earth conductors during straight through in joints, where required, shall be of minimum 75mm. long.

L) The earth conductors shall be in one length between the earthing grid and the equipment to be earthed.

M) The connection between strip and plate shall be through stainless steel bolts and washers.

Following tests shall be carried out :

The entire earthing installation shall be tested as per requirements of Indian Standard Specification IS : 3043.

A) The following earth resistance values shall be measured with an approved earth meager and recorded.
   1) Each earthing station
   2) Earthing system as a whole
   3) Earth continuity conductor

B) Earth conductor resistance for each earthed equipment shall be measured which shall not exceed 3 Ohm in each case.

C) Measurements of earth resistance shall be carried out before earth connections are made between the earth and the object to be earthed.

D) All tests shall be carried out in presence of the Site Engineer.

3 **Mode of measurement**

Rate shall be considered for one unit of pit.

9.2 Earth wire/strips :

Supply and laying cu. earthing strips for interconnecting the earthing stations, panels, DB's etc. in built-up trenches, on walls/ceiling, buried in ground generally as specified and shown on drawings complete with :

a) Fixing accessories.

b) Corrosion protection of buried conductors with bituminous coating and covered with PVC tapes.

9.2.1 50 x 6 mm tinned cu. strips.

9.2.2 32 x 6 mm tinned cu. strips.

9.2.3 25 x 3 mm tinned cu. strips.

9.2.4 No.8 Gauge bare cu earth wire.

1 **Material**

Copper strips of sizes specified in the item shall be had. The strips shall not be corroded.

2 **Workmanship**

Copper strips shall be laid along with the cables and mains as instructed by the consultant and along the path of the cable. The strips shall be terminated at both the ends properly via brezing / SS nut and bolts with double washer screws and nuts as instructed by the consultant. Strips shall not be bend to and extent that they go brittle.

3 **Mode of measurement**

The rate shall be considered on meter basis and the quantity shall be certified by the engineer in charge from Clients side.

9.3 Earth Link :

40mm x 6 mm earth link fixed by necessary screws on wall.

1 **Material**

Should confirm to E – 9

2 **Workmanship**

The links shall be done properly so that after the installation is complete they do not get detached. Proper screwing shall be done so as to avoids gaps and maximum area overlap is available.

3 **Mode of measurement**

The rate shall be for one unit of earth link.

9.4 Earth Plate :

Earth Plate : 600 mm L x 300 mm H x 6 mm Thick earth link fixed by necessary Insulators & Clamps on wall / Floor with Anchor Fastners.

1 **Material**

Should confirm to E – 9

2 **Workmanship**

The Earthplate shall be done properly so that after the installation is complete they do not get detached. Proper screwing shall be done so as to avoids gaps and maximum area overlap is available. Proper sizes holes to be done on plate.

3 **Mode of measurement**

The rate shall be for one unit of earth Plate.

9.5 Earthing Wire :

1 no. of 6 sq mm Cu. PVC insulated flexible wire (Green Colour Only).

1 **Material**

Should confirm to E – 1

2 **Workmanship**

As per item no 1.3 above .

3 **Mode of measurement**

The rate shall be for per meter basis.

9.6 Juction Box :

Water Tight Junction Box of Hensel make Cat. No. KG9003IN or equivalent. With necessary clamp for mounting of the J.B. (All the cable / wire connections to the JB shall be with the Water tight Glands only).

1 **Material**

Should confirm to E – 2

2 **Workmanship**

As per item no 2.2 above .

3 **Mode of measurement**

The rate shall be for one unit of Junction Box.

10.0 TELEPHONE DISTRIBUTION

Supply, installation, connection, testing and commissioning of telephone system with supplying of telephone cables as per specification and drawings. The unit rate considered on running meter basis includes supply, laying, connection, testing and commissioning of multipair telephone cables through rigid PVC conduit from tag block of each floor / of specific area to MDF located in the reception area / near EPABX system. The cable shall be installed in a surface manner in the vertical riser shaft and/or laid in a cable tray including supply & fixing tag block with KRONE type terminal Junction box of specified make.

10.1 Tag Blocks

Supply & fixing of various ranges from 5 to 100 pair tagblock with KRONE terminal.

1 **Material**

Shall confirm to E – 10

2 **Workmanship**

The tag blocks shall be mounted inside fabricated sheet steel boxes with removable hinged covers and shall be fully accessible. The enclosure shall be painted with 2 coats of red oxide and stove enameled.

3 **Mode of measurement**

The rate shall be for 1 no of tag block

10.2 PVC Conduits :

10.1.1 Supply & laying of 25 mm dia. rigid PVC conduit of Heavy gauge.

10.1.2 Supply & laying of 40 mm dia. rigid PVC conduit of Heavy gauge.

1 **Material**

Should confirm to E – 1

2 **Workmanship**

As per item no 1.1

3 **Mode of measurement**

The rate shall be for 1 mtr of PVC pipe

10.3 CABLING :

Telephone cables of following sizes :

a) 0.51 mm dia tinned copper 2 to 20 armoured cables

1 **Material**

Shall confirm to E – 10

2 **Workmanship**

A) As per item no 10

B) All cables shall be on cable racks and neatly stitched together.

C) The connection at the tag blocks shall be silver soldered so as to achieve minimum contact resistance.

D) The final branch connections with single pair cables in conduits and the maximum number of cables in each conduit shall be as follows :

Conduit diameter inch	mm.	Max. No. of cables
3/4"	20	2 Nos. single pair
1"	25	6 Nos. single pair
1¼"	32	12 Nos. single pair
1½"	40	18 Nos. single pair

3 **Mode of measurement**

The rate shall be for 1 mtr of cable.

10.4 **Data CABLING :**

Cat-6 wires :

1 **Material**

Shall confirm to E – 10

2 **Workmanship**

A) As per item no 10

B) All cables shall be on cable racks and neatly stitched together.

C) The connection at the tag blocks shall be silver soldered so as to achieve minimum contact resistance.

D) The final branch connections with single pair cables in conduits and the maximum number of cables in each conduit shall be as follows :

Conduit diameter	Max. No. of cables

inch	mm.	
3/4"	20	2 Nos.
1"	5	3 Nos.
1¼"	32	5 Nos.
1½"	40	6 Nos.

3 **Mode of measurement**

The rate shall be for 1 mtr of cable.

10.5 Telephone outlet socket

10.5.1 Supply, Installing, testing and commissioning of one telephone point to be done with telephone outlet socket (jack type) and box of the specified make.

1 **Material**

Shall confirm to E – 10

2 **Workmanship**

As per item no 1.1

3 **Mode of measurement**

The rate shall be for 1 nos of telephone outlet socket

10.5.2 one Data I/O point to be done with data outlet socket of RJ-45 and Face Plate, box of the specified make..

1 **Material**

Shall confirm to E – 10

2 **Workmanship**

As per item no 1.1

3 **Mode of measurement**

The rate shall be for 1 nos of Data Outlet Socket

11 P. A. SYSTEM

11.1 Supply & Laying of RG 6 TV wire with PVC Pipe With all accessories :

1 **Material**

75 ohms, copper conductor RG 6 co axial shielded cable

2 **Workmanship**

As instructed by site incharge .

3 **Mode of measurement**

The cable shall be paid on per mtr basis which shall include cost of cable.

11.2 SITC of 6W- 8 ohms 6" dia ceiling mounted music speakers with line matching transformer for 100/70 V output line, with bottom grill. (Philips make LDB 8353 + B377or equivalent from specified make).(Philips / Bosch make) :

1 **Material**

Shall be as per E -11 with bottom plate of bison board for support & hanging arrangement. It should be Surface type or concealed type as per instructed by site incharge.

2 **Workmanship**

As instructed by site incharge.

3 **Mode of measurement**

The speaker shall be paid on per unit basis which shall include cost of hanging arrangement.

11.3 SITC of recess / Surface wall mounting speaker with 5W rated input power 3.3 K. Ohms / 3W impedance, 100 - 10000 Hz frequency response with 6 inch dia. cone type 8 ohms speakers duly fitted in ABS plastic cabinet of colour match with wall or ceiling of following size and as directed by enginner in charge :

1 **Material**

Shall be as per E -11 with fixing arrangement. It should be Surface type or concealed type as per instructed by site incharge.

2 **Workmanship**

As instructed by site incharge.

3 **Mode of measurement**

The speaker shall be paid on per unit basis which shall include cost of fixing arrangement.

11.4 SITC OF microphone with press to call switch for Public address system, (Philips / Bosch make) :

1 **Material**

Shall be as per E -11 with Base station.

2 **Workmanship**

As instructed by site incharge.

3 **Mode of measurement**

The microphone shall be paid on per unit basis which shall include cost of fixing arrangement.

11.5 SITC of local volume control -cum ON-OFF switch with flush mounting metal boxes, mounting plate matching with electrical switches (Same make as switch) :

1 **Material**

Shall be as per E -1 with Base box & Face Plates.

2 **Workmanship**

As instructed by site incharge.

3 **Mode of measurement**
shall be paid on per unit basis which shall include cost of fixing arrangement.

11.6 Supply and laying of core twin twisted 40/36 ATC multi strand, over all PVC sheathed speaker wire in PVC Pipe. :

1 **Material**
Shall be as per E -11 with 25 mm dia MMS PVC pipe.

2 **Workmanship**
As instructed by site incharge.

3 **Mode of measurement**
shall be paid on per meter basis which shall include cost of pipes & Accessories.

11.7 SITC of the TV Socket with with the Concealed box, Face plate etc…:

1 **Material**
Shall be as per E-1 & E -11

2 **Workmanship**
As instructed by site incharge.

3 **Mode of measurement**
shall be paid on per unit basis which shall include cost of basebox & Faceplates.

11.8 Splitter

1 **Material**
Shall confirm to E – 11 and E –1

2 **Workmanship**
The Splitter shall be mounted inside Thermoplastic boxes of Spelsberg / hensel make with removable hinged covers and shall be fully accessible.

3 **Mode of measurement**
The rate shall be for 1 no of Splitter & rate shall include the cost of Junction box.

11.9 SITC of 600 watt power Audio amplifiers including all necessary control desk and microprocessor based control unit with microphone, BGM, Call Station & PC input including providing necessary rack for mounting the Amplifier (with Rack) .Contractor to decide on the number, depending upon his amplifiers capacity. Contractor shall furnish quantity and unit rate for each type of amplifier considered by him. The system should have capability to integrate with EPABX, audio Message Generator & Fire Panel

1 **Material**
Shall confirm to E – 11 and E –1

2 **Workmanship**
The amplifier shall be mounted inside Rack.

