CONSTRUCTION OF STAFF HOUSING
AT
THE LAWRENCE SCHOOL
SANAWAR, KASAULI, SOLAN, HIMACHAL PRADESH
173202

(TENDER DOCUMENTS)

M/S SPACE ACE
Architects,Planners, Designers
V-20A/5 DLF CITY- III GURGAON, HARYANA- 122002
PHONE NO: 0124-4106618, 9810066525.
spaceace.india@gmail.com

DATED: NOVEMBER/2022

INDEX

TENDER NOTICE

Dear Sir,

SUB: CONSTRUCTION OF STAFF HOUSING AT THE LAWRENCE SCHOOL, SANAWAR, KASAULI, SOLAN, HIMACHAL PRADESH 173202.

The Lawrence School, Sanawar invites tenders, in duplicate, for the aforesaid work.

Tender copies will be available for download from the website of The Lawrence School, Sanawar http://www.sanawar.edu.in from 05/12/2022.

The tenders may be submitted in the following manner:

Envelope No. 1(EMD):

EMD	Favoring	Amount (Rs.)	DD payable at
	The Lawrence School, Sanawar	50,000 /-	**Sanawar**

1. **The Tenderer must also submit the Mandatory Information strictly in The Lawrence School, Sanawar prescribed Performa. Technical Pre-qualification of the tenderer will be based on the Mandatory Information and supporting documents submitted along with the tender documents as well as Architect/Consultant/The Lawrence School, Sanawar scrutiny of the same and/or inspection of works carried out by the Tenderer. The School reserves the right to accept or reject any tender without assigning any reason whatsoever.**

Envelope No. 2 (Technical Bid):

- □ **Mandatory Information (strictly in the The Lawrence School, Sanawar prescribed Performa)**
- □ **Other supporting documents & credentials of the tenderer.**

2. The tenderer shall submit the completed tender documents duly signed in duplicate in a separate envelope marked as "**Commercial Bid- Envelope No.3".**

Envelope No. 3 (Commercial Bid):

- □ **Commercial Bid.**

2. Tender Bids received in any form other than mentioned above will be disqualified.

3. Sealed tenders, in **duplicate** in the prescribed tender form, with the tender fees and EMD, along with the Mandatory Information etc. and commercial bid (Envelope 1,2 and 3), should be addressed to the Headmaster, The Lawrence School, Sanawar and super scribed **"Tender for Staff Housing The Lawrence School, Sanawar, At Sanawar, Kasauli, Solan, Himachal Pradesh-173202.**

4. The Contractor should certify that he has studied the work at site and acquainted himself with the position with regard to construction, materials and labor required for the work.

5. The Contractor should submit a declaration disclosing all work for which he has already entered into contract, the value of work that remains to be executed in each such contract while submitting the tender and details of any disputes pending in respect of any such contract whether in a court or any other forum or under discussion/ negotiation with the other party to such contracts.

Eligibility Criteria:-

I] Average financial turnover during the last 3 years, ending 31st March of the previous financial year, should be at least 80% of the quoted cost.

II] Experience of having timely & successfully completed similar works during last 5 years ending last day of month previous to the one in which applications are invited should be :- following:-

Every tenderer should furnish the details of similar nature of works completed by them during the last five years, including the contact details of client, architect etc. The tenderer will qualify only if they have completed projects of similar nature of cumulative value, of last five years, totaling to at least 100% of the tender value or should have executed work of similar nature of at least 50% of the tender value in last three years..

A) Two Similar completed works costing not less than the amount equal to 60% of the quoted cost.

B) One similar completed work costing not less than the amount equal to 80% of the estimated cost.

III] One Similar completed work for the heritage building is mandatory, work costing not less than the amount equal to 15% of the estimated cost.

IV] Similar work means Construction and Interior works of same nature /magnitude carried out in **Reputed Institutional projects** in Hills, Including civil, plumbing, electrical, exterior and interior finishing, and firefighting. **The contractor to submit photographs and certificate from client of the qualifying project along with contact number of the client. Upon successful verification and analysis of the completed project through photographs submitted for the quality work done, the contractor will be shortlisted for opening of financial tenders provided that the appointed committee finds the qualifying work acceptable on quality along with nature of work done.** The committee is not answerable to unsuccessful bidder who is not shortlisted for opening of financial bids.

In addition to above, the criteria regarding satisfactory performance of works, personnel, Establishment, plant, equipment etc may be incorporated in the Technical bid.

A) Contact Numbers of 2 client with 2 site locations and assessment and visit to see the contractors competence will be a mandatory part of selection of an eligible contractor by the schools technical term & consultants.

V] All Contractors must visit the site and inspect the existing infrastructure and access the extent of existing Construction.

VI] All Contractors must go through the Tender Drawings & understand the extent and details of the project.

VII] Contractor who have done Heritage Villas & Resorts in the Hills with stone masonry, sloping roofs and detailing will be preferred.

VIII] Only those contractors who have their registered office in India are eligible to apply. Documentary proof need to be submitted for office address.

IX] The Contractor Shortlisted after the assessment will be the sole discretion of the school and its team and final .Being a qualitative analysis and eye for detail. The school holds the final authority for shortlisting the competent contractor.

X] Only those contractors who fulfill the quality eligibility will be allowed to fill the financial bid.

XI] PAN, TIN & GST Numbers should be a mandatory requirement for all bidders and it should be clearly mentioned in tender documents.

Tenders should be submitted to the office not later than 15:00 hrs. On 16/04/2021.

Price Bids- Only eligible L1 tenderer of the shortlisted tenderers whose technical bids have been found acceptable shall be informed via- email, telephone, subsequently. Defect Liability and free Maintenance period shall be twelve months from the date of virtual completion of the works.

Validity of offer shall be 90 days from the date of opening of the tender. The School does not bind Itself to accept the lowest or any tender and reserves to itself the right to accept or reject any or all Tenders, either in whole or in part, without assigning any reason for doing so.

Thank you,

Yours truly,
M/S Space Ace
Date:**NOVEMBER/2022.**

FORM OF TENDER

To,
The Headmaster,
The Lawrence School, Sanawar ,
Kasauli, Solan,
Himachal Pradesh 173202.
Email:
Phone:

Dear Sirs,

Ref: Construction of staff housing for The Lawrence School, Sanawar, Kasauli, Solan, Himachal Pradesh 173202.

Having examined the plans, specifications and schedule of quantities prepared by your **Architect**, **M/s Space Ace**, and satisfying ourselves as to the location of the site and working conditions, I/we hereby offer to execute the above works at the respective rates which I/we have quoted for the items in the Schedule of Quantities.

I/We here with deposit **Rs. 50,000/- (Rupees Fifty Thousand only)** by Demand Draft drawn in favor of The Lawrence School, Sanawar as Earnest Money Deposit for the execution of the works at my/our tendered rates together with any variations should the work be awarded to me /us.

In the event of this tender being accepted, I/we agree to enter into and execute the necessary contract required by you. I/We do hereby bind myself/ourselves to forfeit the aforesaid deposit of **Rs.50,000/- (Rupees Fifty Thousand only)** in the event of our refusal or delay in signing the Contract Agreement. I/we further agree to execute and complete the work within the time frame stipulated in the tender documents. I/we agree not to employ Sub-Contractors without the prior approval of the School.

I/we agree to pay GST, Works Contract Tax, Excise Tax, VAT, Duties, all Royalties and all other applicable taxes prevailing and be levied from time to time on such items for which the same are livable and the rates quoted by me/us are inclusive of the same.

I/we understand that you are not bound to accept the lowest tender or bound to assign any reasons for rejecting our tender. I/we further understand that The Lawrence School, Sanawar may award Contracts for Interior to more than one Contractors and that I/we shall make no claims whatsoever if The Lawrence School, Sanawar accept only a part of my/our tender.

We unconditionally agree to The Lawrence School, Sanawar's preconditions a stipulated in the tender documents.

I/We agree that in case of my/our failure to execute work in accordance with the specifications and instructions received from the Owner or the Architect/Consultants appointed by the School, during the course of the work, the School reserves the right to terminate my contract and forfeit the Earnest money deposit paid by me in additions to recovery of all the dues to the School from the payment receivable by me. Further I may also be barred from tendering in future for the School and its subsidiaries.

I/we enclose demand draft for Rs.50,000/- towards Earnest Money deposit in envelope No.1.

I/we agree to keep our tender open for **30 days** from the date of opening of envelope No.2i.e. (Technical bid). **Any Commercial disclosure in the Envelope no. 1 and/or 2 will disqualify me/us without any further scrutiny.**

I/we enclose herewith the completed tender documents duly signed in duplicate in envelope No. 3. (Commercial Bid).

Yours truly,

[To be signed by the Authorized Representative of Tenderer holding Power of Attorney]

Place:

Date:

INSTRUCTIONS TO TENDERERS:

1.0 Location:

1.1 The site is located at **The Lawrence School, Sanawar ,Kasauli, Solan, Himachal Pradesh 173202.**

1.2 Tenderers must get acquainted with the proposed work and study drawings, designs, specifications, conditions of contract and other conditions carefully before tendering. The Tenderer shall seek clarifications on any item, if required, prior to submitting his tender. No request of any change in rates or conditions for want of information on any particular point shall be entertained after receipt of the tenders.

1.3 The Tenderer is advised to inspect the site to ascertain the nature of site, access thereto, location, facilities for procurement of materials, labor rates and execution of the work. The Tenderer shall be deemed to have full knowledge of the site and drawings whether or not he actually inspects them.

2.0 Submission of Tender:

2.1 Tender must be submitted in original to the Headmaster, The Lawrence School, Sanawar ,Kasauli, Soalan, Himachal Pradesh 173202 and as per details given here under. The rates shall be filled in the Schedule given in, of the tender document.

3.0 In case of any queries, the Tenderer may contact the following –

The Lawrence School, Sanawar
Ph. 01792-261208/208

Architect
M/s Space Ace
Ph. 0124-4106618, 9810066525

3.1 The tender shall be submitted in two parts in separately sealed envelopes: The envelope containing the tender offer shall be duly super scribed with the above title.

3.2 The Tenderer is requested to quote strictly as per the terms and conditions and specifications given in the tender document and not to stipulate any deviations. However, deviations, if unavoidable, should be indicated separately indicating the specific page number and clause number against which the deviations are made. Wherever specifications of certain works are not available they shall be deemed to be done as per relevant I.Scode.

3.3 Addenda to this tender document, if issued, must be signed and submitted along with the tender document.

3.4 All pages to be initialed:

All signatures in tender documents shall be dated and stamped. All pages of tender documents shall be initialed at the lower right hand corner or signed wherever required in the tender papers by

the Tenderer or by a person holding power of attorney authorizing him to sign on behalf of the Tenderer before submission of tender.

3.5 Rates to be in figures and words:

The Tenderer should quote in English both in figures as well as in words the rates and amounts tendered by him in the Schedule of Rates for each item and in such a way that interpolation is not possible. The amount for each item should be worked out and entered and requisite totals given of all items both in figures and in words. The tendered amount for the work shall be entered in the tender and duly signed by the Tenderer.

3.6 Corrections and Erasures

No corrections and alterations in the entries of tender papers shall be permitted. If any they shall be signed and dated in full by the Tenderer. Corrections with white fluid and overwriting are not permitted.

3.7 The tender shall contain the names, postal address of the residence and place of business of authorized person signing the tender and shall be signed in /his usual signature. Partnership firms shall furnish the full names of all Partners in the tender. It should be signed in the partnership name by all the partners or by duly authorized representative followed by the name and designation of the person signing. Tender by a Corporation shall be signed by an authorized representative, and a power of Attorney on their behalf shall accompany the tender. A copy of the partnership deed of the firm with names of all partners shall be furnished.

3.8 When a Tenderer signs a tender in a language other than English, the total amount tendered should, in addition, be written in the same language. The signatures should be attested by at least one witness.

3.9 Witness:

Witnesses and sureties shall be persons of status and propriety and their names, occupation and address shall be stated below their signatures.

4.0 Information required along with tender:

The following details are required to be submitted along with tender:

a) Power of Attorney in the name of persons who has signed the tender document.

b) Each Tenderer shall submit with his tender a list of large works of like nature he has executed giving details as to their magnitude and cost, the proportion of work done by the contractor in it and the time within which the works were completed. The Tenderer shall also submit along with his tender a list mentioning the names of manufacturers of specialized items.

c) Any printing or typographical errors/omission in tender document shall be referred to the Architects appointed by the School and their interpretation regarding correction shall be final and binding on Contractor.

5.0 Transfer of Tender Documents:

Transfer of tender documents purchased by one intending Tenderer to another is not permitted.

6.0 Earnest Money:

6.1 The Tenderer shall pay the amount of Earnest Money as mentioned in the Notice Inviting Tender, by Bank Demand Draft payable to The Lawrence School, Sanawar at Kasauli, Solan, Himachal Pradesh. No interest on Earnest Money deposited by the Tenderer shall be allowed. The Tenderer should attach the School draft along with the tender failing which the tender will not be considered.

6.2 The Earnest Money of the unsuccessful Tenderers will be refunded within a reasonable period of time without any interest.

- The Earnest Money deposited by the successful Tenderer shall be retained as part of Security Deposit.

- The Security Deposit shall be forfeited if the Contractor fails to observe any terms and conditions of the Contract.

- The Earnest Money, shall be **Rs 50,000/-** to be paid in the form of Demand Draft only.