3 **Mode of measurement**
The rate shall be Unit Basis.

11.10 SITC of 480 watt power Audio amplifiers including all necessary control desk and microprocessor based control unit with microphone, BGM, Call Station & PC input including providing necessary rack for mounting the Amplifier (with Rack)

1 **Material**
Shall confirm to E – 11 and E –1

2 **Workmanship**
The amplifier shall be mounted inside Rack.

3 **Mode of measurement**
The rate shall be Unit Basis.

11.11 SITC of 6 zone Switcher

1 **Material**
Shall confirm to E – 11 and E –1

2 **Workmanship**
The shall be mounted properly.

3 **Mode of measurement**
The rate shall be Unit Basis.

13 CCTV SYSTEM

13.1 to 13.4 SITC of Cameras :

1 **Material**
Shall be as per E -13 & with all necessary fixing arrangements.
All cameras shall be with power supply unit with necessary enclauser.

2 **Workmanship**
As instructed by site incharge.

3 **Mode of measurement**
Shall be paid on per unit basis which shall include cost of fixing arrangement.

13.5 Supply and Installation of 32" Colour LCD Flat Screen Monitor

1 **Material**
Shall be as per E -13 & with all necessary fixing arrangements & Cabling.

2 **Workmanship**
As instructed by site incharge.

3 **Mode of measurement**
Shall be paid on per unit basis which shall include cost of fixing arrangement.

13.6 Supply, installation, testing and commissioning of IP digital video management software complete with compatible server grade PC for the software, complete with licenses equal to the number of cameras, client licenses, and all other licenses required to integrate keyboards with PTZ controllers, monitors, etc. The set shall come with RAID backup device sufficient to store all cameras at 4CIF/D1 resolution for minimum 30 Days Backups & Should be enable client to monitor.

1 **Material**
Shall be as per E -13 & with all necessary fixing arrangements & Cabling.

2 **Workmanship**
As instructed by site incharge.

3 **Mode of measurement**
Shall be paid on per complete unit basis which shall include cost of fixing arrangement.

13.7 Cisco Layer 3 switch with number of ports as to support all cameras and having 20% spare ports complete with SITC & Rack.

1 **Material**
Shall be as per E -13 & with all necessary fixing arrangements & Cabling, Rack with power supply unit.

2 **Workmanship**
As instructed by site incharge.

3 **Mode of measurement**
Shall be paid on per complete unit basis which shall include cost of fixing arrangement & Rack.

13.8 Supply and laying of 2c x 1.0 Sq.mm FRLS Shielded wire with cable connections with Glands & Lugs.

1 **Material**
Shall be as per E – 13, E -12, E – 5 & E – 6.

2 **Workmanship**
Shall be as per 1, 5, 6 above.

3 **Mode of measurement**
Shall be paid on per meter basis which shall include cost of fixing arrangement.

13.9 SITC of 75 Ohms copper conductor copper screen co-axial cable.:

1 **Material**
Shall be as per E – 13 & 75 ohms, copper conductor RG 6 & RG 11 co axial shielded cable

2 **Workmanship**
As instructed by site incharge .

3 **Mode of measurement**
The cable shall be paid on per mtr basis which shall include cost of cable.

13.10 Supply, installation, testing and commissioning of CAT 6e UTP data cable with connections:

1 **Material**
Shall confirm to E – 10, E 13

2 **Workmanship**
A) As per item no 10, 13
B) All cables shall be on cable racks and neatly stitched together.
C) The connection at the tag blocks shall be silver soldered so as to achieve minimum contact resistance.

D) The final branch connections with single pair cables in conduits and the maximum number of cables in each conduit shall be as follows :

Conduit diameter inch	mm.	Max. No. of cables
3/4"	20	2 Nos.
1"	25	3 Nos.
1¼"	32	5 Nos.
1½"	40	6 Nos.

3 **Mode of measurement**
The rate shall be for 1 mtr of cable with end connection patching.

13.11 SITC of FRLS PVC Conduits with all accessories of following sizes (Medium duty).

1 **Material**
Shall be as per E -1.

2 **Workmanship**
Shall be as per 1 above.

3 **Mode of measurement**
Shall be paid on per meter basis which shall include cost of fixing arrangement.

14 EXTERNAL LIGHTING

14.1 & 14.2 Supply & installation of hight as per boq decorative Column made out of GI 114 mm dia pipe top swaged, tubular pole 'T' washed and primered& painted as per the approved colour & Shade - minimum 2 coats PU based MRF Paint. The column shall also be provided with flush door at the bottom with proper strengthening to the cutout of the door opening. A junction/ looping box with 32 Amps heavy duty connector shall be built into the pole. street light pole with Single Arm Bracket / arrangement for the top mounting fixture as shown in the drawing complete with :

1. **8 way connector and 6A MCB**
2. **50 mm diameter GI pipe for each cable entry. Pipe length is up to 3.5 mtr. Per cable**
3. **Wiring up to the light fixture from the junction box using 3nos x 1.5 sq.mm. flexible copper wires / Fixture of specified make.**
4. **1 mtr. Depth & 600 mm x 600 mm – M20 Concrete coping with 0.6 mtr. Long 4 nos. foundation bolt (In case of 6 mtr. Height above the ground) with base plate with stiffner as per drawing.**
5. **Sprial/Coil Type Earthing from the 8 swg Cu. Wire of 2.5 mtr. With the suitable size pipe with clamps and painting.**
6. **Radium stip of two colour at suitable height**
7. **Excavation & back filling for erection of poles. Debris to be removed from the site to suitable location as per the instruction of the engineer incharge**

1 **Material**

Shall confirm E – 14

2 **Workmanship**

The pole shall be installed as shown in the drawing and shall be checked for proper earthing. Wiring sequence shall as per the design given by the consultant.

3 **Mode of measurement**

The rate shall be for one pole.

14.3 SITC of Water Tight Junction Box of Hensel make Cat. No. KG9003IN (For Poles) / KF 9500 (For Others) or equivalent. With necessary clamp for mounting of the J.B. (All the cable / wire connections to the JB shall be with the Water tight Glands only)

1 **Material**

As per item no 2.0

2 **Workmanship**

As per item no 2.2

3 **Mode of measurement**

The rate shall be for one no of Junction Box.

15 H. T. GOD & H.T. Work

15.1 H. T. GOD

1 **Material**
Shall confirm E – 15

2 **Workmanship**
The GOD shall be erected as per the drawing and necessary connections shall be done.

3 **Mode of measurement**
All the material listed in the item shall be taken as 1 set. The rate shall be for 1 set of GOD

15.2 UNITISE SUBSTATION

Supply, Unloading, Shifting at site, installation, testing and commissioning of 11 / 0.433 KV compact package sub station comprising 11 KV 400 A, 350 MVA SF6 breaker as incomer with dual core CT & PT of appropriate rating for metering and protection, with 500 KVA 11 / 0.433 KV Dry type cast resin transformer +/- 10 % off load tape change & LT panel consisting of 1 no.800 A 4 Pole manually operated air circuit breaker of 50 KA breaking capacity (ICU = ICS) with 1 no. of 160 Amp TP MCCB with 160 MAp. Capacitor Duty Contactor with Time delay relay with 50 KVAR MPP Heavy Duty Capacitor as outgoing. All ACB shall have Microprocessor based release 6.0 A unit with all kind of communicable accessories with metering as shown in the SLD . Package sub-station shall be complete as per specification. Metering must be as per the SLD. (Scope also includes all kind of testing before installation)

1) Material
Material should confirm to E – 15

2) Workmanship

Supplying, Unloading, shifting at site, assembling, installing, testing and commissioning of unitiise **substation suitable for outdoor mounting having one no of 11 KV, 400 Amps 350 MVA drawout type SF6 type circuit breaker panel with dual core CT & PT of appropriate rating for metering and protection, 1 no of 500 KVA dry type transformer with +/- 10 % off load tape changer and 1 no.800 A 4 Pole manually operated air circuit breaker of 50 KA breaking capacity (ICU = ICS) with 1 no. of 160 Amp TP MCCB with 160 MAp. Capacitor Duty Contactor with Time delay relay with 50 KVAR MPP Heavy Duty Capacitor as outgoing complete in all respect as per technical specifications.**

DRY TYPE TRANSFORMER

(a) ERECTION
Before erection of transformer, the level of rails on foundation shall be checked and minor corrections if necessary shall be carried out. After the completion of erection, necessary stoppers shall be provided at the wheels. All loosely supplied fittings / accessories shall be cleaned and mounted on the transformer and connections made. After completely assembling & installation, the transformer shall be cleaned and touched up with a paint supplied by the manufacturer applied wherever

necessary. All cover bolts shall be checked for proper tightness. All the civil foundation work required shall be in the scope of contractor.

(b) TESTING :
Winding insulation resistance shall be measured from primary and secondary to ground and between primary and secondary.

Check the polarity of terminals and the phase sequence.

(c) Proforma for transformer tests :

- Transformer name plate.
- Insulation resistance test with 1000 V meagre.

a) between primary to earth
b) between secondary to earth
c) between primary and secondary

- Operation of the tap changer.

Operation of the tap at tap No. 1
Operation of the tap at tap No. 2
Operation of the tap at tap No. 3
Operation of the tap at tap No. 4
Operation of the tap at tap No. 5

- Polarity marking and phase sequence.
- Earth resistance : Body as well as Neutral link.

[This proforma shall be jointly signed by the CLIENT / CONSULTANT and the contractor in duplicate].

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3) Mode of Measurement:
The rate shall be for one unit of panel.

15.3 11 KV H. T. Cable :

15.3.1 3 C x 240 sq.mm 11 KV XLPE cable (between metering panel room to HT panel and HT panel to transformers).

1) Material
Material should confirm to E – 15

2) Workmanship
Shall be as per 5 above &

i)Cables shall be laid in the route marked in the drawings. Where the route is not indicated, the contractor shall mark out the cable route on the site and obtain the approval of the Architects/Consultants before laying the cables.

ii)Cables shall be bent to a radius, not less than 20 times the overall diameter.

iii)Cables laid above ground shall be suitably protected to meet the approval of the Electrical Inspectorate and other statutory regulations. Cables run on walls/ceiling or ready-made masonry trenches shall be supported on spacers and saddles which shall be painted with two coats of approved colour on 2 coats of red oxide. Plastic identification tags shall be provided at the ends and along the length of cable @ 20 m. centers. All vertical cable in wall shall be in heavy gauge pipe of suitable size.

iv)HV cables shall be tested upon installation with a 1000 V insulation resistance tested and the following readings established.

1) Continuity on all phases.
2) Insulation Resistance
   a) between conductors.
   b) all conductors and ground.
3) High Potential Testing if required by the local electrical Inspectorate.

v) For each lot of cables the Contractor shall supply a certificate issued by the manufacturer stating its original date of manufacture, constitution and standard to which it complies and the test certificate

vi) Earthing values shall be measured with an approved earth meggar and shall be recorded.

3) Mode of measurement

Cables will be measured on the basis of a common rate per unit length indoor and outdoor and shall include the following :

i) Cables and clamps
ii) Installtion testing and commissioning.
iii) Cable marking and all the accessories for the cable if at all to be installed on walls.

15.4 Supplying and making H.T.outdoor type cable end connection for 11 KV XLPE cable including jointing materials of Heat shrinkable type, H.T. tape flux, suitable size Al. Crimping type lugs, brass cable glands of suitable size with ICC make para compound for 11 KV XLPE cable.

1) Material

Material shall confirm to E – 15

2) Worlmanship

Shall be as per 6 above &

Cable joints shall be carried out taking care that no leakage is left out. Use of proper flux and para compund shall be made. Check of loose connections shall be done. Crimping shall be done with the help of hydraulic tools.

3) Mode of measurement

Each cable termination will be measured as one unit for payment. The item shall include the following :

i) Cable glands, lugs, bolts, nuts.
ii) All jointing materials.
iii) Installations, testing and commissioning.
iv) Earthing the glands.
v) Hi Pot test

15.5 SITC of Control cable.

1 **Material**
Should confirm to E – 5

2 **Workmanship**
Shall be as per 5 above

3 **Mode of measurement**

The cable shall be measured in per mt. Basis and the rates shall include ;

1) Cables and clamps
2) Installation, Commissioning and testing
3) Cable marking and all the accessories for the cable if at all to be installed on walls.

Cable length shall be certified by engineer in charge from Clients side.

15.6 SITC of cable end termination.

1 **Material**
Should confirm to E – 6

2 **Workmanship**
Shall be as per 6 above

3 **Mode of measurement**
Shall be as per 6 above

16.0 Miscellanious

16.1 Providing & Erecting conventional type CO2 based fire extinguishers "Safex" or Approved make of 2.0 Kg.

1) Material
Should confirm to E – 16

2) Workmanship
Shall mount the fire extinguishers at the desired location and shall check for leakage if any.

3) Mode of measurement :
Shall be measured on unit basis.

16.2 Supplying & Erecting automatic emergency light with maintenance free battery for 20 watts. tube.

1) Material
Should confirm to E – 16 & Shall have maintenance free Battery.

2) Workmanship
Should check for the defects and shall mount the same at locations specified by consultant.

3) Mode of measurement :
Shall be measured on unit basis.

16.3 Supplying & Erecting rubber mat of 1.1 KV 1000 x 2000 x 6 mm.

1) **Material**
Should confirm to E – 16

2) Workmanship
Should check for the defects and shall mount the same at locations specified by consultant.

3) Mode of measurement :
Shall be measured on unit basis.

16.4 Supplying & Erecting rubber mat of 1.1 KV 1000 x 2000 x 10 mm.

1) Material
Should confirm to E – 16

2) Workmanship
Should check for the defects and shall mount the same at locations specified by consultant.

3) Mode of measurement :
Shall be measured on unit basis.

16.4 Providing & Erecting danger notice board of 150 x 150 mm.

1) **Material**
Should confirm to E – 16

2) **Workmanship**
Should check for the defects and shall erect the same at locations specified by site consultant.

3) **Mode of measurement :**
Shall be measured on unit basis.

16.5 Providing printed instruction chart both in English & REGIONAL LANGUAGE & duly framed out on glass for treatment of person suffering from Electric shock, or should be laminated.

1) Material
Material shall confirm to E – 16

2) Workmanship
The chart shall be mounted at a height which makes it visible properly using screws with plugswhere ever necessary. The chart shall be aligned properly.

3) Mode of measurement
The quantity shall be measured on the unit basis

16.6 to 16.10 Providing the Various size Colour print of the Final Plan / SLD duly framed out on Glass for Electrical room & BMS Room.

1) Material
Paper should be Photo quality.

2) Workmanship
The chart shall be mounted at a height which makes it visible properly using screws with plugswhere ever necessary. The chart shall be aligned properly.

3) Mode of measurement
The quantity shall be measured on the unit basis

16.11 to 16.16 SITC of various sizes PVC / DWC Pipes

1) Material
Should be as per E-1.

2) Workmanship
Shall be as per 1.1 above

3) Mode of measurement
The quantity shall be measured on the meter basis

16.17 Filling the necessary application to supply co. following up and getting the supply filling the necessary test report to the supply co. inclusive. All official fees including security deposits will be paid by the client and out of pocket expenses shall be of contractor.

1) Material

N.A.

2) Workmanship

Shall be as per Special Condition of Contract

3) Mode of measurement

The quantity shall be measured on the L.S. basis Shall be payable after Getting the Power to site with complete documents.

Material Specifications – Fire Fighting Works

1.0 **FIRE** PROTECTION **SYSTEM:**

1.1 SCOPE**:**

1.1.1 Contractor shall furnish all labor, materials, equipment for supply, installation testing and commissioning of complete fire hydrant and sprinkler system. In general, the item of works shall include but not limited to the following:

a) Electrically operated Submersible hydrant and sprinkler pumps, diesel engine driven pump, jockey pump.

b) Black mild steel (heavy) class 'B' pipes for fire protection system including fittings, valves, accessories etc.

c) Internal and external fire hydrants, including valve chambers, fire brigade inlet connections, air cushion tanks with air release valves, M.S. hose box for Internal and External fire hydrants.

d) Sprinkler system including piping, flow switches, installation valve and sprinkler heads etc.

e) Laisoning work with fire department for getting final fire NOC/Approval

1.2 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.

IS 636 **Non – percolating flexible fire fighting delivery hose**
IS 903 **Specification for fire hose delivery couplings, branch pipe nozzle and Nozzle spanner**
IS 904 **Specification for two – way and three way suction collecting head for Firefighting purpose**
IS 901 **Specification for couplings, double male & double female instantaneous pattern for firefighting purpose**
IS 940 **Specification for portable fire extinguisher water type (gas cartage)**
IS 2171 **Specification for portable extinguisher, dry powder.**
IS 2878 **Specification for fire extinguisher, carbon dioxide type.**
IS 3582 **Specification for basket strainer for firefighting purpose**
IS 4927 **Specification for unlined flex canvas hose for firefighting purpose**
IS 5290 **Specification for hydrant valve (Landing valve)**
IS 13849 **Specification for portable fire extinguisher (Dry powder type)**
IS 14609 **Specification for ABC dry powder for fire fighting**
IS 884 **Specification for first aid hose reel for firefighting purpose**
IS 11101 **Specification for extended branch pipe for fire brigade use.**
IS 14846 **Specification for gate valve**
IS 1239 / 3589 **G.I. Pipe / M.S. pipe**
BS 5155/ IS 13095 **Butterfly valves**

IS 5312/API 594/598	**Non Return Valves**
IS 778	**Gun Metal valves**
IS 6595 / 12469	**Pumps**
IS 325	**Motors**
IS 10001 / 10002	**Diesel Engine**
IS 10221	**Coating / wrapping of underground M.S. Pipe**
BS 336	**Specification for hydrant, standpipe for fire fighting.**
NBC	**National Building Code -2005**
NFPA 13	**Sprinkler System**
NFPA 14	**Stand Pipe System**

1.3 PUMPS**:**

Submersible Fire Pumps (Electric Driven)

Contractor shall provide and install Submersible electrically operated driven fire pumps of capacity and head indicated in the Drawings/Bill of Quantities.

The pump shall be submersible, top discharge, Water cooled. The pump construction shall be cast iron casing; MS body and shall be fitted with packing. Pumps shall be connected to the drive by means of coupling which shall be individually balanced dynamically and statically. Pump should be with gland packing.

The coupling joins the prime mover with the pump shall be provided with a sheet metal guard.

Pumps shall deliver not less than 150% of rated capacity at total head of not less than 65% of rated head. The Shut off head of the pump shall not exceed 120% of rated head.

Fire Pumps (Electric Driven)

Contractor shall provide and install electrically operated driven fire pumps of capacity and head indicated in the Drawings/Bill of Quantities

The end suction fire pump shall be as per approval requirement by UL/FM.

The pump shall be radially split, top center line discharge, self venting casing. The pump construction shall be cast iron; bronze fitted and shall be fitted with packing. The shaft shall be fitted with stainless steel sleeves and be supported by two back to back thrust ball bearings and one radial roller bearing. The back pull out design shall allow the complete rotating assembly to be removed without disturbing the casing piping connection.

Pumps shall be connected to the drive by means of coupling which shall be individually balanced dynamically and statically. Pump should be with gland packings.

The coupling joins the prime mover with the pump shall be provided with a sheet metal guard.

Pumps shall deliver not less than 150% of rated capacity at total head of not less than 65% of rated head. The Shut off head of the pump shall not exceed 120% of rated head.

Motors for Electric Driven Pumps

Squirrel cage, TEFC induction motor suitable for 415 volt, 3-phase 50 Hz A.C. supply and of required capacity (kw/HP) for running the pump at 2850 r.p.m. confirming to IS: 325-1978. It shall have class F insulation & IP 55 protection &suitable for DOL starting.

Motors for fire protection pumps shall be at least equivalent to the horse power required to drive the pump at 150% of its rated discharge and shall be designed for continuous full load duty and shall be design proven in similar service.

Motors for fire pumps shall meet all requirements and specifications of the tariff advisory committee.

The contractor shall submit the following details to the consultant / client for approval:

1. Technical Datasheets for selected pumps
2. Performance characteristics curve.
3. General Arrangement & Foundation drawings for pump sets showing static & dynamic load.
4. Cross Sectional drawings with part list

The fire pumps shall operate on drop of 1 Kg/Sq.cm pressure in the mains. The pump operating sequence shall be arranged in a manner to start the pump automatically but should be stopped manually by starter push buttons only.

1.4 ACCESSORIES AND FITTINGS:

The following accessories shall be provided with each pump among other standard accessories required:

a) Coupling guard for horizontal split casing pumps.

b) Lubrication fittings and seal piping.

c) Test and /or air vent cocks.

Following fittings shall be provided with each pump among other standard fittings required:

a) Suction and discharge shut off valves (butterfly type) and discharge check valves as specified under section “piping”.

b) Pressure gauge at discharge of size not less than 100 mm dia and of the appropriate rating with gauge valves etc. Pressure switch of diaphragm type at discharge side.

c) 25mm GI gland drain.