7.0 Validity:

Tenders submitted by Tenderers shall remain valid for acceptance for a period up to 90 days from the date of opening of tender. The Tenderers shall not be entitled during the period of validity, without the consent in writing of the School to revoke or cancel his tender or to vary the tender given or any terms thereof.

8.0 Addenda:

8.1 Addenda to the tender document may be issued if required to clarify documents or to reflect modifications to the design or contract terms.

8.2 Each addendum issued by the Architect will be distributed to each person or organization to which a set of tender documents has been issued. Each recipient will submit the same along with his tender. All addenda issued by the Architect shall become part of Tender Documents.

9.0 Right to accept or reject tender:

9.1 The acceptance of a tender will rest with the School who do not bind themselves to accept lowest tender and reserve to themselves the authority to reject any or all the tenders received without assigning any reasons. They also reserve the right of accepting the whole or any part of the tender and the Tenderers shall be bound to perform the same at the rates quoted. All tenders

in which any of the prescribed conditions are not fulfilled or are incomplete in any respect or there is any correction not duly signed and dated by the Tenderer are liable to be rejected. For this purpose Tenderer shall quote rates for various items which will be self sufficient to meet their whole costs for executing any / every item. No demand for variations in rates for items executed shall be entertained on the plea of the School deciding to delete, alter or reduce the quantities specified in respect of the any item.

9.2 The work may be awarded to one or more agencies duly splitting the work at the entire discretion of the School and the Architect. The quoted rates shall hold good for such an eventuality.

10. Rates:

10.1 The School is not concerned with any rise or fall in the prices of materials and labor. The rates quoted shall include all costs, allowances, taxes including sales tax on works contract or any other charges including any enhanced labor rates etc. which may become effective for any reason including those due to acts of Government/ Statutory Bodies enacted from time to time by the State and or the Central Government. Under no circumstances, shall the School be held responsible for compensation or loss to the contractor due to any increase in the cost of labor or materials etc.

10.2 The rate quoted in the tender shall also include electric and water consumption charges for construction and erection. If power and water are available at the site, the Contractor shall have to make his own arrangements to obtain the connections from the available sources at his own expense and maintain an efficient service of electric light and power and water and shall pay for the services consumed and maintain the installations at his own cost. If no power and water are available at the site, the Contractor shall have to make his own arrangements to obtain power and water connections and maintain at his own expense an efficient service of electric light and power and shall pay for the electricity consumed.

10.3 The rate quoted in the tender by the contractor should include cost of 3 sets of 10" x 12" photographs done by a reputed professional photographer, of the completed work.

10.4 Contractor to include cost of pest control treatment of the entire site, including white ants, roaches, rodents for one year from date of virtual completion of the contract.

10.5 Contractor to coordinate and assist the Architect in obtaining all statutory approvals including any other State and Central rules in force. Any expenses incurred in obtaining such approvals are deemed included in the rates quoted by the Contractors.

10.6 The entire Premises work shall be guaranteed to be free from manufacturing defects, defective workmanship or materials and any defects that may appear within 12 months from the date of issue of completion certificate which in the opinion of the School/Consultants have arisen from bad manufacturing, workmanship or materials, shall upon intimation be made good by the Contractor at his own cost within the time specified. During the said period of 12 months the Contractor shall without any extra cost, carry out all routine and special maintenance of the Premises and attend to difficulties and defects that may arise. The Tenderer / Contractors shall associate with him during the execution and free service period, the operation and maintenance staff of the School.

10.7 Payments for the work to be executed under this contract shall be made as per the tender document, and no variation in the mode of payment will be acceptable.

10.8 The Tenderer shall guarantee that the work shall conform to the detailed specifications.

10.9 Before handing over the Premises, 6 copies shall be furnished to the School along with 6 sets of "as built" drawings of all the works done as executed by the contractor. In addition to hard copy of as built drawings, the contractor shall also supply a computer CD containing these drawings in a digital form (done with AutoCAD - 2008 or above version) similarly the operation and maintenance manual etc. shall also be supplied in a CD with suitable indexing format for easy retrieval and reference.

11. Signing of the Contract:

11.1 The successful Tenderer shall be required to execute an agreement in the Performa attached with this tender document within 7 days from the date of receipt of the notice of acceptance of tender. In the event of failure on the part of the successful Tenderer to sign the agreement within the above-stipulated period. The School reserves the right to forfeit the earnest money/ security deposit and cancel the contract.

11.2 Until the Agreement is formally signed, the Work Order / Letter of Acceptance of Tender issued to the successful Tenderer and accepted by him shall be operative and binding on the School and the Contractor.

11.3 On acceptance of the tender, the name of the accredited representatives of the Tenderer who would be responsible for taking instructions from the School shall be mentioned by the Tenderer.

11.4 If so decided, the School reserves the right to appoint PMC (Project Management Consultant), Independent Third party audit of quality, quantity, safety, billing etc. or any other agency to get the quality of works checked, measurements recorded, including certification of bills etc.

11.5 The School reserves the right to reproduce partly or fully the items executed on site anywhere in the country premises and no copyright claims shall be made by any contractor of any description from the School.

11.6 The School has the right to delete items, reduce or increase the scope of work without the contractor claiming any compensation for the reduction in the scope of work.

11.7 I / We hereby declare that I / We have read and understood the above instructions for the guidance of the Tenderers.

Witness

_____

_____

_____

_____

_____

Address:

_____

_____

Date:_____

Signature of the tenderer

Address

_____

_____

Date: _____

Mandatory information required for Prequalification of the bidder for Construction of Staff Housing for The Lawrence School, Sanawar ,Kasauli, Solan, Himachal Pradesh 173202.

Important:

1. Please type or handwrite in capital letters.
2. Attach copies of the supporting documents.
3. Please use additional sheets if required.

Name of the Bidder :

email address :

Telephone number office :

Telephone number office :

Fax no. :

Address 1 :

Address 2 :

City :

Pin code :

Year of Establishment :

Status of the Firm : Proprietary/Partnership/Pvt. Ltd./Pub. Ltd.

Names of the directors/Partners/proprietor :

Name and address of Share Holder 1:

Name and address of Share Holder 2:

Name and address of Share Holder 3etc:

Registration number and date with Registrar of Companies/Firms:

PAN Card Number :

GST:

GST Number : **(Contractor who do not submit valid Sales Tax / VAT document shall not be considered for opening of price bid)**

Request copies of the Balance sheet :

Empanelment with the other Companies/PSUs :

Field of activities :

Main Activity :

Value of the total work done till date :

List particulars of minimum5successfully completed works during last Seven years amounting to Rs._____& more:

List Number of Technical staff Working in the organization:

List number of other staff working in the organization:

Have you in past carried out any Works for The Lawrence School, Sanawar or its subsidiaries?:

Have you been ever disqualified or levied penalty by the School in past for non fulfillment of the contractual obligations. If yes, please provide details in brief. :

Have you been ever been put on holiday list or banned by any Organizations and Institutions? If yes please provide details in brief:

I/We confirm that to the best of our knowledge this information is authentic and accept that any deliberate concealment will amount to disqualification at any stage.

Seal and Signature of the Bidder/s. Date:
Place:

ARTICLES OF AGREEMENT

TO BE STAMPED AS AN AGREEMENT

ARTICLES OF AGREEMENT

ARTICLES OF AGREEMENT made at Sanawar on the __/___/2022 between **THE LAWRENCE SCHOOL, SANAWAR** (Hereinafter called "**the School**") of the one part

AND

_____(herein after called "**The Contractor**") which expression shall, unless repugnant to the context, mean and include of the other part.

WHEREAS

The School is desirous of carrying out Construction of staff housing at **The Lawrence School, Sanawar ,Kasauli, Solan, Himachal Pradesh 173202.**
(hereinafter referred to as the said **site**) and the said complex as is more fully described in the layout drawings and for the purpose, the parties hereto have agreed to entered into this contract (hereinafter referred to as the contract).

1. **The School** has for the purpose, arranged drawings and specifications, describing the works to be done: prepared by **M/S Space Ace,** its Architect/Consultant having office at V -20A/5,DLF CITY -III,PH-0124-41066418 ,GURGAON, HARYANA-122002.

2. The said drawings have been signed by or on behalf of the parties.

3. **The Contractor** has agreed to execute the said works viz. Staff Accommodation Works subject to the provisions hereinafter contained and subject also to General and Special Conditions, Safety Code, Model Rules for the protection of health and Sanitary arrangements for works, Specifications, Preambles and Schedule of Quantities and installation schedule, all of which are hereinafter collectively referred to as the 'said tender conditions' strictly in accordance with the drawings annexed hereto, and the specifications and schedule of quantities referred to above at or for the respective rates set out in the priced Schedule of Quantities amounting to the sum as there under arrived at or such other sums as shall become payable there under (hereinafter referred to as the said contract value).

NOW IT IS HEREBY AGREED AS FOLLOWS:-

1. In consideration of the said contract value to be paid by **the School** to the Contractor at the time and in the manner set forth in the said tender conditions and in accordance with the Schedule of payments to execute and complete the work shown upon the said Drawings strictly in accordance with the specifications and priced schedule of quantities.

2. The expression "**Architect/ Consultant**" in the said condition shall mean **Architect/ Consultant** for the Construction and Interior works of said building for civil, plumbing, electrical, exterior and interior finishing, and firefighting works. In the event of their or any of them ceasing to be Architect/ Consultant as the case maybe, for whatever reason such other person or persons as shall be, appointed by the School. For that purpose PROVIDED

ALWAYS, that no person subsequently appointed to be Architect/ Consultant, shall be entitled to disregard any opinion or decision or approval or instruction given or expressed in writing by the Architect/ Consultant/Consultants for the time being.

3. The said tender Conditions and the Annexure hereto shall be read and construed as forming part of this contract and the parties hereto shall respectfully abide by, submit themselves to the said conditions and perform the agreements on their part respectively contained in the said conditions.

4. The approved drawings mentioned herein shall also form the basis of this contract.

5. This Contract is neither a fixed Lump sum Contract, nor a piece work contract, but is a contract to carry out the work on item rate basis to be carried out and to be paid for according to the actual measured quantities at the rates contained in the schedule of Quantities and probable quantities as contained in the priced Schedule of Quantities.

6. The contract herein contained shall comprise not only the works mentioned above but all subsidiary works connected therewith at and within the same site as may be ordered to be done from time to time by the said **Architect/ Consultant** for the time being, even if such work may not be shown on the said drawings or described in the said schedule of specifications and schedule of Quantities.

7. The Schools reserves to themselves the right of altering the drawings and the nature of the work through the **Architect/Consultant** by adding to or omitting any items of work or having portions of the same carried out without prejudice to this contract.

8. Time shall be considered as the essence of this contract and the **Contractor** hereby agrees to commence the work within 15 days from the date of work order or handing over of the site as provided for in the said terms and conditions, whichever later, and shall complete the entire work within the specified period, subject nevertheless to be provisions for extension of time as may be agreed to by the School and as contained in the said conditions.

9. All disputes arising out of or in any way connected with this contract shall be deemed to have arisen at Sanawar and only courts in Kasauli/Solan shall have jurisdiction to determine the same.

10. This contract shall be signed in quadruplicate, the original whereof shall be kept in the custody of the School, the duplicate with the Contractor, the triplicate with the **Architect/Consultant**.

11. That the contract and several parts of this contract have been read by the contractor and fully, understood by the contractor. The contractor shall not be entitled for payment beyond tender quantities unless ordered specifically by written instructions of **School**.

IN WITNESS WHERE OF the School has set his hands here unto and three duplicates hereof through his duly authorized official and **the Contractor** has caused these presents and three duplicates hereof under his common seal/by his duly authorized representative at the place and on the date month and year first herein above written.

_____

SIGNED SEALED AND DELIVERED by THE LAWRENCE SCHOOL, SANAWAR , by the hand of Shri. (Name and Designation) in the presence of

1. Name _____
2. Address _____

SIGNED SEALED AND DELIVERED BY M/s. ___

The contractor by the name of Shri_____(Name and Designation) in the presence of

(1)____

Address:

_____

THE COMMON SEAL OF M/s____the contractor was hereunto affixed pursuant to the resolutions passed by its Board of Directors at the meeting held on_____in the presence of:

(1) _____

(2) _____

Directors who have signed these presents in token thereof in the presence of

(1) _____

(2) _____

1. GENERAL CONDITIONS OF CONTRACT

1.1. In construing these conditions and the specifications, Schedule of Quantities and Contract Agreement, the following words shall have the meanings herein assigned to them except where the subject or context otherwise requires :

1.2. "**School"** shall mean "**The Lawrence School, Sanawar" with its Office at Kasauli, Solan, Himachal Pradesh, 173202** and shall include his/their heirs, legal representatives, assignees and successors.

1.3. The "**Architect/Consultant**" shall mean the Architect named in the Tender, appointed by the School for the said works.

1.4. The **"Consultants"** for Construction of Staff Housing shall mean the Consultants named in the Tender, appointed by the Architect for Construction of Staff Housing on their own behalf.

1.5. "**Contractor" / "Contractors**" shall mean the person or the persons, firm or company whose tender has been accepted by the School and shall include his/their heirs, and legal representatives, the permitted assigns and successors.

1.6. "**This Contract**" - Shall mean the Articles of Agreement, the conditions, the Appendix, the Schedule of Quantities and specifications attached hereto and duly signed.

1.7. "**Site**" - Shall mean the site of the contracted works including any building and erection thereon and any other land (inclusively) as aforesaid allotted by the School for the contractor's use.