1.5 CONTROL PANEL:

1.5.1 Cubical Panel:

The main switch board cubicle panel shall be of floor mounted type, totally enclosed, dust and vermin proof made from 16 SWG M.S. sheet of suitable size duly painted with one coat of anti-corrosive paint and two coats of synthetic enamel paint of approved make and shade with stove enameled finish, the cubical shall comprise of the followings:

a) Incoming main M.C.C.B unit of required capacity.

b) Outgoing M.C.C.Bs one for each motor.

c) Aluminum bus bar of suitable capacity.

d) Fully Automatic "DOL" starter suitable for the motor H.P. with Push Buttons and ON/OFF indicating light one for each motor.

e) Single phasing preventers one for each motor.

f) 96 mm^2 panel type Ampere meters - one for each motor complete with CTs.

g) 150 mm^2 voltmeter on incoming main with rotary selector switch to read voltage between phase to neutral and phase to phase.

h) Three neon phase indicating lamps.

i) Rotary switch for manual/auto operation.

j) potential free contact for monitoring the status of pumps through BMS

k) All colour coded internal and inter-connecting wiring from incoming main to busbar, switch board panel and power/control cables from switch board cubicle to motors, engine and batteries etc. complete in all respect.

All switchgears and accessories shall be approved make to relevant IS codes and to the satisfaction of Client's Representative/Consultant and rating of all equipment must match the KW of motors included and as per TAC rules. All electrical work to be carried out as per TAC and CPWD rules/specifications.

1.5.2 Earthing:

1.5.2.1 There shall be two independent earthing stations at least 3 meters away from the pump room. Each earth electrode shall consist of M.S. earth plate 600mmx600mmx3mm thick including accessories and masonry enclosure with cover plate having locking arrangement. All electrical apparatus, cable boxes and sheath/armour clamps shall be connected to the main bar by means of branch earth connection of 25mmx3mm M.S. strip. All joints in the main bar and between main bar and branch bars shall have the lapping surface properly tinned to prevent oxidation. The joints shall be riveted and sheathed. The main earthing strip shall be 25x3mm M.S. in 40mm dia M.S. pipe from earth electrode as required.

1.5.2.2 Earth plates shall be buried in a pit 1.2 x 1.2m at minimum depth of 3 meters below ground. The connections between main bar shall be made by means of these 10 mm studs and

fixed at 100mm centers. The pit shall be filled with coke breeze, rock salt and loose soil. A G. I pipe of 29mm dia with performations on the periphery shall be placed vertically over the plates to reach ground level or watering.

1.5.2.3 A brick masonry man hole 30x30x30cms size shall be provided to surround the pipe for inspection. A bolted removable link connecting main bar outside the pit portion leading to the plates shall be accommodated in this manhole for testing.

1.5.2.4 Earthing shall be done complete as per TAC and CPWD specifications.

1.5.3 Cabling:

1.5.3.1 All cables from switch board panel to the motors shall be PVC insulated and PVC sheathed armoured aluminium conductor power cables of 650/1100 V grade conforming to IS:1553. The cables of required size shall be suitable for laying on surface of wall or in flooring with suitable clamps. Necessary cable trays shall deemed to be included in this item as per site requirements.

1.5.3.2 The termination shall be with brass compression glands suitable for PVC sheathed armoured aluminium conductor cable of 1.1 KV `A' grade of the required size.

1.6 INSTALLATION:

Pump shall be installed as per manufacturer's recommendations. Pump sets shall be mounted on machinery isolation cork or any other equivalent vibration isolation pad. Concrete floating foundation shall be provided by the Owner as per approved shop drawings and specifications. The isolation pads, foundation bolts etc. shall be supplied by the Contractor. Contractor shall however ensure that the foundation bolts are correctly embedded.

Pump sets shall preferably be factory aligned, whenever necessary, site alignment shall be done by competent persons. Before the foundation bolts are grouted and the couplings are bolted, the bed plate levels and alignment results shall be submitted to the Client's Representative.

1.7 TESTING:

Tenderers shall submit the performance curves of the pumps supplied by them. They shall also check the capacity and total head requirements of each pump to match his own piping and equipment layout.

On completion of the entire installation, pumps shall be tested, wherever possible, for their discharge, head, flow rate, B.H.P.

Discharge, head and B.H.P. (as measured on the input side) shall be field tested. Test results shall correspond to the performance.

1.8 MEASUREMENT:

1.8.1 Pumping sets, and switch board cubicle shall be measured by number and shall include all item necessary and required and given in the specifications.

1.8.2 Earthing and power/control cabling shall not be measured separately but included in

switchgear cubicle and shall include all items necessary and required to complete the work as per specification and relevant IS to the satisfaction of Client's Representative.

1.8.3 Pressure switches and pressure gauges shall not be measured separately, but included in respective pumping sets and shall include all items necessary and required to complete the work to the satisfaction of Client's Representative.

2.0 FIRE HYDRANT SYSTEM:

2.1 SCOPE:

Work under this section shall consist of furnishing all labor, materials, equipment and appliances necessary and required to completely install wet riser fire hydrant system as required by the drawings and specified hereinafter or given in this Bill of Quantities.

Without restricting to the generality of the foregoing, the fire hydrant system shall include the following:

a) Black mild steel 'B' Class mains including valves, hydrants and appurtenances.

b) Black mild steel 'B' Class fire risers within the building.

c) Landing valves of 63mm diameter canvas hose pipes,20 mm diameter hose reels, hose cabinets 63mm diameter fire brigade connections, connections to pumps, appliances and pressure reducing devices, 20mm diameter gunmetal nozzle for hose reel.

d) Excavation, anchor blocks and valve chamber.

e) Underground pipe protection.

2.2 GENERAL REQUIREMENTS:

All materials shall be of the best quality conforming to the specifications and subject to the approval of the 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 and ceilings by suitable clamps at intervals specified. Only approved type of anchor fasteners shall be used for RCC ceilings and walls.

Valves and other appurtenances shall be so located that they are easily accessible for operations, repairs and maintenance.

The system piping shall be supported to resist both lateral and longitudinal horizontal seismic loads and to prevent vertical motion resulting from seismic loads.

2.3 INTERNAL FIRE HYDRANT SYSTEM:

2.3.1 Scope:

Work under Internal Fire Hydrant System shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install wet riser, fire hydrant system as required by the drawings and specified hereinafter or given in the Bill of Quantities.

Without restricting to the generally of the foregoing Internal fire hydrant system shall include the following:

1. Black mild steel 'B' Class pipe mains including valves, hydrants and appurtenances.
2. M.S. 'B' Class fire risers within the building.
3. Landing valves, canvas hose pipes, hose reels, hose cabinets, connections to pumps.

2.3.2 Pipes and Fittings:

a) All pipes within the building in exposed locations and shafts including connections burried under floor shall be Black mild steel 'B' Class tubes conforming to IS: 1239-1979 with screwed flanged or welded joints as specified by the Client's Representative.

b) Pipes (exposed) shall be given one primary coat of red oxide paint and two or more coats of synthetic enamel paint to give an even look (fire red, shade No. 536 as per IS: 5).

c) Fittings for Black mild steel Pipes shall be approved type malleable iron (forged fittings) for tapered screwed joints. Fittings shall be approved type steel fittings conforming to IS: 1239-1982 Part - II for screwed joints and welded.

d) All fittings such as bends, tees, etc. for 50mm and below shall be standard forged fittings. Cast iron fittings and fabricated fittings shall not be accepted.

e) All piping laid shall be as follows:

Pipe Size	Material	Joints & Fittings	Sealing Material
Up to 50mm	E.R.W., M.S. Pipe	Screwed Fittings	Non-Hardening
	Heavy Class	Unions	Lubricant
	IS:1239/1979	Raised face Slip-on Flanges	3mm, 3-ply Rubber insertion
65mm to 150mm	E.R.W., M.S. Pipe	Welded Fittings	-----
	Heavy Class	Raised face Slip-on Flanges	-----
	IS:1239/1979	-----	3mm, 3-ply Rubber insertion

200mm to 300mm	E.R.W. Welded Pipes	Welded	-----
	Heavy Class	Raised face Slip-on Flanges	3mm, 3-ply Rubber insertion
	IS:3589/1981	------	-----
350mm and Over	E.R.W. Welded Pipes	Welded	-----
	IS:3589/1981	Raised face Slip-on Flanges ------	3mm, 3-ply Rubber insertion -----

a) Pipes shall be provided with electrical resistance welding. Jointing shall be butt welded between pipe and pipe and fittings.

b) Joints between C.I. and M.S. pipes shall be made by provided a suitable flanged tail or sockets piece and M.S. flanges on the M.S. pipe shall have appropriate number of holes and shall be fastened with nuts, bolts and 1.5mm thick compressed asbestos gaskets.

c) Tee off connections shall be through reducing tees. Drilling and tapping of the main walls of the main pipe shall not be allowed.

d) All equipment and valve connections shall be through flanges (Welded or screwed for M.S.).

e) All welded piping is subjected to the approval of the Client's Representative and sufficient number of flanges and unions shall be provided.

2.3.3 Piping Installation:

Tender drawings indicate schematically the size and location of pipes. The Contractor on the award of the work, shall prepare detailed 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. Drawings to be got approved from Local Fire Authorities.

Contractor shall submit the Hydraulic calculation for the system in accordance with Fire Authority By Laws.

Piping shall be properly supported on or suspended from stand 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 of steel, adjustable for height and primer coated with rust preventive paint and finish coated back. Where pipe and clamps are of dissimilar materials a gasket shall be provided in between. Spacing of pipe supports shall not exceed the following:

Pipe Size	Spacing between Supports
3 to 12 mm	1.22 meter
19 to 25 mm	1.83 meter
32 to 150 mm	2.44 meter
150 mm & over	3.05 meter

Vertical risers shall be parallel to walls and column lines and shall be straight and plumb. Risers passing from floor to floor shall be supported at each floor by clamps or collars steel structural supports attached to pipe and with a 15 mm thick rubber pad or any resilient material. Where pipes pass through the roof floor, suitable flashing shall be provided to prevent water leakage. Risers shall have a suitable clean out at the lowest point and air vent at the highest point. The Contractor shall coordinate with structural.

Pipe sleeves, 50 mm 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.

Piping work shall be carried out in a workmen like manner, causing minimum disturbance to the existing services, buildings, roads and structure. The entire piping work shall be organized in consultation and coordination with other agencies work so that particular area work shall be carried out in one stretch.

Piping layout shall take due care for expansion and contraction in pipes.

All pipes using screwed fittings shall be accurately cut to the required sizes and thread in accordance with IS: 554 and burrs removed before lying. Wherever reducers are to be made, eccentric reducers shall be used.

Air valves shall be provided at all high points in the piping system for venting. Valves shall be of the double float type, with G.M./C.I. body, vulcanite balls, rubber seating etc. Air valves shall be the sizes specified and shall be associated with equal sizes specified and shall be associated with an equal size gate valve with rising spindle.

Discharge from the air valves shall be piped through an equal sized M.S. pipe to the nearest drain or floor waste or as shown.

Drain shall be provided at all low points in the piping system and shall be of the following sizes:

Mains	Drains
Up to 300mm dia	25mm dia
Over 300mm dia	32mm dia

2.3.4 Vibration Elimination:

Piping installation shall be carried out with vibration elimination fittings wherever required.

2.3.5 STRAINERS

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

2.3.6 Valves:

Gate Valves:

Gate valves shall be provided as required or as shown in the applicable shop drawings conforming to the following specifications:

Pipe Size	Material	Joints & Fittings	Sealing Material
	Seat - The Resilient lining moulded black nitrile rubber.		
	Disc - SG iron to IS:1865 SG 400/12 and BS:2789 Gr 420/12 Nylon coated.		

Gate valves shall conform to IS: 780/1969 Flanges to IS: 1536 or as required. Valves shall have non-rising spindles unless otherwise specified and shall be suitable for 21 Kg/Sq.cm test pressure.

Sluice valves of sizes 80mm and above shall be cast iron double flanged solid wedge, outside screw, non rising stem, yoke type bonnet and two piece gland construction. The valves shall have renewable screwed body seat rings. Flanges shall have raised faces and serrated face finish and shall conform to IS: 780-1984.

Check valves:

Check valves shall be provided as required or as shown on the drawings and conform to the following specifications:

Size	**Connection**	**Ends**
15mm to 50mm	Gunmetal	Screwed Female
65mm to Over	C.I.	Flanged

Check valves shall normally be used in all water services. Lift type valves may be used in horizontal runs. Air release and clean out plugs shall be provided whenever required Valves shall be suitable for 21 Kg/Sq.cm test pressure.

Butterfly Valves:

All the isolation valve 65cm 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 GI. 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 24 Bar
b)	Valve Component	: Material of Construction
i)	Body	: Cast Iron, Gr. FG 260, IS:210
ii)	Disc	: Nylon or Epoxy powder coated high duty iron, Gr, FG 260
iii)	Stem	: Stainless Steel or carbon steel – IS: 1570, Part-II.
iv)	Seat	: EPDM
v)	Hand Lever (Mechanical Memory Stop)	: Cast Iron
vi)	Bearings	: PTFE or Nylon covered S.S. bush bearings at stem and pivot.
vii) Primary Seal		: Reinforced PTEE slide bearings
viii) 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 w/chain cleats on all valves more than 2.4 meter above floor.

2.3.7 Pressure Gauges:

Pressure gauge shall be not less than 100mm dia dial type with 4 mm cock and lever handle and of appropriate range and be complete to isolate gauge and duly calibrated before installation.

Pressure gauge shall be provided at the following locations and as indicated on the drawings and Bill of Quantities. Care shall be taken to protect pressure gauges during pressure testing.

2.3.8 Pressure Vessel:

M.S. fabricated (vertically) mounted pressure vessels made from required thickness suitable for required test pressure. M.S. Plate (minimum 8 mm) as per I.S. 2062, 300mm in diameter and 1.2 Meter high shell with dished ends at top and flat bottom with floor mounting supports including 25mm outlet, inlet and Branch for Pressure gauge complete. The interior of the tank surface shall be coated with suitably graded Non-Toxic epoxy coating after necessary surface treatment by sand blasting, etc. to prevent corrosion of the vessel and shall be painted externally with 3 coats of enamel paint over one coat of Zinc Chromate primer including all accessories for complete installation.

2.3.9 Internal Hydrants:

Contractor shall provide on each landing and other locations as shown on the drawings one double headed gunmetal landing valve with 63mm dia. outlets and 100mm inlet (IS: 5290-1983) with individual shut off valves and cast iron wheels. Landing valves shall have flanged inlet and instantaneous type outlet as shown on the drawings.

Instantaneous outlets for fire hydrants shall be standard pattern approved and suitable for fire brigade hoses.

Contractor shall provide for each internal fire hydrant station two numbers of 63mm dia, 15 meter long rubberized fabric lined hose pipes with gunmetal male and female instantaneous type coupling machine wound with CI wire (Hose to IS: 636 type 2 and couplings to IS: 903 with IS certification), fire hose reel drum, 1 no. gunmetal branch pipe with nozzle IS: 903.

Each hose box shall be conspicuously painted with the letters “FIRE HOSE”.

2.3.10 Fire Hose Reels:

Contractor shall provide auto rewind spring type fire hose reels with 20mm dia, high pressure rubber hose of 30 meters length with gunmetal nozzle with 5mm bore, and control valve, connected wall mounted on circular hose reel of heavy duty mild steel construction and cast iron brackets. Hose reel shall conform to IS: 884-1969. The hose reel shall be connected directly to the pipe riser with cutoff isolation valve through an independent connection.

2.3.11 Orifice Plate:

Providing 8mm thick Orifice plate complete in S.S. on the landing hydrant outlet for necessary pressure reduction to maintain a maximum allowable outlet pressure including all accessories.

2.3.12 Fire Brigade Connections:

The Contractor shall provide gun-metal Fire Brigade collecting head with 4 Nos. 63mm dia instantaneous type inlets with built in butterfly valves and 150mm dia flanged outlet connection. The collecting heads shall be connected to underground Fire water tank for the use of local Fire Brigade.

The contractor shall provide gunmetal fire brigade suction hose coupling (draw out connection) with nut for female coupling as per IS :902-1974 complete with 150 mm dia. M.S. suction pipe and 150 mm dia. 1 no. C.I. foot valve flanged (to be connected to static water tank)

The contractor shall provide gunmetal fire brigade Siamese connection to Hydrant ring main with NRV & BFV of 150mm dia on vertical pipes with 2 nos. 63mm dia instantaneous type male couplings with 150mm dia flanged outlet complete with bolts, nuts, and rubber insertions as required and as per IS:904-1983.

2.3.13 Fire Hose Cabinets & Doors:

Provide hose cabinets for internal hydrants fabricated from 16 gauge MS sheet with single or double glass front door and locking arrangement with breakable glass key access arrangement, duly painted red with stove enameled paint fixed to wall or self supported on floor as per site conditions. The cabinet shall also have a separate chamber to keep the key with breakable glass as per approved design. Hose cabinets shall be stove enameled fire red paint with “FIRE HOSE” written on it prominently. Samples of hose cabinet for internal and external works be got approved from Client’s Representative before installation at site.

Fire hose cabinet suitable to accommodate double headed landing valves, 2 Nos. 15 meters long hoses, 1 No. first aid reel, 1 Nos. branch pipe and fire extinguishers.

The contractor shall provide weather proof hose door fabricated from 16g M.S. Sheet with full glass door and locking arrangement. The door shall be painted with one coat of primer and finished stove enameled “Fire Red”, Fire Hose written in front including suitably mounted on a raised masonry platform as required.

2.3.14 Drain Valve:

Provide 25mm dia, M.S. pipe to IS:1239 (heavy class) with 25mm gunmetal full way valve for draining any water in the system in low pockets same to be extended to the nearest drain point as directed by Client’s Representative.

2.3.15 Air Release Valve:

Provide 20mm dia, G.M. single acting type air release valve with screwed ends on all high points in the system.

2.3.16 Testing:

All piping shall be tested to hydrostatic test pressure of 15 Kg/Sq.cm or twice the design pressure whichever is higher for a period of not less than 24 hours. All leaks and defects in joints

revealed during the testing shall be rectified to the satisfaction of the Client's Representative.

Piping required subsequent to the above pressure test shall be re-tested in the same manner.

System may be tested in sections and such sections shall be securely capped.

The Client's Representative shall be notified well in advance by the Contractor of his intention to test a section of piping and all testing shall be witnessed by the Client's Representative.

The Contractor shall make sure that proper noiseless circulation of fluid is achieved through the system concerned. If proper circulation is not achieved due to air bound connections, the Contractor shall rectify the defective connections. He shall bear all the expenses for carrying out the above rectification including the tarring-up and re-finishing of floors, walls etc. as required.

The Contractor shall provide all materials, tools, equipment, instruments, services and labour required to perform the test, and shall ensure that the plant room and other areas are cleaned up and spill over water is removed.

The Contractor shall give the pressure test of head for external yard hydrant at ground level and also for hydrant at terrace level.

2.3.17 Painting:

All pipes in exposed locations shall be painted with one coat of red oxide primer and two or more coats of synthetic enamel paint of approved shade after the Hydrostatic test pressure of the internal hydrant piping network.

2.3.18 Measurement:

M.S. pipes shall be measured per linear meter of the finished length and shall include all fittings, welding, jointing, clamps for fixing to walls or hangers, anchor fasteners and testing.

Sluice valves with pressure reducing discs, check valves and full way valves shall be measured by numbers and shall include all items necessary and required for mixing and as given in the Specifications/Bill of Quantities.

Landing valves, hose cabinets, rubberized fabric linen fire hose pipes. First-aid fir hose reels (with gunmetal port way valves) and gunmetal branch pipes shall be measured by numbers and shall include all items necessary and required for fixing as given in the Specifications/Bill of Quantities.

Suction and delivery headers shall be measured per linear meter of finished length and shall include all items as given in the Bill of Quantities. Painting shall be included in the rate of headers.

Painting of pipes shall be included in the rate for pipes and no separate payment shall be made. No additional payment shall be admissible for cutting holes or chases in walls or floors, making connections to pumps, equipment and appliances.

3.0 SPRINKLER SYSTEM:

3.1 SCOPE:

Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install the sprinkler system as required by the drawings and specified hereinafter or given in this Bill of Quantities.

a) Sprinkler mains, branch and connection from external piping complete with valves, alarm, hangers, appurtenances and painting.

b) Sprinkler heads with spare sprinklers.

c) Connections to risers, pumps and appliances.

d) Flow switches, installation valve

e) Vertical drain pipes.

3.2 GENERAL REQUIREMENTS:

All materials shall be of the best quality conforming to the specifications and subject to the approval of the 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 and ceilings by suitable clamps at intervals specified. Only approved type of anchor fasteners shall be used for RCC ceilings and walls.

Valves and other appurtenances shall be so located that they are easily accessible for operations, repairs and maintenance.