1.8. "**Works**" shall mean the works to be executed and recorded in accordance with the Contract and shall include all extra or additional altered or substituted works as required and recorded for the performance of the Contract

1.9. "**Contract Documents**" shall include the notice inviting Tenders, the Articles of Agreements, the General Conditions of Contract, the special conditions of contract, the Appendices, the Schedule of Quantities, Specifications for Materials, Work-Sheet and mode of measurements, and drawings pertaining to the work. All sections of this Contract Document are to be read together. Further such correspondence between the School / Architect/Consultant and Contractors as admitted by the School before award of work and thereafter shall also form part of contract documents.

1.10. "**Drawings**" shall mean the drawings referred to in the specifications, description of items etc. and any modifications of such drawings approved in writing by the Architect/Consultant and such other drawings as may from time to time be furnished or approved in writing by the **Architect/Consultant.**

1.11. "**Notice in Writing**" or written notice shall mean a notice in writing, typed or printed characters, sent by the School or **Architect/Consultant** (unless delivered personally or otherwise) proved to have been received by registered post to the last known private or business address or registered office of the contractors and shall be deemed to have been received by them when in the ordinary course of post it would have been delivered.

1.12. "**Act of Insolvency**" shall mean any Act of Insolvency as defined by the Presidency Towns

Insolvency Act, or the Provincial Insolvency Act or any Act amending such original act/s..

1.13. **"Virtual Completion**" shall mean that the works are in the opinion of the **Architect/ Consultant/ School** complete or fit for occupation.

1.14. Words importing persons include firms and Corporations, words importing the singular only also include the plural and vice versa where the context requires.

1.15. Headings and marginal notes to these conditions shall not be deemed to form a part there of or be taken into consideration in the interpretation or construction thereof or of the contract.

1.16. "**Net Prices**" - If in arriving at the contract amount the contractor shall have added to or deducted from the total of the items in the Tender any sum, either as a percentage or otherwise, then the net price of any item in the Tender shall be the sum arrived at by adding to or deducting from the actual figure appearing in the Tender as the price of that item a similar percentage of proportionate sum, provided always that in determining the percentage or proportion of the sum so added or deducted by the contractor the total amount of any Prime Cost Items and Provisional sum of money shall be deducted from the total amount of the Tender. The expression "net rates" or "net prices" when used with reference to the contract or accounts shall be held to mean rates or prices so arrived at. Words "importing persons" including firms and corporations. Words importing the singular only also include the plural and vice versa where the context requires.

2. SCOPE OF CONTRACT:

2.1. The contract comprises of the construction, completion and maintenance of the works, provision of all labor, materials, constructional plant, temporary works and everything whether of a temporary or permanent nature required in and for such construction, completion and maintenance.

2.2. The Contractor shall carry out and complete the works in every respect in accordance with this Contract and with the directions of and to the satisfaction of the **Architect/Consultant/School**. The **Architect/ Consultant** may in his absolute discretion and from time to time issue further drawings and/or written instructions, details, directions and explanations, which are here after collectively referred to as "**instructions**". These instructions shall be reflected either in the minutes or in any other form when The Lawrence School, Sanawar approval/ consent is obtained in regard to: -

2.2.1. The variation or modification of the design, quality or quantity of works or the addition or omission or substitution of any work.

2.2.2. Any discrepancy in or divergence between the Drawings or between the Schedule of quantities and/or Drawings and/or specifications.

2.2.3. The removal from the site of any materials brought thereon by the Contractor and the substitutions of any other materials thereof.

2.2.4. The removal and/or re-execution of any works executed by the Contractor.

2.2.5. The postponement of any work to be executed under the provisions of this Contract.

2.2.6. The dismissal from the works of any person employed there upon.

2.2.7. The opening up for inspection of any work covered up.

2.2.8. The amending and making good of any defects.

2.2.9. Co-ordination of work with other agencies appointed by the School for due fulfillment of the total work.

2.2.10. The School shall have a right to delete any item of work from the scope of contract and contractor shall not make any extra claim on this account.

2.2.11. The Contractor shall forth with comply with and duly execute any work contained in **Architect/ Consultants/ School** instructions whether oral or written, It is provided that verbal instructions, directions and explanations given to the Contractor or his representative upon the works by the **Architect/ Consultant/ School** shall, if involving a variation, be confirmed in writing by the Contractor within 5 days and if not dissented from in writing within a further 10 days by the **Architect/ Consultant/ School,** such shall be deemed to be the **Architect/ Consultant's/ School's** instructions within the scope of the contract.

2.2.12. If Compliance with the **Architect/ Consultant's/ School's** instructions involves any variation, the School shall pay the Contractor on the Architect's certificate the price of the said work (As an extra to be valued by the Architect as herein after provided).

2.2.13. If the Contractor fails to comply with the **Architect/ Consultant's/ School's** instructions within a fortnight after the receipt of written notice from the **Architect/ Consultant/ School** requiring compliance with such instructions, the School through the **Architect/ Consultant/ School** may employ some other agency to execute any work whatsoever which may be necessary to give effect to such instructions

2.2.14. For the purpose of entering day-to-day instructions by the **Architect/ Consultant/ School**, the Contractor shall maintain at his own cost, a **"Site Instruction Book"** in quadruplicate in which the instructions shall be entered by **Architect/ Consultant/ School**.

2.2.15. 'Instruction' to the Contractor shall be generally issued through **Architect/ Consultant/ School**. However **School** may issue instructions directly, if deemed fit.

3. GENERAL OBLIGATIONS

3.1. CONTRACT:

The contractor shall enter into and execute a contract in the form annexed hereto within the line specified in the letter of intent and in default thereof the earnest money paid by the contractor shall be forfeited and acceptance of this tender shall be considered as withdrawn. The cost of the stamp of the agreement is to be borne and paid by the contractor.

3.2. TOTAL SECURITY DEPOSIT:

Total Security Deposit shall comprise:

- Earnest Money Deposit
- Initial Security Deposit
- Retention Money

3.2.1. EARNEST MONEY DEPOSIT:

a) The Tenderer shall deposit an **Earnest Money Deposit** (EMD), in the form of Demand Draft or Banker's cheque drawn in favor of **The Lawrence School, Sanawar** at the time of submission of tender as Earnest Money.

b) No tender shall be considered unless the Earnest Money is deposited. No Interest shall be paid on this Earnest Money Deposit.

c) The Earnest Money of an unsuccessful Tenderer will be refunded, without any interest, soon after the decision to award the work is taken.

d) The Earnest Money Deposit shall stand absolutely forfeited if the Tenderer revokes his tender at any time during the period when he is required to keep his tender open for acceptance by the School, or if, after the tender is accepted, the Contractor fails to enter into a formal agreement/ or if he fails to pay the security deposit as stipulated/or if he fails to commence the work within stipulated time limit. The EMD of appointed tenderer will be released after issue of virtual completion certificate by architect and accepted by the school.

3.2.2. SECURITY DEPOSIT:

a) The successful Tenderer to whom the Contract is awarded shall deposit as initial security deposit by Demand draft or Bank Guarantee a sum to make up 2.5% of the value of the accepted tender.

b) The successful Tenderer shall pay security deposit within (10 days) Ten days after receiving the letter of acceptance of his tender. No interest shall be paid on this security deposit.

c) The security deposit, either in whole or in part thereof, shall be forfeited in the event of the Contractor's failure to observe any terms of this Contract/or non-compliance with the conditions of the Contract.

d) On virtual completion of the job and on the Contractor's submitting to the **Architect/**

Consultant/ School the **"As built" drawings**", the **Architect/ Consultant/ School** shall declare the job to be virtually complete and issue a certificate to this effect.

e) Security deposit will be released upon completion of 12 calendar months from the date of acceptance of Virtual Completion within 15 days after adjusting all dues if any from the contractor.

3.2.3. RETENTION MONEY:

a) In addition to the Initial Security Deposit, retention money shall be deducted from running account bills at 5% of gross value of certified work.

b) If the Contractors do not carry out the rectification work during the Defects Liability Period, the School shall have the right to get such defective work rectified after giving due notice in writing to the Contractors and recover the cost of repairs from the money so retained.

c) The retention amount will be released upon completion of 12 calendar months from the date of acceptance of Virtual Completion within 15 days after adjusting all dues if any from the contractor.

3.3. ACCESS TO WORKS:

The **Architect/ Consultant/ School** and any person authorized by them shall at all reasonable times have free access to the works, and to the workshops, Factories or other places where materials are being prepared or constructed for the Contract and also to any place where the materials are lying or from which they are being obtained. The Contractor shall give every facility to the **Architect/ Consultant/ School** and their representatives for inspection and examination and test of the materials and workmanship. No person unless authorized by the **Architect/ Consultant or the School**, except the Representatives of Statutory Public Authorities authorized by the School, shall be allowed on the works at any time. If any work is to be done at a place other than the site of the works, the Contractor shall obtain the written permission of the **Architect/ Consultant/ School** for doing so.

3.4. TENDERER TO VISIT SITE:

Each Tenderer must before submitting his tender visit the site of works so as to ascertain the physical site conditions and prices, availability and quality of materials according to Specifications before submitting the quotations.

3.5. INSPECTION OF SITE AND SUFFICIENCY OF TENDER:

3.5.1. The Contractor shall inspect and examine the site and its surrounding and shall satisfy himself before submitting his tender as to the form and nature of the site, the quantities and nature of access to the site, the accommodation he may require and in general, shall himself obtain all necessary information as to risk, contingencies and other circumstances which may influence or affect his tender.

3.5.2. The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the works and of the rates and prices quoted in the

Schedule of work/ items/ quantities or in Bills of Quantities, which rates and prices shall, except as otherwise provided, cover all his obligations under the Contract and all matters and things necessary for proper completion and maintenance of the works.

3.5.3. No extra charges consequent on any misunderstanding or otherwise shall be allowed.

3.6. INSPECTION OF DRAWINGS:

Before filling in the Tender, the Tenderer will have to check up all Drawings and Schedule of Quantities, and will have to get an immediate clarification from the **Architect/ Consultant/ School** on any point that he feels is vague or uncertain. No Claim nor damages or compensation will be entertained on this account.

3.7. INTERPRETATION OF CONTRACT DOCUMENTS

3.7.1. The various sections of tender / contract documents are intended to be complementary to one another.

3.7.2. In case of a discrepancy in the description of a subject between different sections, the following guidelines shall generally apply.

3.7.3. Special Conditions of Contract shall override General Conditions of Contract.

3.7.4. Special specifications shall override General specifications.

3.7.5. For the sole purpose of determination of rates and prices, the Schedule of Quantities including its Preamble shall override Specifications and drawings.

3.7.6. Detailed drawings shall override General layout drawings.

3.7.7. Hard copies of the drawings shall override Soft copies.

3.7.8. Irrespective of these general guidelines the Contractor shall bring any discrepancy he notices immediately to the attention of the **Architect/ Consultant/ School** and shall follow **Architect/ Consultant's/ School's** instructions accordingly.

4. QUALITY CONTROL

4.1. QUALITYASSURANCE:

The contractor shall prepare a detailed quality assurance program to control activities connected with the work to ensure a quality job at various stages.

- Planning
- Execution
- Completion
- Post Completion Maintenance

4.2. DRAWINGS AND SPECIFICATIONS:

4.2.1. The Work shall be carried out to the entire satisfaction of the **School / Architect/ Consultant** and in accordance with the signed drawings, specifications, preambles and such further drawings and details as may be provided by the **Architect/ Consultant/ School** and in accordance with such written instructions, directions and explanations as may from time to time be given by the **School / Architect/ Consultant** whose decisions as to sufficiency and quality of the work and materials shall be final and binding upon all parties.

4.2.2. No drawing shall be taken as in itself an order for execution unless, in addition to the **Architect/ Consultants** signature, it bears express words stating remark **"GOOD FOR CONSTRUCTION".**

4.2.3. Three complete sets of the signed Drawings and Specifications and Schedule of Quantities shall be furnished by the **Architect/ Consultant** to the Contractor. Such copies shall be kept on the works, and the **Architect/ Consultant** or his Representatives shall at all reasonable time have access to the same.

4.2.4. All drawings and specifications shall be returned to the **Architect/ Consultant** by the Contractor before the issue of the final certificates. The original copy of contract shall remain in the custody of the School and shall be produced by him at his office as and when required.

4.2.5. Any additional prints of drawings if any, required by the contractor will be supplied by the **Architect/Consultant** on the payment of charges as stipulated in clause **4.2.8.**

4.2.6. Over and above, Soft Copies of the drawings will be issued by the **Architect/ Consultant** if requested by the Contractor. Necessary protection will be used by the **Architect/ Consultant** to prevent willful editing of such soft copies of the drawings by the contractors. In case of any dispute on between Contractor and **Architect / Consultant** on sanctity of such drawings, hard copies issued by the **Architects/ Consultants** shall prevail and by binding on both the parties.

4.2.7. DIMENSIONS:

Figured dimensions are in all cases to be followed and in no case should they be scaled. Large-scale details take precedence over small- scale drawings, in case of the discrepancy; the Contractor is to ask for an explanation before proceeding with the work.