The system piping shall be supported to resist both lateral and longitudinal horizontal seismic loads and to prevent vertical motion resulting from seismic loads.

3.3 PIPES AND FITTINGS:

Pipes for sprinkler system network shall be M.S. Class 'B' confirming to IS: 1239 with screwed/welded joints having flanges at regular intervals not exceeding 24 M. For MRI (Magnetic Resonance Imaging) area, copper piping shall be provided.

Fittings for steel pipes shall be of heavy class forged steel having tapered pipe threads. For pipe sizes 50mm and above, fabricated fitting shall not be accepted.

3.4 JOINTING:

Joints for M.S. pipes and fittings shall preferably be metal to metal tapered thread joints. A small amount of red lead may be used for lubrication and rust prevention. Joints shall not be welded or caulked. Joints for 50mm dia and above, however, may be of butt-welded type using heavy class butt welded fittings. However, sprinkler heads shall be screwed with Teflon or equal bonding tape.

Joints between CI or M.S. pipes and valves and other appurtenances, pumps etc. shall be made with CI or M.S. flanges with appropriate number of bolts. Flanged joints shall be made with 3mm thick compressed synthetic rubber insertion gaskets. All flanges shall confirm to IS: 6392-1971 Table 17/18 with regards to material, thickness as well as dimensions.

3.5 PIPE SUPPORTS:

All pipes shall be adequately supported at a maximum interval of 3 M from roofs or walls from existing inserts if available, by structural clamps fabricated from MS structural e.g. rods, channels, angles and flats to the prior approval of Consultant. All support shall be MS hot dip galvanized. Where existing inserts not available, the Contractor shall provide anchor fasteners.

Pipes shall be measured by linear meter and shall include all fittings, flanges, jointing, clamps, hangers, and all other material necessary and required whether specified or not to complete the system including painting, testing and commissioning. All support shall be MS hot dip galvanized.

3.6 PIPE PROTECTION:

All pipes above ground and in exposed locations shall be painted with one coat of red oxide primer and two or more coats of synthetic enamel paint of approved shade.

3.7 VALVES:

3.7.1 Float Valve :

The 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. 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 24 Kg/Sq.cm.

The ball valve shall generally conform to IS specifications No. 1703-1962.

3.7.2 Sluice Valves and Non Return Valves:

Sluice valves of sizes 65mm and above shall be cast iron double flanged with non rising spindle

and gunmetal inner. Sluice valve below ground shall be provided with caps suitable for operations by a key. Sluice valves in exposed location e.g. pump house, etc. shall be provided with cast iron wheels. Sluice valve shall conform to IS: 780 Class-I.

Check valves shall be cast iron double flanged conforming to IS: 5312-1984 with cast iron steel body 13% chrome steel disc, hinge pin and body seat ring.

Valves on M.S. Pipes 50mm and below shall be heavy pattern gunmetal valves with cast iron wheel conforming to IS: 778-1984 (Class-II).

3.7.3 Butterfly Valve:

All the isolation valve 50cm 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 24 Bar

b) Valve Component : Material of Construction

i) Body : Cast Iron, Gr. FG 260, IS:210

ii) Disc : Nylon or Epoxy powder coated high duty iron, Gr, FG 260

iii) Stem : Stainless Steel or carbon steel – IS: 1570, Part-II.

iv) Seat : EPDM

v) Hand Lever (Mechanical Memory Stop) : Cast Iron

vi) Bearings : PTFE or Nylon covered S.S. bush bearings at stem and pivot.

vii) Primary Seal : Reinforced PTEE slide bearings

viii) 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 installed.

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

- Provide chain operators w/chain cleats on all valves more than 2.4 meter above floor.

3.7.5 Provide Pressure reducing valve of approved makes and of diameter as indicated including necessary isolation valve (BFV), pressure gauges on upstream & downstream of PRV all complete as per drawing, specification and direction of engineer-in-charge.

3.7.6 Drain Valve:

Provide 25 mm diameter M.S. pipe to IS:1239 (heavy class) with 25mm gunmetal full way valve for draining any water in the system in low pockets same to be extended to nearest drain point as directed by Client's Representative.

3.7.7 Air Release Valve:

Provide 20mm dia, G.M. single acting type air release valve with screwed ends on all high points in the system.

3.8 AIR VESSEL/AIR CUSHION TANK:

Air vessel (air cushion tank) shall be of size and capacity indicated in Bill of Quantities. It shall be provided at the top most point/points or in pump house (as specified). The tank shall be complete with 20mm dia brass air valve (Ball type), stop valve (20mm dia), drain valve (20mm dia) and pressure gauge including 20mm dia M.S. Galvanized pipes and fittings, unions, etc. as required to complete the work as per site conditions.

Air Cushions tank shall be measured by numbers and shall include air valve, pressure gauge, globe valves for testing and draining, M.S. clamps, pipes, fittings, tees, elbows, union and all other items required to complete the work.

3.9 FLOW SWITCH:

Flow switch shall have a paddle made of flexible and sturdy material of the width to fit within the pipe bore. The terminal box shall be mounted over the paddle/ pipe through a connecting socket. The Switch shall be potential free in either N O or N C position as required. The switch shall be able to trip and make / break contact on the operation of a single sprinkler head. The terminal box shall have connections for wiring to the Annunciation Panel. The flow switch shall have connections for wiring the seat shall be of S.S to the Annunciation Panel. The flow switch shall have IP: 55 protections.

The flow switches work at a triggering threshold bandwidth (flow rate) of 4 to 10 GPM. Further, it shall have a 'Retard' to compensate for line leakage or intermitted flows.

3.10 SPRINKLER HEADS:

Sprinkler shall be provided at regular spacing so as to cover required area per sprinkler as per the rated fire hazard. The spacing shall however be in conformity with the drawings and properly coordinated with electrical fixtures, ventilation ducts and grills and other services

along the ceiling. Sprinkler head shall be of brass quartz bulb type with a temperature rating of 68 Deg. C. Sprinkler heads shall be of concealed, pendent, upright and side wall mounted as shown in drawings.

The sprinklers are standard response which incorporates a 5 mm diameter glass bulb as a heat sensitive element.
Sprinkler heads shall UL listed / FM approved. The finish shall be as specified in Bill of Quantities.

Contractor shall install cabinet fabricated from 16 gauge MS sheet with lockable glass shutters. Shelves for keeping spare sprinklers and spanner at locations approved by the Client's Representative and given in the Bill of Quantities.

The spray patterns & finish shall be specified as per manufacturer.

3.11 INSTALLATION CONTROL VALVE:

Installation control valve for sprinkler system shall consist of a vertical alarm valve complete with 50mm dia drain and 15mm test valve with a provision to install water operated turbine alarm. A cast iron sluice valves shall be provided on upstream of alarm valve. The size of alarm valve and sluice valve shall be as indicated in BOQ.

One water operated turbine alarm motor with gong to be provided for each sprinkler installation control valve on the sprinkler main. The alarm shall operate and sound a gong on the drop of pressure and flow of water in the mains. Turbine alarm shall be approved by the Client's Representative and installed at approved locations. The alarm shall be provided with suitable test cock. Both alarm valve and turbine alarm must have UL/FM approval/listing.

Installation control valve shall be measured by numbers and shall include upstream C.I. sluice valve, alarm valve, alarm motor and gong, drain valve, test valve, drain piping (50mm dia M.S. up to 5 M) and all fittings including 2 Nos. pressure gauges required to complete the work.

3.12 TESTING:

All piping in the system shall be tested in the presence of Consultant/ Client's Representative to a hydrostatic pressure of 14 Kg./Sq.cm or twice the design pressure (whichever is higher) without any drop in pressure for at least 2 hours and thereafter the entire system shall be hydraulically tested at 3.5 Kg/Sq.cm above the pump shutoff pressure or 12 Kg/Sq.cm (whichever is higher) for 24 hours without any drop in pressure.

Contractor shall rectify leakage, if any and replace all defective components and retest the system as per above requirements to the satisfaction of and Consultant/Client's Representative.

If required by Client's Representative, at least 10% of all the welded joints shall be radio-graphically tested by the Contractor and half the joints radio-graphed shall be field joints. It will be Contractors responsibility to arrange radiography.

Contractor shall give the water flow test of pumps as required by the Client's Representative.

3.13 SIGNAGE

Required, as per Local fire force like exit signs & Floor indication (eg Ground floor, 1st floor..), size shall 200mm x 500mm & action chart (size shall be 600mm x 1000mm) in case of fire / emergency, Staircase location indication etc. The location / quantity shall be on each landing of every staircase on each floor.

Signs shall be made out of 3mm thick PVC foam board with PVC non – reflective self adhesive vinyl foam board OR equivalent material with Mirror fasteners for fixing complete.

TEST AT THE SITE:
Material at the site will be checked randomly along with the client during the inspection.

4.0 COMMISSIONING OF FIRE FIGHTING SYSTEM:

4.1 SCOPE:

Work under this section shall consist of pre-commissioning, commissioning, testing and providing guarantees for all equipment, appliances and accessories supplied and installed by the Contractor under this contract.

4.2 GENERAL REQUIREMENTS:

Work under this section shall be executed without any additional cost. The rates quoted in this tender shall be inclusive of the works given in this section.

Contractor shall provide all tools, equipment, metering and testing devices required for the purpose.

On award of work, Contractor shall submit a detailed proposal giving methods of testing and gauging the performance of the equipment to be supplied and installed under this contract.

Contractor shall get the thread test between the Fire Department Hose and service connections.

4.3 PRE-COMMISSIONING:

On completion of the installation of all pumps, piping, valves, pipe connections, electrical wiring, motor control panels and water level controlling devices the Contractor shall proceed as follows:

Testing of M.C.C.:

Tests to be carried out for motor control centers shall be:

i) Insulation resistance test with 500 volt megger, before and after high voltage test, on all power and control wiring.

ii) High voltage test at 3000 Volts A. C. for one minute on all power and control wiring.

iii) Low voltage continuity test (6 volts) on power wiring of each feeder, between bus bars and outgoing terminals with switches and contractors in closed position.

iv) Low voltage continuity test (6 volts) on all control wiring.

v) Operation test for all feeders with only control supply made "ON" to ensure correctness of control wiring, operation of the various equipment used, such as push buttons, protective devices, indicating lamps and relays, etc. All contractors shall be checked for the earth bus provided in the M.C.C.

vi) Operation of all instruments and meters provided on the M.C.C.

4.4 FIRE PROTECTION SYSTEM:

i) Check all hydrant valves and close if any valve is open. Check that all suction and delivery connections are properly made.

ii) Test run and check rotation of each motor and correct the same if required.