4.2.8. ISSUE OF EXTRA CONSTRUCTION DRAWINGS:

a) **Architect/ Consultant** will supply six sets of drawings to the Contractor for construction with spiral bending. Extra prints of drawings for construction will be issued on chargeable basis by **Architect/ Consultant** as detailed here under:

i)	A0-Size	Rs.300.00each
ii)	A1-Size	Rs.200.00each
iii)	A2-Size	Rs.100.00each
iv)	A3-Size	Rs. 50.00each
v)	A4-Size	Rs. 10.00each

b) The Contractor shall ensure that all the bills furnished by the **Architect/Consultant's** Office in this regard are honored, failing which the certificate for payment of Contractor's next Interim Bills will be withheld. The drawings are to be used only for the project concerned.

4.2.9. CONSTRUCTION DRAWINGS:

a) The successful Tenderer shall state, on receiving the Letter of Intent, what drawings are yet to be issued by the **Architect/Consultant** for construction purposes and what further details are required by him from the **Architect/Consultant**. Silence on the part of the successful Tenderer in this regard will be construed to mean that he has all the information that he needs for ordering out materials and for contractual purposes. Unless specifically asked for in writing, delays later claimed by the successful Tenderer on account of drawings will not be construed as reason for delay in the execution of the work.

b) Apart from clarifications sought during the periodic visits to site by the **Architect/ Consultant's** representative, the successful Tenderer shall obtain all clarifications on the **Architect/ Consultant's** drawings from their office.

c) Extra/Variations not registered within 2 weeks on receipt of drawings will not be entertained.

4.2.10. SHOP DRAWINGS AND TECHNICAL DATA

The Contractor shall submit, in triplicate within mobilization period on receipt of acceptance of the tender, detailed shop drawings, and specifications showing the complete details of all relevant works required to be done by The Lawrence School, Sanawar in connection with the Civil / Interiors etc. works. He will be held responsible for any discrepancies, errors, and omissions in the drawings or particulars submitted by him even if these have been approved by the **Architect/ Consultant**. Any delay in submitting shop drawings shall be the Contractor's responsibility and shall be to his account.

4.2.11. COMPLETION DRAWINGS/ACCEPTANCE OF INSTALLATIONS:

a) The Contractor shall submit the required guarantees for the works in approved formats as well as performance guarantees for those items of works for which such guarantees are required.

b) Before handing over the Premises, 3 copies of maintenance manual for major items shall be furnished to the School along with 3 sets of **"as built"** drawings of all the works done as executed by the contractor.

c) In addition to hard copy of as built drawings, the contractor shall also supply soft copies of these drawings in AutoCAD – 2008 OR latest version format similarly the maintenance manual etc. shall also be supplied in soft form with suitable indexing format for easy retrieval and reference.

4.2.12. TECHNICAL DATA:

Technical Data of relevant items shall be furnished as required.

4.2.13. ACTION WHERE THERE IS NO SPECIFICATION:

In the case of any class of work for which there is no Specifications mentioned, the same shall be carried out in accordance with the Indian Standard Specifications subject to the approval of the **Architect/ Consultant/ School**.

4.3. EXTENT OF CONTRACT:

Items executed shall be complete in all respect with accessories, fittings as required though they may not have been specifically mentioned in the technical specification. All similar standard components/ parts of similar items shall be inter-changeable.

4.4. MATERIALS & WORKS

4.4.1. APPROVAL OF SUPPLIERS:

For all supplies, the names of manufacturers/brands have to be got approved by the **Architect/ Consultant/ School** after getting the respective samples first approved by the **Architect/ Consultant/ School** as the case may be. All materials will be of tested quality and as per relevant Indian Standards. In addition to the Test Certificates, mandatory tests will also be done on them by the **Architect/ Consultant/ School** at an approved laboratory at the cost of the contractor immediately as well as at regular frequency laid down in the relevant Indian Standards.

4.4.2. MATERIALS AND WORKMANSHIP TO CONFIRM TO DESCRIPTION:

a) All materials and workmanship shall, be of the respective kinds specified in the Schedule of Quantities and /or specifications and in accordance with the **Architect/ Consultants** instructions and / or any test of all materials, which the contract provides for, and **Architect/ Consultant** may require. The Contractor shall submit the samples of various materials, to **Architect/ Consultant/ School** for approval. Further, the contractor shall upon the request of Architect furnish him with all invoices, accounts, receipts and other vouchers to prove that the materials comply there with. The contractor shall at his own cost arrange for and/or carry out the test of any materials which the Architect may require.

b) If the Contractor contends that any of the materials, goods or workmanship specified as aforesaid, is unobtainable, he shall submit to the School his grounds for his contention, and there upon the **Architect/ Consultant/ School** shall verify the same and if required issue necessary clearances and/or instruction in writing.

5. VARIATIONS

5.1. VARIATIONS NOT TO VITIATE CONTRACT:

5.1.1. The Contractor shall when directed in writing by the **Architect/ Consultant/ School** to omit from or vary any works shown upon the drawings or described in the specifications or included in the priced Schedule of Quantities, carry out such directions but the Contractor shall not make any alterations in the provisions of the Contract without such authorization or direction in writing from the **Architect/School**.

5.1.2. No claim for any extra work executed shall be allowed unless it shall have been executed by the authority of the **Architect/ Consultant/ School** as herein mentioned. No variation, i.e. additions, omissions or substitutions shall vitiate the Contract.

5.1.3. No claim for payment for extra work shall be allowed unless the said work shall have been executed under the provisions of Clause **"Authorities, Notices, Patent Rights and Royalties",** or by the authorities, directions in writing of the **Architect/ Consultant/ School** as herein mentioned.

5.1.4. The rate of items not included in the Bill of Quantities shall be settled by the **Architect/ Consultant/ School** in accordance with the provisions of relevant clauses for variations.

5.2. VARIATIONS TO BE APPROVED BY THE SCHOOL

5.2.1. Notwithstanding anything herein contained the rates for such extra/variation items shall be derived as far as possible from like items in the tender, adding/subtracting cost for such variations from like items.

5.2.2. In the event of such extra/variation items totally differ in specification/ character/ nature, rates for such items will be worked out based on prevailing market rates for the ingredients that going to making such of items and finalized by the **Architect/Consultant** in consultation with the School.

5.3. DEFECTS

5.3.1. DEFECTS AFTER COMPLETION:

Any defect in work and materials or due to unsound installation or other faults which may appear either in the work executed or in materials used within the "**Defects Liability Period"** stated in the **Appendix to General Conditions of Contract** hereto or if none stated, then for a period of twelve months after the Virtual Completion of the work, arising in the opinion of the **Architect/ Consultant/ School** from materials or workmanship not being in accordance with the Contract, shall upon the directions and writing of the **Architect/ Consultant/ School**, and within such reasonable time as shall be specified therein, be amended and made good by the Contractor, at his cost unless, the **Architect/ Consultant/ School** in consultation with the School shall decide that he ought to be paid for such amending and making good and in case of default the School may employ and pay other persons to correct the faults, and all damages, loss and expenses consequent there on or incidental thereto shall be made good and borne by the Contractor and such damage, loss and expenses shall be recoverable from him by the School or may be deducted by the School

upon the **Architect/ Consultant's certificate** in writing from the amount retained with the School vide relevant Clause for **"Certificate and Payment"** or any money due or that may become due to the Contractor or the School may in lieu of such amending and making good by the Contractor, deduct from such money a sum, to be determined by the **Architect/ Consultant/ School**, equivalent to the cost of amending such works, and in the event the said amount retained under relevant clause For **"Certificate and Payment "** and/or the other sums payable to the Contractor being insufficient, recover the balance from the Contractor.

5.3.2. INSPECTION & TESTS

a) ACCESS FOR INSPECTION:

The Contractor is to provide at all times during the progress of the works and the maintenance period proper means of access, ladders, gangways etc. and the necessary attendants to move and adapt the same as directed for the inspection or measurement of the works by **the School/ Architect/Consultant** or their representatives.

5.3.3. TESTING OF WORKS AND MATERIALS AND PREPARATION OF SAMPLES:

a) The Contractor shall arrange to test materials and/or portions of the works as instructed by **Architect/ Consultant/ School** to specifications/ ISI standards at his own cost, in order to provide their soundness and efficiency. The Contractor will establish the quality control/test labs at site. If after any such test, the work or portions of the works are found to be defective or unsound, the Contractor shall pull down and re-erect the same at his own cost.

b) Samples of various materials shall be submitted by the Contractor for approval prior to ordering out the same. Wherever necessary the Contractor shall, at his own cost, prepare samples to indicate the workmanship.

5.3.4. TEST DATA

All the materials shall be tested in the presence of the **School/ Architect/ Consultant** as required by the various sections of the specification and Test Data, shall be furnished as required.

5.3.5. GENERAL CONDITIONS FOR TESTS TO BE CALLED FOR APPROVAL PURPOSE:

The contractor shall submit the samples of various materials for the approval of the Architect. The contractor shall use the material only after the approval of **the Architect/ Consultant/ School**. The verification of the material shall be done on random base during the progress of the work in either the following manner:

(a) Random samples would be picked up during execution of work from site & if decided by the **Architect/ Consultant/ School,** it would be sent to one of the approved laboratories for test & quality check.

(b) The **Architect/ Consultant/ School** may direct the contractor to submit the challan of delivery of the material brought at site. It would be on Random based. The **Architect/Consultant/ School** may also direct the contractor to submit the copy of the test/verification certificate provided by the manufacturer of that particular material.

(c) Samples including brand/ quality of materials and fittings to be used in the work shall be got approved from the Architect, well in advance of actual execution and shall be preserved till the completion of the work. All the materials procured by the contractor shall be in conformity with the sample approved by the Architect/Consultant/School for the same. Any material, even though approved by Architect if found defective subsequently shall be replaced/ removed by the contractor at his own risk & cost.

(d) For certain items, if frequency of tests is not mentioned in the CPWD Specifications then 25% of the frequency mentioned in relevant I.S. Code shall be applied for testing. Wherever BIS marked materials are brought to the site of work, the contractor shall, if required by the Architect, furnish manufacturer's test certificate or test certificate from approved testing laboratory to establish that the material produced by the contractor for incorporation in the work satisfies the provisions of BIS codes relevant to the material and/or the work done.

(e) For any specific job wherever required before execution as desired by Architect a detailed works of drawings with complete fittings, fixture and pattern shall be supplied by the agency at free of cost and shall be got approved from the Architect with conformity to specific job and quality of product as per manufacturer specification before execution of work in advance.

(f) The cost of tests shall be borne by the contractor.

5.4 WATER:

Water shall be arranged by the Contractor.

5.5 ELECTRICITY:

The School shall make available electricity at the site of work to the Contractor on chargeable basis. Temporary light points required in working area will be provided by the Contractor at his own cost in consultation with the Architect at site. The tender rates shall be quoted accordingly by the contractor.

The recovery for electricity shall be affected as per the rates paid by the Employers to the Electricity Supply Co. from time to time, from his payments due. The Contractor has to put a sub-meter at the tapping point.

QUALITY ASSURANCE OF THE WORK

1. The contractor shall ensure quality control measures on different aspects of construction including materials, workmanship and correct construction methodologies to be adopted. He shall have to submit quality assurance program within two weeks of the award of work. The quality assurance program should include method statement for various items of work to be executed along with check lists to enforce quality control. In case, the School deems fit, a third party independent audit of quality, quantity, safety, billing etc. will be carried out.

2. The contractor shall get the source of all other materials, not specified elsewhere in the document, approved from **the Architect/ Consultant/ School** The contractor shall stick to the approved source unless it is absolutely unavoidable. Any change shall be done with the prior approval of **the Architect/ Consultant/ School** for which tests etc. shall be done by the contractor at his own cost. Similarly, the contractor shall submit brand/ make of various materials not specified in the agreement, to be used for the approval of the Architect along with samples and once approved, he shall stick to it.

3. The contractor shall submit shop drawings of staging and shuttering arrangement, aluminum work, and other works as desired by Architect for his approval before execution. The contractor shall also submit bar bending schedule for approval of Architect before execution.

4. A material entry register will be maintained by the School at the entry gate. The duty lies on the contractor to ensure that all correct entries are made. The contractor will show the documentary proof of type of material and its quantity. The entries of this register will be taken as the conclusive evidence of material received and no representation in this regard will be entertained.

5. TEST LABORATORIES:

A) Laboratory at site:

The contractor shall provide at site, the testing equipment and materials for the field and as per scope of work and as per direction of Architect, tests mentioned in the list of mandatory tests given in CPWD specifications 2009 Vol. 1 & 2 with correction slips at his own cost. Nothing extra shall be payable to him on this account. In all cases, cost of samples and to and fro carriage shall be borne by the contractor.

The representatives of the department shall be at liberty to inspect the testing facilities at site and conduct testing at random in consultation with Architect. The contractor shall provide all necessary facilities for the purpose. The laboratory shall be equipped, inter alia, with the following equipment's:

a) Concrete cube-crushing tests
b) Sieve analysis of fine and coarse aggregates
c) Silt content in fine aggregates
d) Moisture content in aggregates
e) 12 or more as required Steel moulds for 150mm x 150mm x 150mm test cubes and all other testing equipment.
f) Dumpy level, Theodolite, Set Squares, Spirit levels, Berumla bobs, 1m, 2 m , 4 m and 6 m straight edges etc.

g) Or any other test as may be deemed fit by the **Architect/ Consultant/ School**

h) Equipment for concrete testing:

Water Measuring Equipment	1	5ltr, 2ltr, 1ltr, ½ltr	1 No. /each
	2	Measuring cylindercapacity500ml, 250ml, 100ml.	1No. /each
	3	Beakers with capacity 500ml, 200ml, 50ml.	1 No. /each
Laboratory Tools		Hacksaw with 6 blades	1 No.
		Measuring tape 2 mtr.	1 No.
		Depth gauge 20cm.	1 No.
		Vernier Calliper.	1 No.
		Micrometer screw 25mm gauge	1 No.
Miscellaneous items		Showels & Spade.	1 No. /each
		Plastic or GI Buckets 15 ltr., 10ltr & 5ltr.	3 Nos. /each
		Wheel Barrow.	1 No.

Other instruments like Vernier Callipers, a good quality plumb bob, spirit level minimum 30cm long with 3 bubbles for horizontal vertical, wire gauge (circular type) disc, foot rule, long nylon thread, magnifying glass, screw driver 30 cms long, ball pin hammer 100 gm, plastic bags for taking samples etc.

The equipment's not relevant for this work may be exempted by Architect on the written request of the agency.

Any other equipment relevant for this work may be asked by Architect from the agency.

All test which can be performed in the site lab with above equipment's shall be done at site except that at least 10% testing of materials shall be got done from external laboratories. However, for the tests to be carried out by the external laboratories, the contractor shall supply free of charge all the materials required for testing, including transportation. The testing charges shall be borne by the Contractor.

B) Other Laboratories:

The contractor shall arrange carrying out of all tests required under the agreement through the laboratory as approved by the **Architect/ Consultant/ School** and shall bear all charges in connection there with including fee for testing. The said cost of tests shall be borne by the contractor.

1 If the tests, which were to be conducted in the site laboratory, are conducted in other laboratories for whatever the reasons, the cost of such tests shall be borne by the contractor.

2 The tests, as necessary, shall be conducted in the following laboratory. The samples shall be taken for carrying out all or any of the tests stipulated in the particular specifications and as directed by the Architect/Consultant/School or his authorized representative.

SPECIAL CONDITIONS FOR CEMENT & STEEL

1. The contractor shall, at his own expense procure and provide all materials including cement and steel required for the work.

2. The contractor shall procure all the materials in advance so that there is sufficient time to testing and approving of the materials and clearance of the same before use in work.

3. The contractor shall also employ necessary watch and ward establishment for the safe custody of materials at his own cost. The contractor shall be fully responsible for the safe custody of materials brought by him/ issued to him even though the materials may be under double lock and key system.

4. Contractor has to produce manufacturers test certificate for each lot of cement & steel procured at site.

5. CONDITIONS FOR CEMENT:-

a. The contractor shall procure 43 grade ordinary Portland Cement conforming to IS 8112/ Portland Pozzolana cement conforming to IS 1489 (Part-I), as required in the work, from reputed manufacturers of cement such as ACC, UltraTech, BirlaVikram, Shree Cement, Ambuja, Jaypee Cement, Century Cement & J.K. Cement or from any other reputed cement Manufacturer having a production capacity not less than one million tones per annum. The tenderers may also submit a list of names of cement manufacturers which they propose to use in the work. The tender accepting authority reserves right 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 contractor shall be taken by the Architect/Consultant/School and got tested in accordance with provisions of relevant BIS codes. In case the 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 Architect/Consultant/School to do so.

b. The cement shall be got tested by the Architect/ Consultant/ School 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 laboratories. The cost of tests shall be borne by the contractor.

c. The cement brought to the site and the cement remaining unused after completion of the work shall not be removed from site without the written permission of the Architect/ Consultant/ School.

d. The damaged cement shall be removed from the site immediately by the contractor on receipt of a notice in writing from the Architect/ Consultant/ School.

e. The cement in bags shall be stacked by the contractor in two godowns one for fresh arrival to be tested for quality and another already tested in use having weather proof roof and walls and

on a proper floor consisting of two layers of dry bricks laid on well consolidated earth at a level at least 30 cm above the ground level. These stacks shall be in rows of two bags deep and 10 bags high with a minimum of 60 cm. clear space all round. The bags should be placed horizontally continuous in each line as per sketch given in **CPWD Specification – 2009**. The sketch is only for guidance. Actual size / shape of godowns shall be as per site requirement. The decision of **Architect/ Consultant/ School** regarding the capacity needed will be final and nothing extra shall be paid on this account.

f. Cement register for the cement shall be maintained at site. The account of daily receipts and issue of cement shall be maintained in the register by the authorized representative of the **Architect/ Consultant/ School** and signed daily by contractor or his authorized agent.

PROFORMA FOR THE CEMENT REGISTER

PARTICULARS OF RECEIPT			**PARTICULARS OF ISSUE**			**REMARK**						
Date of receipt	Quantity received	Progressive Total	Date of issue date	quantity issue date	Item of work for which issued	Quantity returned at the end of the day		Daily Balance in hand				

6. COST CONTROL

6.1. QUANTITIES

6.1.1. SCHEDULE OF QUANTITIES:

a) The Schedule of the Quantities unless otherwise stated shall be deemed to have been prepared in accordance with the standard procedure of the **Architect / Consultant**, and shall be considered to be approximate and no liability shall attach to the **Architect / Consultant / School** for any error that may be discovered therein.

6.1.2. SUFFICIENCY OF SCHEDULE OF QUANTITIES:

a) The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the works and of the prices stated in the Schedule of Quantities and/or the Schedule of Rates and Prices, which rates and prices shall cover all his obligations under the Contract, and all matters and things necessary for the proper completion of the works.

b) The Contractor shall check all the interior drawings and details prepared by the **Architect / Consultant** and report errors if any in the drawings or details.

6.1.3. ERRORS IN SCHEDULE OF QUANTITIES:

a) Should any error appear in the Schedule of Quantities, other than in the Contractor's prices and calculations, it shall be rectified, and such rectification shall not vitiate the Contract but shall constitute a variation of the Contract and shall be dealt with as an authorized extra or deduction.

6.1.4. <u>Prime cost & Provisional sums:</u>

a) Where "Prime cost"(p.c.) prices or provisional sums of moneys are provided for any goods or work in the specification / Schedule of Quantities the same amount will be exclusive of any trade discounts or allowances, cash-discounts, profit, carriage and fixing which the contractor may require.
b) All goods or work for which prime cost prices or provisional sums of money are provided may be selected or ordered from any manufacturers or firms at the discretion of the Architect of the School and the School reserves to himself the right of paying direct for any such good or Work and deducting the said prices and sums from the amount of contract. Should any good or work for which prime cost prices or provisional sums are provided or portions of the same be not required, such prices of sums, together with the profits allowed for the same and such additional amounts as the contractor may have allowed for carriage and packing will be deducted in full from the contract, whether the goods be ordered by the contractor or otherwise, the contractor shall at his own cost fix the same if called upon to do so and the contractor shall also receive and sing for such goods and be responsible for their safe custody from the date of their delivery upon the works.

c) In cases in which the provisional quantities of materials are contained in the contract, the contractor shall provide such material to such amounts or to greater or less amounts as the

Architect shall direct in writing as the net rates at which he shall have priced such items in his schedule of Quantities, should however any such items be entirely omitted, which omission shall be at the Architect's discretion, no profit or such items shall be allowed to the contractor.

d) No prime costs sum or sums (or any portion thereof) shall be included in any certificate for payment to the contractor until the receipted accounts relating to them have been produced by the contractor to the Architect. Such accounts shall show all discounts and any sum or sums in respect of such discounts shall be treated as trade discount provided always that should the contractor in lieu of producing such receipted accounts request the Architect in writing to issue a Certificate on the School for such sum or sums due either on account in settlement to a sub-contractor direct, the architect shall, upon satisfying himself that the sub-contractor is entitled to the same, so issue the certificate, and such sum or sums shall be deducted from the amount of the contractor at the settlement of accounts and any profit or further sum which the contractor is property entitled in respect of such sub-contract, and which is in conformity with the terms of the contract, shall be allowed to the contractor at the settlement of accounts as though the amount of such certificate to the sub-contractor had been included in a certificate drawn in favor of the contractor.

e) If the Contractor neither produces the receipt nor gives authority to the Architect to issue a certificate in favor of such sub-contractor directly, the Architect shall, upon giving the contractor seven days' notice in writing of his intentions to do so, issue to the Sub- contractor such Certificate directly on the School and obtain the receipt from the Sub-contractor, which receipt shall be deemed a discharge for the amount of such certificate as though given by the Contractor. In the event of such default on the part of the Contractor, he shall not be allowed any profit he may have added in the Schedule of Quantities upon such-contract.

f) The exercise of the option before referred to by the contractor and the issue of certificate as before described to Sub-contractors upon the Contractor's request on the issue to sub-contractor direct of certificate by the Architect shall not, however, relieve the Contractor from any of the liabilities in respect of insufficient, faulty or in completed work or the Sub-contractor for which he may be liable under the terms of the contract.

g) If any provisional items are provided for work of any nature usually carried out by the contractor in the ordinary course of his business, the School shall give the contractor an opportunity of tendering for the same without prejudice to the The Lawrence School, Sanawar right to reject the lowest or any tender.

6.2. VARIATIONS

6.2.1. EXTRA ITEMS /DEVIATIONS:

a) The Contractor shall not commence work in respect of any extra items/deviations without obtaining the approval of the **Architect/ Consultant** in writing. The Contractor shall immediately submit the rate analysis for such item, with necessary details to support the rate quoted. The rate shall then be settled by the **Architect/ Consultant/ School** and necessary certificate based on this shall be given to the School while incorporating the item in the Interim Bills.

b) Claims for extra/deviated items shall be submitted in the as per specimen copies of Performa

included in this tender document that indicate authority/order for such items.

6.2.2. SCHEDULE OF QUANTITIES - VARIATION IN TENDER QUANTITIES

Quantities in this tender are subject to any variation by way of addition, reduction or deletions of the items or quantities. No compensation whatsoever will be paid for such variations.

6.2.3. PRICES FOR EXTRAS ETC. - ASCERTAINMENT THEREOF:

a) Should it be found from measurements taken in accordance with the clause on "Measurement of works" that any of the quantities or amounts of works thus ascertained are less or greater than the amounts specified for the works in the priced schedule of quantities and/or that any variation is made from the tender schedule of items by operating Additional items called **"Extra Items"** or **"Substitute Items"** in substitution of some tendered items, the rate and valuation thereof, of such items unless previously or otherwise agreed upon, shall be made in accordance with the following rules:

b) The net rate or prices in the original Tender shall determine the **valuation of the extra quantities** where extra quantities for any item are of similar character and executed under similar conditions as the work priced therein. In other words variation in quantities shall be measured and paid at quoted price only.

c) The net rate or prices in the original Tender shall determine the **rate for the items altered**, provided if omissions / additions vary the conditions under which any remaining items of works are carried out, the prices for the same shall be valued under thereof.

d) For extra items/Substitute items where the description of items is different from that of any tendered item, the following method shall hold good -:

Where the extra item works are not of similar character and/or executed under condition as aforesaid or where the omissions vary, the conditions under which any remaining items of works are carried out or if the amount of any omission or additions relative to the amount or the whole of the Contract works or to be any part thereof shall be such that in the opinion of the **Architect/ Consultant** the net rate or price contained in the priced Schedule of Quantities or tender or for any item of the works involves loss or expenses beyond that reasonably contemplated by the Contractor or is by reason of such omission or addition rendered unreasonable or inapplicable, the **Architect/Consultant** shall fix such other rate or price as in the circumstances he shall think reasonable and proper on the basis of actual rate analysis cost of work including cartage ,GST involved plus fifteen percent (15%) towards Contractor's over heads and profits, which shall be final and binding on the Contractor.

e) The measurement and valuation in respect of the Contractor shall be completed within the "period of Final Measurement" or within one month of the completion of the Contract works as defined under Clause For "Certificate of Virtual Completion".

f) The Contractor shall submit the claims for Deviated items and Extra items as per Performa annexed hereto.

6.3. MEASUREMENTS

6.3.1. MEASUREMENT OFWORKS:

a) The **Architect/Consultant** shall from time to time intimate the Contractor that he requires the works to be measured and the Contractor shall forthwith attend or send a qualified agent to assist the **PMC's representative** in taking such measurements and calculations and to furnish all particulars or give all assistance required by either of them.

b) Should the Contractor omit to attend or neglect or omit to send such agent, then the measurements taken by the **Architect/ Consultant or approved PMC**, shall be taken to be the correct measurements. The works shall be measured according to the mode of measurements specified in the Contract documents and, where no mode is specified, as per the latest edition of relevant I.S. Codes.

c) A certain percentage of measurements will be checked/test checked by the School as the case may be for each trade, and for this the contractor has to render all necessary assistance and co-operation.

d) The Contractor or his Agent may at the time of measurement take such notes and measurements as he may require.

e) All authorized extra works, omissions and all variations made without the **Architect/ Consultant's** knowledge, but if subsequently sanctioned by the School in writing, shall be included in such measurements.

6.3.2. MODE OF MEASUREMENT

a) The mode of measurement for this contract shall be on item rate basis and shall include all quantities specified in the Schedule of Quantities of this tender/ contract. It shall be further deemed that all variations and deviations if specifically agreed to in writing shall also form part of this tender/ contract and shall be subject to measurements. All payments released to the Contractor shall be subject to verification of quantities on the basis of mode of measurements herein stated.

b) If the mode of measurement for any or all item is not specified in the contract, latest relevant IS. Code will prevail.

c) The Contractor shall give due notice to **the School/ Architect/ Consultant** in writing whenever any work is to be concealed or made inaccessible, in order that the work may be inspected and correct measurements are recorded before such concealment, in default whereof the same shall be

at the option of the Architect/ Consultant/ School to either open up for measurement at the Contractor's expense or no allowance shall be made for such work.