4.5 PIPE WORK:

i) Check all clamps, supports and hangers provided for the pipes.

A Fill up pipes with water and apply hydrostatic pressure to the system as given in the relevant section of the specifications if any leakage is found. Rectify the same and retest the pipes.

4.6 COMMISSIONING AND TESTING:

Fire Hydrant System:

i) Pressurize the fire hydrant system by running the main fire pump and after attaining the required pressure shutoff the pump.

ii) Open bypass valve and allow the pressure to drop in the system. Check that the jockey pump cuts in and cuts out at the pre-set pressures. If necessary adjust the pressure switch for the jockey pump. Close by pass valves.

iii) Open hydrant valve and allow the water to flow into the fire water tank in order to avoid wastage of water. The main fire pump should cut in at the present pressure and should not cut out automatically on reaching the normal line pressure. The main fire pump should stop only by manual push button. However, the jockey pump should cut out as soon as the main pump starts.

iv) Switch off the main fire pump and test check the diesel engine driven pump in the same manner as the electrically driven pump.

v) When the fire pump have been checked for satisfactory working `ON' automatic controls open fire hydrant valves simultaneously and allow the hose pipes to discharge water in to the fire tank to avoid wastage. The electrically driven pump should run continuously for 8 hours so that its performance can be checked.

vi) Diesel engine driven pump should also be checked in the same manner as given in para above by running for 8 hours.

vii) Check each landing valves, male and female coupling and branch pipes for compatibility with each other. Any fitting which is found to be incompatible and does not fit into the other properly shall be replaced by the Contractor. Landing valves shall also be checked by opening and closing under pressure.

4.7 SPRINKLER SYSTEM:

i) Start the sprinkler pump and develop the right pressure in the sprinkler pipes.

ii) Open the test valve to check the automatic starting of the pump. If necessary make adjustments in the setting of the pressure switch. The sprinkler fire alarm should also operate when the test valve is open.

iii) After satisfactory operation of the pump the Contractor shall set up mock fire and test the system.

4.8 HANDING OVER:

i) All commissioning and testing shall be done by the Contractor to the complete satisfaction of the Client's Representative/consultant, and the job handed over to the client.

ii) Contractor shall also hand over to the client all maintenance and operation manuals and all items as per the terms of the contract.

iii) Contractor shall arrange the inspection from Local Fire Authority to inspect the systems installed by him. Contractor shall arrange to get the system completion and satisfactory working certificate from the local Fire Authority after the inspections conducted by the Local Fire Authority.

iv) Contractor shall train the Facility management staff and security personnel regarding the operation and maintenance of the overall system including necessary preventive maintenance, do's and dont's for the system.

v) Contractor shall also perform a mock up drill to demonstrate the use of complete fire fighting system

vi) All control, drain, test, pumps and alarm valves shall be provided with signs to identify their purposes, functions, direction of flow the satisfaction of the Consultants.

5.0 HAND APPLIANCES:

5.1 SCOPE:

Work under this section shall consist of furnishing all labour, material, appliances and equipment necessary and required to install fire extinguishing hand appliances.

Without restricting to the generality of the foregoing the work shall consist of the following: Installation of fully charged and tested Fire Extinguishing Hand Appliances CO_2, Foam, Dry chemical powder type as required by these specifications and drawings.

5.2 GENERAL REQUIREMENTS:

5.2.1 Fire extinguishers shall conform to the following Indian Standard specifications and shall be with BIS approved stamp as revised and Amended up to date.

a) CO_2 Type : IS:2878

b) Foam Type : IS:933-1989

c) Dry Powder Type : IS 2171-1985

d) ABC Powder Type : IS 1349-1993

e) DCP Trolley Mounted : IS 10658

f) CO_2 Trolley Mounted : IS:2878

g) Mechanical Foam Trolley Mounted : IS:13386

5.2.2 Fire extinguishers shall be installed as per Indian Standard Code of practice for selection, installation and maintenance of portable first aid appliances IS:2190-1979.

5.2.3 Hand appliances shall be installed in readily accessible locations with the Appliance brackets fixed to wall by suitable anchor fasteners.

5.2.4 Each appliance shall be provided with an inspection, testing, change of charge and other relevant data.

5.2.5 All appliances shall be fixed in a true workman like manner truly vertical and at current locations.

5.3 Measurements:

Fire extinguishers shall be measured by numbers and include installation and all items necessary and required and given in the Bill of Quantities.

6.0 ELECTRICAL INSTALLATION

6.1 SCOPE

The scope of work shall include supply , storing, unpacking, fixing of all items associated with electrical equipment such as Motors, Motor Control Centers, Starters Cables, interlocks etc. as required.

6.2 APPLICABLE CODES

All applicable codes, standards and statutory regulations shall be used for design and constructions. In general all equipment materials as well as construction shall be in accordance with the latest issues of Indian Standards currently in force and Installation conforming to IE Rules.

6.3 ELECTRICAL SUPPLY SYSTEM

All equipment shall be suitable to following electrical supply parameters:

Voltage	415 V
Phase	3
Wire	4 Wire System
Hz	50
Grounding	Solid
Variation	5% in either voltage or in frequency or in both.

6.4 EQUIPMENT AND MATERIAL

All equipment shall be as per the specifications and drawings and shall be rated to site conditions.

6.5 APPROVAL

The Contractor shall be responsible for obtaining the approval of Drawings and material from Client's Representative.

6.6 ELECTRICAL MOTORS

Rating and Duty:

a) Motor rating shall be as indicated in the Technical Specifications. Any variation shall be clearly pointed out to Client's Representative and necessary approval to be taken before any installation work is carried out.

b) All Motors shall be rated for continuous duty at maximum output.

c) All Motors to be rated for electrical supply parameter as indicated elsewhere in this document.

Design Features:

a) Motor body shall be of close grained cast iron construction and shall be provided with lifting hook. The Motor along with the fan and half coupling shall be dynamically balanced.

b) Fan provided for fan cooled motor shall be non directional type.

Enclosure/Protections:

a) Enclosures for motors shall be totally enclosed fan cooled (TEFC) unless otherwise indicated-SPDP motors shall be used only where desired output is not obtainable in a TEFC frame.

b) Degree of protection shall be IP44 as per IS 4901 and outdoor motor shall be TEFC weather proof type.

c) All motor frame shall have two earth terminals.

Bearings:

All bearings shall have ball and/or roller bearings with limit lubricators.

Insulation:

a) All motors shall have insulation as specified in specifications and Bill of Quantities sections unless the ambient temperature or other conditions necessitated another class of insulation.

b) All materials used in the construction of motors shall be non-hydroscopic.

Painting:

All motors shall be painted in an approved manner using two priming coats and two finish coats. The final colour shall be to the approval of Client's Representative.

Tests :

a) Routine tests shall be carried out on all motors as per IS 325 at manufacturer's work. Test Certificates shall be furnished for all motors before dispatch of motors to site.

b) Owner reserve the right to witness the tests.

Performance Particulars:

Following performance particulars for all motors to be furnished by Contractor before finalizing the orders for motors.

a) Make
b) Type
c) Enclosure
d) Class of Insulation
e) Temperature rise above 40 degree C
f) Rated Output
g) Speed
h) No load current

i) Full load current
j) Locked rotor current
k) Starting Torque
l) Efficiency at full load,3/4 load,1/2 load.
m) Power factor at full load,3/4 load, 1/2 load.
n) Rotor current at rated output
o) Rotor resistance for different torque values
p) Cable terminal size.

6.7 CONTROL STATIONS

Control stations shall be of cast iron or cast aluminium enclosures, consisting of 'START' and 'STOP' push buttons shall have stay put feature of twist unlock type.

6.8 CABLE AND ACCESSORIES

All cables shall be heavy duty insulated armoured and PVC sheathed of 1.1 kv grade. Aluminium conductor cables shall be used for power and copper cables shall be used for control wiring. Glands used shall be compression type.

6.9 OTHER MATERIAL

a) Structural Material:

This shall include MS angles channels, flats, etc required for fabrication of cable trays, local supports for cables control station etc. All steel sections shall be new and conform to IS 226.

b) Conduits:

Shall be GGI heavy gauge/black enameled with prior approval.

c) Earthing:

Shall be either copper strips or wires of suitable sections used for earthing as per IS 3043. All 3 phase 415 v equipments shall be earthed at two points and single phase at one point.

6.10 DRAWINGS

Contractor shall submit 3 sets of control of schematic wiring diagram for all plumbing equipment showing all protections and interlocking for approval before starting of installation or ordering work.

6.11 INSTALLATION AND PAINTING

a) Motor Control Center shall be installed on welded construction channel frame work. Frame work shall be properly grouted by means of foundation bolts or anchor fasteners.

b) All metal work and metal parts shall be cleaned to remove rust, scale, grease or any other matter. Suitable anti corrosion treatment such as phosphatizing shall be given in to metal

work. All exposed surfaces of the metal work shall then be given a priming coat of zinc chromate or equivalent and finished with two coats of paint of approved shade.

6.12 TESTING AND COMMISSIONING

a) Check tripping and closing of circuit breakers of its protective relays by manual and through control circuit.

b) Check mechanical operation of closing and tripping devices.

c) Check lockout conditions for closing of circuit breakers by stimulating the required conditions.

d) Check control, indications, sequence interlocks and alarm.
e) Check Polarity and connections of instrument transformers.

f) Check CT AND PT connections for its correctness and continuity.

g) Check operation of instruments, meters, relays.

h) Check continuity of power circuits and earth continuity of all non current carrying metallic parts with a low voltage (6V or less) continuity tester.

i) Check insulation of power cables through Megger.

j) Check all equipment for their satisfactory operation and correct wiring.

6.13 OPERATION TEST

a) After successful completion of the above tests operational tests shall be carried out by Contractor for checking the connection done by him and satisfactory operation of all the equipment supplied by him. This test shall be carried out initially without energizing the power circuits.

b) Various control conditions shall be stimulated for the purpose of energized conditions. Any defects deducted during the tests such as blown of fuses damage to circuit breaker or to device shall be rectified by Contractor free of cost.

7.0 MATERIAL AND EQUIPMENT - APPROVED MAKES:

8.1 All materials and equipment shall conform to the relevant standards and shall be of approved make and design. The list of approved manufacturers/vendors is given in clause herein below.

ANNEXURE

ANNEXURE-I

GUARANTEE TO BE EXECUTED BY THE CONTRACTOR FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF WATER PROOFING WORKS.

The agreement made this……day of …… Two Thousand …….. between ……..S/o of Shri …….. (Hereinafter called the GUARANTOR of the one part) and the Chief Executive Officer, DIU SMART CITY LTD, Diu,(hereinafter called the Government of the other part).