6.4. PAYMENTS & CERTIFICATION

6.4.1. CERTIFICATE & PAYMENT:

a) The Contractor shall be entitled for periodic Interim Certificates for work done of a minimum value as specified in Appendix hereto to be issued by the Architect/ Consultant to the Contractor, and within stipulated number of days for ad hoc payment (if allowed) and for full settlement of the bill as indicated in appendix to General Condition of Contract hereto, subject to work being executed in accordance with this Contract and reasonable scrutiny by the School. The Retention at the given percentage rate of the value of certified work as indicated in the appendix subject to the specified limit shall be deducted from running bills. The Contractor shall be entitled under the Certificate to be issued by the Architect/ Consultant, to receive payment of retention amount and security at the end of the defects liability period, provided the defects are made good, according to the true intent and meaning hereof after due completion of work. Should any decorative works or painting be deferred on the Instruction of the Architect/ Consultant under the relevant Clause For **"Suspension of Works"**, payments for such decorative work or painting shall be made up to the stipulated percentage on completion and the balance at the expiration of 6 months from that date. Provided always that the issue by the **Architect/ Consultant** of any certificate during the progress of the works or after their completion shall not have effect as a Certificate of satisfaction or relieve the Contractor from his liability under the clause **"Defects after Completion"** and within the extent and period provided by the Statute of Limitations.

b) The **Architect/ Consultant/ School** shall have the powers to withhold any Certificate if the works or any part thereof is not carried out to his satisfaction.

c) The **Architect/ Consultant/ School** may by any Certificate make any correction in any previous certificates, which shall have been issued by him. In the event if it comes to the The Lawrence School, Sanawar notice any omission or corrections required in bill certified by **Architect/ Consultant/ School**, the School shall effect necessary corrections and the contractor shall be bound to accept the same. This certificate is particularly essential for settlement and payment of the Final Bill.

d) The Contractor shall submit interim bills only after working out the appropriate measurements jointly recorded with **Architect/ Consultant/ School** at site in a register and showing the register to **Architect/ Consultant/ School**. This is not only to regulate the correctness of the quantity but also to facilitate expeditious clearing of the bills.

e) Note: **If any part/reduced rate is proposed by the Contractor (recommended by Architect/ Consultant) the same should be brought out in the remarks column along with reasons.**

f) The School shall carry out test checking of measurement as and when required.

g) The final bill shall be submitted by the Contractor within One month of Virtual Completion

Certificate received by the Contractor duly endorsed by the **Architect/ Consultant** and the Architect, and such bill shall be settled and certified for payment by the **Architect/ Consultant** within four weeks of the receipt of the Certificate of payment from the **Architect/ Consultant**.

h) Payments upon the **Architect/Consultant's Interim certificate** shall be made within a period mentioned in the appendix as **"Period of Honoring of Interim Certificates"** after such Certificates have been received and accepted by the School. The School shall make payment upon the Architect/ Consultant's Final Certificate within a period of Four weeks from the date of its receipt and acceptance of the certificate.

i) The Contractor shall submit Performa (A) and (B) serially numbered with dates for all extra/ deviated items of work.

j) Contractor shall, without fail, submit along with his R.A.Bills/ Final Bills test certificates as specified.

k) Running Account Bills (R.A.Bills)/Final Bill received without the test certificates duly approved by **Architect/ Consultant** shall be returned to the Contractor for the reason of the same being not submitted duly.

6.4.2. AD HOC PAYMENT FOR INTERIM BILLS:

No Ad hoc payment will be paid to the Contractor on interim bills unless expressly agreed by the School.

6.4.3. CERTIFICATE FOR PAYMENT TO CONTRACTOR:

The Contractor's bills will be submitted to School through the **Architect/Consultant** for payment as per Performa enclosed for Interim Bill Certificate and final Certificate. The Architect/ Consultant in confirmation that the work has been carried out satisfactorily as per detailed drawings and specifications will endorse and certify the bill.

6.4.4. CERTIFICATE OF VIRTUAL COMPLETION OF WORKS:

a) The Contractor shall report in writing to the **Architect/ Consultant**, as and when the works are completed in all respects. The **Architect/ Consultant** shall after the verification of the works and in Consultation with the School issue to the Contractor a certificate to be called **"Virtual Completion Certificate"**, a copy where of shall be submitted to the School to enable them to take possession of the completed works.

b) The works shall not be considered as completed till the Architect certifies in writing that all the work including those mentioned in **the snag list** prepared jointly with **Architect/ Consultant/ School** prior to the acceptance of the Virtual Completion. The defect liability period shall commence only from the date of issue of such certificate.

6.4.5. LIEN ON SUMS PAYABLE TO THECONTRACTORS

Any sums of money due and payable to the Contractor including any deposits returnable to them under this Contract may be withheld or retained by the School, against any claim of the School against the contractor in respect of any sums of money due under this contract or any other contract made by the contractor with the School, but limited to the amount of The Lawrence School, Sanawar claim and the School shall always have a lien upon the money so withheld or retained as such by the School until appropriated towards such claim. The contractor shall not be entitled to claim any interest or damages whatsoever on such retained or appropriated sum.

7. PROJECT MANAGEMENT

7.1. PROGRAM OF WORK:

7.1.1. The Tenderer shall, along with his bid, submit a schedule for completion of work, either in the form of a CPM Net Work or in the form of a bar chart, showing how he proposes to complete the works. This program shall be prepared in sufficient detail and shall indicate, among other things, the following details on a month-to - month basis (for each month).

a) Quantum of work under each major item of work that would be carried out.
b) List of Sub-contractors.
c) Amount of resources that would be deployed (e.g. materials, skilled/unskilled labor, equipment etc.)
d) Schedule of delivery of materials to site.
e) Approximate value of work contemplated to be completed each month.
f) Schedule and manner in which details or materials (to be issued by the School) are required from the **Architect/ Consultant/ School**
g) Time periods allowed for other agencies work,
h) Various milestones to be achieved.

7.1.2. This program suitably amended after discussions with the **Architect/ Consultant** shall become binding on the Contractor. However, during the execution of the project, should it become necessary, in the opinion of the **Architect/ Consultant** to reschedule some of the activities, the Contractor shall do so at no extra cost and/or without any other claim.

7.1.3. Acceptance of a bidder's tender does not necessarily imply acceptance of the schedule submitted and the **Architect/Consultant/ School** reserve the right to modify/amend this schedule to suit the overall project schedule which will be binding on the Contract or at no extra cost to the School.

7.2. COMMENCEMENT OF WORK

The contractor shall be allowed admittance to the site on the "date of Commencement" stated in the Appendix and on submission of the valid tamper-proof photo Identity Card (and/or in any other form), duly endorsed by the Contractor, for all their labor, and staff in accordance with the School's prevailing security requirement.

7.2.1. The Contractor shall commence work forthwith or within the mobilization period defined in the Work order or within the maximum period of 15 days, whichever is later, from the date of receipt of Work Order and shall regularly proceed with the work and ensure to complete same on or before the "day of Completion" stated in the Appendix subject nevertheless to the provisions for extension of time herein after contained.

Until the site is partly / fully handed over to the Contractor, the commencement of work shall include off-site activities including planning, procurement of materials shop drawings, manufacture/ fabrication, interaction with **Architect/ Consultant** / other contractors etc.

7.3. DATE OF COMPLETION:

7.3.1. The entire work shall be completed in all respects including testing within the period stipulated in the Appendix to General Conditions of Contract.

7.3.2. Time is the essence of the Contract.

7.3.3. The work shall not be considered as complete until the **Architect/ Consultant** have certified virtual completion in writing. The defects liability period shall commence from the date of such certificate.

7.3.4. During the period of Contract, the Contractor shall maintain progress on the basis of the programmed initially agreed to by **School** / **Architect/ Consultant** and later updated from time to time in consultation with **School/ Architect/ Consultant** to suit the overall project schedule and prevailing site conditions.

7.3.5. DELAY AND EXTENSION OF TIME:

i) If in the opinion of the School the works be delayed by force majeure

Or

ii) by reason of any exceptionally inclement weather

Or

iii) by reason of proceedings taken or threatened by the dispute with adjoining or neighboring Institutions or public authorities arising otherwise than through the Contractor's own default

Or

iv) by the works or delays of other Contractors or tradesmen engaged or nominated by the School or the **Architect/ Consultant/School** and not referred to in the Schedule of Quantities and/or Specifications

Or

v) by reason of the **Architect/Consultant's/School's instructions.**

Or

vi) by reason of civil commotion, legal combination of strike or lock-out affecting any of the building traders or in consequence of the Contractor not having received in due time necessary instructions from the **Architect/ Consultant/ School** for which he shall have specifically applied in writing, ahead of time, giving the Consultant reasonable time to prepare such instructions, the School shall make a fair and reasonable extension of time for completion of the Contract works. In case of such strike or lock-out, the Contractor shall, as soon as may be, given written notice thereof to the **Architect/ Consultant/ School**, but the Contractor shall nevertheless constantly use his endeavors to prevent delay and shall do all that may reasonably be required to the satisfaction of the **Architect/ Consultant/ School** to proceed with the work.

b) The Contractor shall proactively take all practicable steps to avoid or reduce any delay in the execution and completion of the works arising out of -:

i) Force Majeure
ii) Exceptionally inclement weather
iii) Loss and damage by fire and earthquake
iv) Civil commotion, lockout, strike etc.
v) Delay on the part of the nominated Sub-Contractor or nominated supplier.
vi) Delay on the part of the other Contractors employed by the School.

7.4. SUSPENSION OF WORKS:

The **Architect/Consultant/School** may in an extreme case suspend works if the quality or safety of the works are likely to be compromised due to heavy rains, natural calamities etc. The **Architect/ Consultant/ School** may grant such extension of time with the approval of the School as may be justified by such a delay in the works. The Contractor shall not be entitled to any compensation on account of such delay.

7.5. WORK AT NIGHT:

If the Contractor is required to work at night in order to complete the work within the Time Schedule, the Contractor shall provide and maintain at his own cost sufficient lights to enable the work to proceed satisfactorily without danger. Approaches to the site also shall be sufficiently lighted by the Contractor. No extra payments will be made for night work. Prior intimation and approval should also be taken from **Architect/ Consultant/ School**.

7.6. WORK ON HOLIDAY:

7.6.1. No work shall be done on national holidays that may be notified by the School without the

specific sanction in writing of the **School/ Architect/ Consultant.**

8.0 PERFORMANCE

8.1 GENERAL

8.1.1 INDEPENDENT CONTRACTOR

The Contractor agrees to perform this Contract as an independent Contractor and not as a sub-Contractor, agent or Employee of the School.

8.1.2 ASSIGNMENT OR SUB-LETTING:

The whole of the works included in the Contract shall be executed by the Contractor and the Contractor shall not directly or indirectly transfer, assign or underlet the Contract or any part/ share thereof or interest therein, nor shall he take a new partner, without the written consent of the **Architect/Consultant/ School** and no undertaking shall relieve the Contractor from the full and entire responsibility of the Contract or from active superintendence of the works during their progress.

8.1.2.1 <u>Nominated Sub-contractors:</u>

a. All specialists, merchants, tradesmen and others executing any work or supplying and fixing any goods for which prime cost prices or provisional sums are included in the Schedule of Quantities and/or Specifications who may be nominated or selected by the Architect are hereby declared to be Sub-contractors employed by the Contractor and are herein referred to as nominated Sub-contractors. No nominated Sub-contractor shall be employed on or in connection with the works against whom the contractor shall make reasonable objection or (Save where in the Architect and Contractor shall otherwise agree) who will not enter into contract provided:-

b. That the nominated Sub-contractor shall indemnify the contractor against the same obligations in respect of the Sub-contract as the contractor is under in respect of this contract.

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

d. Payment shall be made to the nominated Sub-contractor within **15 days** of his receipt of the Architect's certificate provided that before any certificate is issued the contractor shall upon request furnish to the Architect proof that all nominated Sub-contractor's accounts included in previous certificates have been duly discharged; in default whereof the School may pay the same upon a certificate from the Architect and deduct the amount thereof from any sums due to the contractor.

8.1.2.2 OBTAINING INFORMATION:

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

8.1.2.3 THE SETTING OUT:

The Contractor shall at his own expense, set out the works accurately in accordance with the plans. The Contractor shall be solely responsible for the true and perfect setting out of the works, and for the correctness of the position, levels, dimensions and alignment of all parts thereof. If at any time any errors shall appear during the progress or on completion of any part of the work, the Contractor shall at his own cost rectify such error if called upon to the satisfaction of the **Architect/ Consultant/ School**. The School and/or its representatives shall time to time inspect the work but such inspections shall not exonerate the Contractor in any way from his obligations to remedy any defects, which may be found to exist at any stage of the work or after the same is completed.

8.1.2.4 PERFORMANCE

a. The Contractor shall be fully and solely responsible for proper, safe and efficient design and performance of his equipment and installation, in conformity with drawings and parameters and specifications stipulated in the Contract documents.

b. In case the Contractor finds that anything contained in drawings, specifications or given parameters will not ensure such performance and compliance with best trade practices and codes, rules and regulations laid down by Authorities, he shall bring such matters to the attention of the **Architect/ Consultant/ School** and shall follow their instructions.

c. The contractor shall also guarantee that the performance of the various materials and items individually shall not be less than specified ratings when working under operating conditions given for the respective items.