WHEREAS THIS agreement is supplementary to a contract (hereinafter called the Contract) dated……..and made between the GUARANTOR OF THE ONE PART AND the Government of the other part, whereby the contractor inter alia, undertook to render the building and structures in the said contract recited completely water and leak proof.

AND WHEREAS THE GURANTOR agreed to give a guarantee to the affect that the said work will remain water and leak proof, **for ten years** from the date of giving water proofing treatment.

NOW THE GUARANTOR hereby guarantees that work executed by him will render the structures completely leak proof and the minimum life of such water proofing treatment shall be **ten years** to be reckoned from the date of expiry of Defect & Maintenance period prescribed in the contract.

The decision of the Engineer in Charge with regard to nature and cause of defect shall be final. During the period of guarantee, the guarantor shall make good all defects and in case of any defect found render the building water proof to the satisfaction of the Engineer in Charge calling upon him to rectify the defects failing which the work shall be got done by the Department by some other contractor at the Guarantors cost and risk The decision of the Engineer in Charge as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to execute the water proofing or commits breach thereunder, then the guarantor will indemnify the principal and his successor against all loss, damage, cost expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and or cost incurred by the Government, the decision of the Engineer in Charge will be final and binding on both the parties.

IN WITNESS WHERE OF these presents have been executed by the obligator……and……..by…….for and on behalf of the President of India, Diu on the day, month and year first above written.

SIGNED, sealed and delivered by OBLIGATOR in the presence of :

1……. 2……

SIGNED FOR AND ON BEHALF OF THE Chief Executive Officer, DIU SMART CITY LTD, Diu,BY……

1……. 2…….

ANNEXURE-II

GUARANTEE TO BE EXECUTED BY THE CONTRACTOR FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF STONE/ TILE WORKS.

The agreement made this……day of …… Two Thousand …….. between ……..S/o of Shri …….. (Hereinafter called the GUARANTOR of the one part) and the Chief Executive Officer, DIU SMART CITY LTD, Diu,(hereinafter called the SPV of the other part).

WHEREAS THIS agreement is supplementary to a contract (hereinafter called the Contract) dated……..and made between the GUARANTOR OF THE ONE PART AND the Government of the other part, whereby the contractor inter alia, undertook to render the Stone/Tile Works in the said contract recited completely.

AND WHEREAS THE GURANTOR agreed to give a guarantee to the affect that the said work will remain intact in all respect, from the date of execution of Stone works/Tile works upto completion of Defect & Maintenance liability period of **Five year**s.

NOW THE GUARANTOR hereby guarantees that work executed by him will render the Stone/Tile Works completely intact in all respect and the minimum life of such work shall be **Five years** to be reckoned from the date of expiry of Defect & Maintenance liability period prescribed in the contract.

The decision of the Engineer in Charge with regard to nature and cause of defect shall be final. During the period of guarantee, the guarantor shall make good all defects and in case of any defect found render the Stone/Tile Works to the satisfaction of the Engineer in Charge calling upon him to rectify the defects failing which the work shall be got done by the Department by some other contractor at the Guarantors cost and risk The decision of the Engineer in Charge as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to execute the Stone/Tile Works or commits breach thereunder, then the guarantor will indemnify the principal and his successor against all loss, damage, cost expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and or cost incurred by the Government, the decision of the Engineer in Charge will be final and binding on both the parties.

IN WITNESS WHERE OF these presents have been executed by the obligator……and……..by…….for and on behalf of the Chief Executive Officer, DIU SMART CITY LTD, Diu,on the day, month and year first above written.

SIGNED, sealed and delivered by OBLIGATOR in the presence of :

1……. 2……

SIGNED FOR AND ON BEHALF OF THE Chief Executive Officer, DIU SMART CITY LTD, Diu,BY……

1……. 2…….

ANNEXURE-III

GUARANTEE TO BE EXECUTED BY THE CONTRACTOR FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF SANITARY INSTALLATIONS/WATER SUPPLY/DRAINAGE WORK.

The agreement made this……day of …… Two Thousand …….. between ……..S/o of Shri …….. (Hereinafter called the GUARANTOR of the one part) and the Chief Executive Officer, DIU SMART CITY LTD, Diu,(hereinafter called the SPV of the other part).

WHEREAS THIS agreement is supplementary to a contract (hereinafter called the Contract) dated……..and made between the GUARANTOR OF THE ONE PART AND the Government of the other part, whereby the contractor inter alia, undertook to render the Sanitary installations/Water supply/Drainage Works in the said contract recited completely.

AND WHEREAS THE GURANTOR agreed to give a guarantee to the affect that the said work will remain intact in all respect, from the date of execution of Sanitary installations/Water supply/Drainage Works upto completion of Defect & Maintenance liability period of **Five years**.

NOW THE GUARANTOR hereby guarantees that work executed by him will render the Sanitary installations/Water supply/Drainage Works completely intact in all respect and the minimum life of such work shall be **Five years** to be reckoned from the date of expiry of Defect & Maintenance liability period prescribed in the contract.

The decision of the Engineer in Charge with regard to nature and cause of defect shall be final. During the period of guarantee, the guarantor shall make good all defects and in case of any defect found render the Sanitary installations/Water supply/Drainage Works to the satisfaction of the Engineer in Charge calling upon him to rectify the defects failing which the work shall be got done by the Department by some other contractor at the Guarantors cost and risk The decision of the Engineer in Charge as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to execute the Sanitary installations/Water supply/Drainage Works or commits breach thereunder, then the guarantor will indemnify the principal and his successor against all loss, damage, cost expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and or cost incurred by the Government, the decision of the Engineer in Charge will be final and binding on both the parties.

IN WITNESS WHERE OF these presents have been executed by the obligator……and……..by…….for and on behalf of the President of India on the day, month and year first above written.

SIGNED, sealed and delivered by OBLIGATOR in the presence of :

1……. 2……

SIGNED FOR AND ON BEHALF OF THE Chief Executive Officer, DIU SMART CITY LTD, Diu,BY……

1……. 2…….

ANNEXURE-IV

GUARANTEE TO BE EXECUTED BY THE CONTRACTOR FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF ALUMINUM DOORS,WINDOWS,VENTILATORS,STRUCTURAL GLAZING WORK.

The agreement made this……day of …… Two Thousand …….. between ……..S/o of Shri …….. (Hereinafter called the GUARANTOR of the one part) and the Chief Executive Officer, DIU SMART CITY LTD, Diu,(hereinafter called the SPV of the other part).

WHEREAS THIS agreement is supplementary to a contract (hereinafter called the Contract) dated……..and made between the GUARANTOR OF THE ONE PART AND the Government of the other part, whereby the contractor inter alia, undertook to render the Aluminum Doors, Windows, Ventilators, Structural Glazing Works in the said contract recited completely.

AND WHEREAS THE GURANTOR agreed to give a guarantee to the affect that the said work will remain intact in all respect, from the date of execution of Aluminum Doors, Windows, Ventilators, Structural Glazing Works upto completion of Defect & Maintenance liability period of **Five years**.

NOW THE GUARANTOR hereby guarantees that work executed by him will render the Aluminum Doors, Windows, Ventilators, Structural Glazing Works completely intact in all respect and the minimum life of such work shall be **Five years** to be reckoned from the date of expiry of Defect & Maintenance liability period prescribed in the contract.

The decision of the Engineer in Charge with regard to nature and cause of defect shall be final. During the period of guarantee, the guarantor shall make good all defects and in case of any defect found render the Aluminum Doors, Windows, Ventilators, Structural Glazing Works to the satisfaction of the Engineer in Charge calling upon him to rectify the defects failing which the work shall be got done by the Department by some other contractor at the Guarantors cost and risk The decision of the Engineer in Charge as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to execute the Aluminum Doors, Windows, Ventilators, Structural Glazing Works or commits breach thereunder, then the guarantor will indemnify the principal and his successor against all loss, damage, cost expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and or cost incurred by the Government, the decision of the Engineer in Charge will be final and binding on both the parties.

IN WITNESS WHERE OF these presents have been executed by the obligator……and……..by…….for and on behalf of the President of India on the day, month and year first above written.

SIGNED, sealed and delivered by OBLIGATOR in the presence of :

1……. 2……

SIGNED FOR AND ON BEHALF OF THE Chief Executive Officer, DIU SMART CITY LTD, Diu,BY……

1……. 2…….

ANNEXURE-V

GUARANTEE TO BE EXECUTED BY THE CONTRACTOR FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF SEASONED/CHEMICALLY TREATED WOODEN SHUTTERS.

The agreement made this……day of …… Two Thousand …….. between ……..S/o of Shri …….. (Hereinafter called the GUARANTOR of the one part) and the Chief Executive Officer, DIU SMART CITY LTD, Diu,(hereinafter called the SPV of the other part).
WHEREAS THIS agreement is supplementary to a contract (hereinafter called the Contract) dated……..and made between the GUARANTOR OF THE ONE PART AND the Government of the other part, whereby the contractor inter alia, undertook to render the Seasoned/Chemically Treated Wooden Shutters in the said contract recited completely.

AND WHEREAS THE GURANTOR agreed to give a guarantee to the affect that the said work will remain intact in all respect, from the date of execution of Seasoned/Chemically Treated Wooden Shutters upto completion of Defect & Maintenance liability period of **Five years.**

NOW THE GUARANTOR hereby guarantees that work executed by him will render the Seasoned/Chemically Treated Wooden Shutters completely intact in all respect and the minimum life of such work shall be **Five years** to be reckoned from the date of expiry of Defect & Maintenance Liability period prescribed in the contract

The decision of the Engineer in Charge with regard to nature and cause of defect shall be final. During the period of guarantee, the guarantor shall make good all defects and in case of any defect found render the Seasoned/Chemically Treated Wooden Shutters to the satisfaction of the Engineer in Charge calling upon him to rectify the defects failing which the work shall be got done by the Department by some other contractor at the Guarantors cost and risk The decision of the Engineer in Charge as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to execute the Seasoned/Chemically Treated Wooden Shutters or commits breach thereunder, then the guarantor will indemnify the principal and his successor against all loss, damage, cost expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and or cost incurred by the Government, the decision of the Engineer in Charge will be final and binding on both the parties.

IN WITNESS WHERE OF these presents have been executed by the obligator……and……..by…….for and on behalf of the President of India on the day, month and year first above written.

SIGNED, sealed and delivered by OBLIGATOR in the presence of :

1……. 2……
SIGNED FOR AND ON BEHALF OF THE Chief Executive Officer, DIU SMART CITY LTD, Diu,BY……

1……. 2…….