8.1.2.5 EXECUTION OF WORK:

a. The whole of the work as described in the Contract (including the Schedule of Quantities, Preamble, the Specifications and all drawing pertaining thereto) and as advised by the **Architect/ Consultant/ School** from time to time is to be carried out and completed in all its parts to the entire satisfaction of the **Architect/ Consultant/ School**.

b. Any minor details of manufacture, fabrication and installation which are obviously and fairly intended, or which may not have been definitely referred to in this Contract, but which are usual in

sound interiors execution practice and essential to the work, are to be included in the Contract. Rates quoted in the Schedules shall be inclusive of all freights, taxes, such as GST, Sales Tax, Excise Tax, Work Contract Tax, Royalties, VAT etc. as well as transportation so as to execute the Contract as per the rules and regulations of Local Bodies, State Government and the Government of India, and to the full intent of tender documents.

8.1.2.6 Following shall be deemed to be provided for in the quoted rates:

a. Labour for constructing, fixing, finishing,carrying, cleaning, making good etc.

b. Framework, ladders, ropes, nails, spikes, tools, material and workmanlike protection from weather, temporary supports.

c. Covering for the works during inclement weather or strikes or whenever directed, as necessary.

d. All temporary canvass, lights, tarpaulin, barricades water- sheets etc.

e. All such temporary weatherproof sheds at such places and in a manner approved by the **Architect/ Consultant/ School** for the storage and protection of materials against the effects of Sun or rain.

f. All minor civil works like breaking and making good of masonry walls to original condition for passage of cables, cable trays, etc.

g. Provision of necessary frames (MS/wooden) for dressing up of wall/RCC openings and for installation of Fans etc. if instructed by **Architect/Consultant/School**. Drawings for frame work to be got approved from **Architect/ Consultant/ School**.

h. The rate quoted by the Tenderer in the schedule of probable quantities will be deemed to be for the finished work inclusive of the cost of providing the above items.

8.2 SITE MANAGEMENT

8.2.1 CONTRACTOR TO PROVIDE EVERYTHING NECESSARY:

a. The Contractor shall provide everything necessary for the proper execution of the works according to the true intent and meaning of the Drawings, Specifications and Schedule of Quantities taken together whether the same may or may not be particularly shown or described therein, provided that the same can reasonably be inferred where from and if the Contractor finds any discrepancy in the Drawings or between the Drawings, Specifications and Schedule of Quantities he shall immediately refer the same in writing to the **Architect/ Consultant/ School**, who shall decide which shall be followed, and his decision shall be final and binding on all parties. The Contractor shall provide ground for himself and fresh water and power for carrying out of the works at his own cost.

b. The School shall not charge the Contractor for his own un -rented ground but shall on no Account be responsible for the expenses incurred by the Contractor for hired ground.

c. The Contractor shall provide and maintain all measuring and testing instruments at all times for properly carrying out the work and for the use of the **Architect/ Consultant /School**, including providing skilled attendants as required.

d. The Contractor shall supply, fix and maintain at his cost during the execution of any works, all the necessary equipment, materials and lighting required by night and as well as by day for proper execution of work. The contractor shall take down and remove any or all such unwanted waste materials, debris etc. as occasion shall require or when ordered to do so, and shall fully reinstate and make good all matters and things described during the execution of the works, to the satisfaction of the **Architect/ Consultant/ School.**

8.3 FACILITIES TO OTHER CONTRACTORS

The Contractor shall give full facilities and co-operation to other Contractors employed by the School and shall afford them reasonable opportunity for the execution of their works and for properly connecting and co-coordinating their works with the work of the other Contractors. The decision of the Architect/Consultant on any points of dispute between the various Contractors shall be final and binding on all parties concerned.

8.4 STORES AT SITE:

The Contractor shall be allotted space / existing rooms on site subject to availability. The Contractor shall make his own arrangements to enclose, secure and guard the space allotted to him. Wherever there may be materials, which are likely to deteriorate by the action of the sun, rain or other elements, all such materials, tools etc. shall be duly protected by the Tenderer from damage by weather or any other cause. All such stores and yards shall be cleared away and ground left in good and proper order, on completion of this Contract unless otherwise expressly mentioned herein.

Entry and Safety of Material Brought at Site.

All The material brought at site will be entered in material register kept at the gate of the school and contractor and his staff shall be responsible to ensure that all the material brought at site is entered in the register kept. Contractor will also ensure safety of his material at site at his cost.

8.5 ELECTRIC POWER FOR INSTALLATION

a) The Contractor shall be given a temporary electrical connection at one location at or below ground level to be decided by the School. The Contractor shall, at his own cost, provide a sub-meter, cabling and wiring and switchboards complying with all laws, rules and regulations in force and ensuring the safety of everyone working or visiting on site.

b) The Contractor shall regularly reimburse cost for electricity consumed to the School at the same tariff rates as charged by the Electric Supply Company.

8.6 GENERAL CONDITIONS OF SUPPLY OF MATERIALS FOR EXECUTING WORK

The successful Tenderer before placing the orders or before supplying shall seek clearance in a meeting with the **School/ Architect/ Consultant**. The final list of supply of materials shall however be made at the time of signing of the contract by the School in consultation with the **Architect/ Consultant/ School** and the successful Tenderer. The Contractor shall then strictly adhere to these approved list of makes and materials and proceed to supply the same. If any deviation and/or for any unforeseen reasons the makes or materials are to be altered, the contractor shall obtain the approval from the **School/ Architect/ Consultant** in writing and then only he may proceed to supply.

8.7 REMOVAL OF ALL OFFENSIVE MATTERS:

All soil, filth or other matter of an offensive nature taken out of any trench, sewer, drain or other place shall not be deposited on the surface, but shall be at once carried away by the Contractor and disposed of as per the rules and regulations of the Local Authorities concerned. No additional money will be paid for this disposal.

8.8 UNFIXED MATERIALS:

When any materials intended for the works shall have been placed at site by the Contractor, such materials shall not be removed there from (except for the purpose of being used on the works) without the written authority of the **Architect/ Consultant/ School** and when the Contractor shall have received payment in respect of any Certificate in which the **Architect/ Consultant/ School** shall have stated that he has taken into account the value of such unfixed materials on the works, such materials shall become the property of the School, and the Contractor shall be liable for any loss or damage to any such materials.

8.9 REMOVAL OF IMPROPER WORK AND MATERIALS:

The **Architect/ Consultant/ School** shall, during the progress of the works, have power to order in writing from time to time the removal from the works, within such reasonable time as may be specified in the order, of any materials which, in the opinion of the **Architect/ Consultant/ School** are not in accordance with the specifications or the instructions of the **Architect/ Consultant/ School** and the substitution of proper materials and the removal and proper re-execution of any work, which has been executed with materials or workmanship, not in accordance with the Drawings and 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 School shall have power to employ and pay other persons to carry out the same and all expenses consequent there on or incidental thereto shall be borne by the Contractor, and shall be recoverable from him on behalf of the School or may be deducted by the **Architect/ Consultant/ School** from any money due or that may become due to the Contractor.

If the correcting works are not done in accordance with the Contract the **Architect/ Consultant/ School**, in consultation with the School, may allow such work to be got done through other parties at Contractors risk and cost and in that case they may make allowance for the difference in value together with such further allowance for damages to the School as in their opinion may be reasonable.

8.10 CLEARING THE SITE OF WORKS:

The Contractor shall clear site of works as per the instructions of the **Architect/ Consultant/ School**. The site of works shall be cleared of all men, materials, sheds, etc. belonging to the Contractor. The site shall be delivered in a clean and neat condition as required by the **Architect/ Consultant/ School** within a period of one week after the job is completed. In case of failure by the Contractor, the School under advice of the **Architect/ Consultant/ School** will have the right to get the site cleared at the risk and cost of the Contractor to the satisfaction of the **Architect/ Consultant/ School**.

8.11 OCCUPATION OF PARTIALLY COMPLETED WORKS BY THE SCHOOL:

The School shall be entitled to and at liberty to occupy even the partially completed works or any portion thereof by themselves or through their agents and staff if they so desire, in which event, necessary extension of time on this account for completing the works shall however be granted to the Contractor, but he shall have no claim for any compensation whatsoever due to the delay involved in completing works. Both the School and the Contractor will work out the repercussions on the insurance Clause mentioned afore to mutual satisfaction safeguarding each other's interest.

8.12 PREPARATION FOR OCCUPATION AND USE ON COMPLETION:

On completion of the work, the Contractor shall inform the **Architect/ Consultant/ School** in writing that he has finished the work and it is ready for the **Architect/ Consultant's/ School** inspection. The Contractor shall clean all his works and all the rooms under his charge. He will leave the entire works neat and clean and ready for occupation and to the satisfaction of the **Architect/ Consultant/ School**.

8.13 KEEPING THE AREAS AND ACCESS ROADS CLEAN:

The Contractor shall be required to maintain the site and the building areas in a neat and clean condition at all times to the satisfaction of the **Architect/ Consultant/ School**. Debris to be removed every 2 days.

The Contractor shall also be required to keep all access roads to the site and within the site free from all obstructions, material droppings etc. to the satisfaction of the Consultant and local authorities.

8.14 COVERING UP OF WORKS:

The Contractor shall cover up and protect the works from the weather and shall suspend all wet operations during weather which, in the opinion of **Architect/ Consultant/ School**, will be detrimental to the works.

8.15 MEASUREMENT TO BE RECORDED BEFORE WORK IS COVERED UP:

The Contractor shall take joint measurements with the **Architect/ Consultant/ School** before covering up or otherwise placing beyond the reach of measurement any items of work. Should the Contractor neglect to do so, the same shall be uncovered at the Contractor's expense or in default thereof, no payment or allowance shall be made for such work or the materials with which the same was executed.

8.16 SITE SURVEY:

On award of the works, the Contractor shall immediately survey the complete site and record his findings on civil works and services connected with his works and submit the report in duplicate. No extra payment shall be made for this work.

8.17 LABOUR HUTMENTS:

The Contractor shall not be allowed to put up any hutment/temporary structure of accommodating his labor/staff. He shall be required to make these arrangements elsewhere at his own cost. However, if the rules of local authorities so permit and subject to the contractor arranging for such permission, some space at site which will not come in the way of the permanent construction, temporary construction facilities and offices may be provided to the contractor at the discretion of the School for essential/core staff engaged on emergency or essential services round the clock work with proper sanitary facilities.

8.18STAFF MANAGEMENT : INFORMATION TO BE SUPPLIED BY THE CONTRACTOR:

The Contractor shall furnish the School the following:

a. Detailed industrial statistics regarding the labor employed by him, etc.
b. The power of Attorney, name and signature of his authorized representative who will be in charge for the execution of the work.
c. A list of technically qualified persons Employed by him for the execution of the work.
d. The total quantity and quality of materials used for the work.

8.19 APPOINTMENT OF ENGINEERS:

a. The Contractor shall appoint a Senior Engineer to the satisfaction of the **Architect/ Consultant/ School**. This senior Engineer will be on site throughout the day or as and when work is in progress. The **Architect/ Consultant/ School** shall be entitled to approve or disapprove without assigning reasons the appointment of such Engineer proposed by the Contractor. This condition shall be reckoned as being the essence of the contract and its breach shall make the Contract revocable at the option of the School. The Senior Engineer shall be assisted by a number of other Engineers and Supervisors in the respective disciplines as required for the smooth and satisfactory execution of the work.

b. The Engineer so appointed shall be available at all times when required by **Architect/ Consultant/ School** to attend all site/office meetings to discuss all aspects of the Contract including design,

administration, planning, fabrication, installation, commissioning, testing and defects liability maintenance as well as site coordination with all Contractors/Agencies.

c. **The contractor shall maintain and be represented on site, at his own cost at all times while the work is in progress, by an experienced and qualified Engineer with valid diploma, approved by the Architect with 5 years of experience and who must thoroughly understand all the trades entailed and be constantly in attendance while the men are at work. The contract's Engineer appointed at the site shall not be removed from the work without the written consent of the Architects / Employer. Any directions explanations, instruction or notices given by the Architect / Employer to such representative shall be deemed to the given to the contractor and shall be binding as such on the contractor.**

   If contractor fails to appoint the said engineer, then department will be at liberty to deduct a sum of Rs. 45,000/- per month (rupees forty five thousand only) from any sum due to contractor or from his final bill for entire duration of the work.

8.20 SITE ENGINEER:

Successful Tenderer will have to, before receiving work order, select suitable Engineer to be interviewed by **Architect/ Consultant/ School**. It will be the responsibility of the selected engineer to ensure that minutes of site meetings are maintained up- to-date. Contractors have to be up-to-date for each site meeting to be held.

8.21CONTRACTOR'S SUPERINTENDENCE & REPRESENTATIVE ON WORKS:

The Contractor shall give all necessary personal superintendence during the execution of the works and as long thereafter as the **Architect/Consultant** may consider it necessary until the expiration of the "Defects Liability Period" stated in the Appendix hereto.

The Contractor shall maintain and be represented on site, at all times while the work is in progress, by a responsible and efficient Engineer In-charge, approved by the **Architect/ Consultant** and who must thoroughly understand all the trades entailed and be constantly in attendance, while the men are at work. Any directions, explanations instructions or notices given by the **Architect/ Consultant** to such Engineer In-charge shall be deemed to be given to the Contractor and shall be binding as such on the Contractor. The Engineer-in-charge shall be thoroughly conversant with the English Language and should be able to read, write and speak English.

8.22 DISMISSAL OF WORKMEN:

The Contractor shall on the request of the **Architect/Consultant/ School** immediately dismiss from the works any person employed there on who may, in the opinion of the A**rchitect/ Consultant/ School**, be unsuitable or incompetent or who may misconduct himself and such person shall not again be employed or allowed on the works without the permission of the **Architect/ Consultant/ School**.

8.23 OTHER PERSONS ENGAGED BY THE SCHOOL:

The School reserves the right to use the premises and any portion of the site for the execution of any work not included in this Contract which he may desire to have carried out by other persons, and the

Contractor has to allow all reasonable facilities for the execution of such work, but is not required to provide any plant or material for the execution of such work, except by special arrangement with the School. Such work shall be carried out in such a manner as not to impede the progress of the works included in the Contract, and the Contractor shall not be responsible for any damage or delay which may happen to or be occasioned by such work.

9.0 SAFETY MANAGEMENT

9.1 REPORTING OF ACCIDENTS TO LABOUR:

The Contractor shall be responsible for the safety of persons employed by him on the works and shall report serious accidents to any of them, however and wherever occurring on the works, to the **Architect/Consultant** and the School who shall make every arrangement to render all possible assistance. This shall be without prejudice to the responsibility of the Contractor under the Insurance Clause of the General Conditions.

9.2 USE OF EXPLOSIVES:

Explosives shall not be used on the works by the contractor without the written permission of the **Architect/ Consultant** and then only in the manner and to the extent to which He has prescribed. When explosives are used, the same shall be stored in a special magazine to be provided by and at the cost of the contractor, who shall be liable for all damages, loss or injury for non-compliance with all the statutory obligations.

9.3 SAFETY CODES SCAFFOLDS:

Suitable scaffolds shall be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except in the case of short duration work, which can be done safely from ladders. When a ladder is used, it shall be of rigid construction made either of good quality wood or steel. The steps shall have a minimum width of 450mm and a maximum rise of 300mm.Suitable hand holds of good quality wood or steel shall be provided and the ladder shall be given an inclination not steeper than 1/4 to 1 (1/4 horizontal to 1 vertical)

Scaffolding or staging more than 4 m. above the ground floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly bolted, braced or otherwise secured, at least 1m. Above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be fastened to prevent it from swaying from the building or structure.

Working platforms, gangways and stairway shall be so constructed that they do not sag unduly or unequally and if the height of the platform, gangway or stairway is more than 4m. Above ground level or floor level, they shall be closely boarded and shall have adequate width and be suitably fenced as described in (ii) above.

Every opening in the floor of a building or in a working platform shall be provided with suitable

means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 1m.

Wherever there are open excavations in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping into excavations.

Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9m. in length while the width between said rails in rung ladder shall in no case be less than 290mm for ladder up to and including 3 m. in length. For longer ladders this width shall be increased at least 20mm. for each additional meter of length.

A sketch of the ladders and scaffolds proposed to be used shall be prepared and approval of the Engineer obtained prior to construction.

All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while itis in use.

9.4 OTHER SAFETY MEASURES:

All personnel of the Contractor working within the site shall be provided with safety helmets. All welders shall wear welding goggles while doing welding work and all metal workers shall be provided with safety gloves. Persons employed on metal cutting and grinding shall wear safety glasses.

Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.

9.5 PERSONAL SAFETY EQUIPMENTS:

All necessary personnel safety equipment as considered adequate by the Engineer should be kept available for the use of the persons employed on the site and maintained in a condition suitable for immediate use, and the Contractor should take adequate steps to ensure proper use of equipment by those concerned.

Workers employed on mixing asphalt materials, cement and lime mortar shall be provided footwear and protective goggles.

Those engaged in white washing and mixing or stacking of cement bags or any materials, which are injurious to the eyes, shall be provided with protective goggles.

Those engaged in welding works shall be provided with welder’s protective eyesight lids.

Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

When workers are employed in sewers and manholes which are in use, the Contractor shall ensure that

the manhole covers are opened and are ventilated at least for an hour before the workers are allowed to get into manholes and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public.

The Contractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form. Whenever men above the age of 18 are employed on the work of lead painting, the following precautions should be taken:

No paint containing lead or lead products shall be used except in the form of paste or readymade paint.

Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scraped.

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

When the work is done near any public place where there is risk of drowning all necessary equipment's should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

Adequate washing facilities should be provided at or near places of work.

9.6 HOISTING MACHINES:

Use of hoisting machines and tackle including their attachments anchorage and supports shall confirm to the following standards or conditions:

a. This shall be of good mechanical constructions, sound material and adequate strength and free from patent defect and shall be kept in good repair and in good working order.

b. Every rope used in hoisting or lowering materials or as means of suspension shall be of durable quality and adequate strength and free from patent defects.

c. Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years shall be in charge of any hoisting machine including any scaffolding winch or give signals to operator.

d. In case of every hoisting machine and of every chain ring hook, shackle, shovel and pulley block used in hoisting or as means of suspension of the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load. In case, a hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond its specified capacity.

e. In case of departmental machines, the safe working load shall be notified by the engineer as regards contactor's machines, the contractor shall notify the safe working load of the machine to the engineer whenever he brings any machinery to site of work and get it verified by the engineer concerned.

f. Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards, hoisting appliances should be provided with such means as will reduce to the minimum of the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations that are already energized, insulating mats, wearing apparel, such as gloves, sleeves and boots as may be necessary should be provided. The workers should not wear any rings, watches and carry keys or other materials that are good conductors of electricity.

g. These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at work spot. The person responsible for compliance of the safety code shall be named therein by the Contractor.

h. To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the Contractor shall be open to inspection by the Labor Officer, Engineers of the Department or their representatives.

i. Notwithstanding the above clauses there is nothing in these to exempt the Contractor from the operations of any other Act or Rule in Force in the Republic of India.

j. In case the above mentioned safety measures have not been taken by the Contractor, a penalty of Rest. 300 per day per person will be levied by School.

9.7 RISK MANAGEMENT

9.7.1 WORK PERFORMED AT CONTRACTOR'S RISK:

The Contractor shall take all precautions necessary and shall be responsible for the safety of the work and shall maintain all safe guards, including providing for guards, proper lights, signs, temporary passages, or other protection necessary for the purpose. All work shall be done at the Contractor's risk, and if any loss or damage shall result from fire or from other cause, the Contractor shall promptly repair or replace such loss or damage free from all expenses to the School. The Contractor shall be responsible for any loss or damage to materials, tools or other articles used or held for use in connection with the work. The work shall be carried on and completed without damage to any work or property of the School or of others and without interference with the operation of existing machinery or equipment, if any.

9.7.2 CONTRACTOR'S LIABILITY AND INSURANCE

From commencement to completion of works, the Contractor shall take full responsibility for the care of the work and for taking precautions to prevent loss or damage to the work to the maximum extent

possible and shall be liable for any damage or loss that may arise to the works or any part thereof from any cause whatsoever including causes of fire, lightening, explosion, fire, earthquake, storm, hurricane, floods, inundation, subsidence, landslides, rock slides, riots (excluding civil war, rebellion, revolution and insurrection) or any latent defect or damage and shall at his own cost repair and make good the same so that at all times the work shall be in good order and condition and in conformity in every respect with the requirements of the Contract.

Explanation: For the purpose of this condition, the expression "from commencement to completion of works" shall mean the period starting with the date of issue of the work order or date of handing over of site whichever is later and ending with issue of Virtual Completion Certificate. For the purpose of this Insurance clause only, handing over of site shall also include any handing over of space to the Contractor for the purpose of storage of materials and equipment.

Without limiting the obligations and responsibilities under this condition, the Contractor shall insure and keep insured the works from commencement to completion, as aforesaid, as increased by 25% of the contract value against the risk of loss or damage from any cause whatsoever including the causes enumerated in the foregoing Clause (a). In the event of there being a variation in the nature and extent of the works, the Contractor shall from time to time increase or decrease the value of the insurance correspondingly. All the premium for the insurance shall be borne and paid by the Contractor. The said insurance shall also provide cover for the removal of debris of the lost or damaged works. The said insurance shall be in the joint names of the School and the Contractor, School's name being mentioned first in the policies and the Contractor shall deposit with the School the said policy or Policies before commencing the work. All money payable by the insurer under such Policy/Policies shall be recovered by the School only and may be paid to the Contractor or any other agency of The Lawrence School, Sanawar choice in the installments for the purpose of rebuilding or replacing or repairing the works and/or goods destroyed or damaged as the case may be.

The Contractor shall at all times indemnify and keep indemnified the School against all losses, claims, damages or compensation including under the provisions of the payment of the Wages Act 1936, Minimum Wages Act 1948,Workman's Compensation Act 1923,the Maternity Benefit Act 1961,the Bombay Shops and Establishments Act1947, Industrial Disputes Act 1947, and Contract Labor (Regulation and Abolition) Act 1970 and Employees State Insurance Act 1948, Motor Vehicles Act 1988 or any modifications thereof or under any other law relating thereto and rules made there under from time to time or as a consequence of any accident or injury to any workman or other person in or about the work whether in the employment of the School or Contractor or not, and also against all costs, charges and expenses of any suit, action or proceedings whatsoever out of such accident or injury or combination of any such claims.

Before commencing the work, the Contractor shall without limiting his obligations and responsibilities under this condition, insure against any loss of life or injury to any personnel in the employment of Contractor/sub-Contractor/nominated Sub- Contractor. For this purpose, an insurance shall be taken by the Contractor /Sub-Contractor. Such insurance shall be taken to include both employees/ workmen covered by the Workman's Compensation Act 1923, as well as those employees /workmen not covered by the said Act. Separate insurance policies may be taken for employees/work men covered by Workman's Compensation Act 1923, and employees/ workmen not covered by the said Act. All the premium shall be paid by the Contractor. Policy/Policies taken under this paragraph for the personnel in employment with the Contractor/Sub-Contractor may be in their School's names

of the Contractor/Sub-Contractor/nominated Sub-Contractors. In the event of any loss or injury to personnel in employment with the Contractor/Sub-Contractor/nominated Sub-Contractors, the Employee and Contractor shall recover directly from the Insurance Company and ensure that payment of the same is made to the affected parties including the School. The policy in original shall be deposited with the School. However, if the Policy obtained by the Contractor is not project-specific but covers several works, a certified copy of the Policy shall be submitted to the School, together with original which shall be returned after verification.

The Contractor shall at all times indemnify and keep indemnified the School against all losses and claims for injuries or damage to any person or any property whatsoever which may arise out of or in consequence of the construction and maintenance of the work and against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto. Before commencing the execution of the works, the Contractor shall without in any way limiting his obligations and liabilities under this condition, insure at his cost and expense against any damage or loss or injury which may be caused to any person or property including the Employee or servants of the School and the Consultants and their property by or in the course of the execution of the works. Such insurance to be known as the Third Party Insurance shall be in a sum equivalent to two percent of the estimated value of the work, subject to the minimum sum of Rupees Five Lacs. The Insurance policy to be so obtained by the Contractor shall be deposited by the Contractor with the School within seven days of its issue by the insurer.

The Contractor shall provide the School with documentary evidence from time to time, that he has taken all the insurance policies mentioned in the foregoing paragraphs and that he has paid the necessary premium for keeping the policies valid till the works are completed and handed over to the School.

The Contractor shall ensure that similar insurance policies are taken out by his sub-Contractors or nominated Contractors, if any. The Contractor shall be responsible to the School or to any other person for any claim or loss resulting from the failure of the Sub- contractors or nominated Sub-Contractors to obtain such insurance policy. While taking the insurance policies, Contractor should indicate clearly to the insurance companies that policies issued should cover their Sub-Contractors and nominated Sub-Contractors also.

If the Contractor and/or his sub-Contractor or nominated Sub Contractor, if any, shall fail to effect and keep in force the insurance referred to above or any other insurance which he/they may be required to effect under the terms of the Contract, then in any such case, the School may, without being bound to effect and keep in force any such insurance policy and pay such premium or premia, as may be necessary for that purpose from time to time and deduct the amount so paid by the School from any money due or becoming due to the Contractor recover the same as a debt due from the Contractor.

All Insurance Policies shall be obtained from nationalized Insurance Companies only.

Without prejudice to any of its obligations and responsibilities under this condition, the Contractor shall, within 30 days from the date of the Work Order and thereafter at the end of each quarter submit insurance documents with relevant documentary evidence.

No work shall be commenced by the Contractor unless and until he has obtained the insurance or insurance required to be obtained by him under or by the foregoing clauses and no work shall be carried out or continued by the Contractor unless and until such insurance is current and valid at that time. All the receipts in original along with two photocopies thereof, for the payment of the premium shall be furnished by the Contractor to the School. The original receipts will be returned to the Contractor after verification. The School reserves the right for payment for works done subject to fulfillment of this condition and shall instruct the **Architect/Consultant** accordingly.

In the event of any claim for insurance becoming due on account of any eventuality covered by the respective insurance policy/policies, the Contractor shall reinstate the installation, replace the materials or equipment's or pay compensations to the affected personnel/ Employees or their legal heirs without waiting for settlement of the claim from insurance company.

If the Contractor shall not perform and observe any of the duties and obligations devolving upon him hereunder, and such omission or breach by the Contractor shall involve the School in any liability tortuous or otherwise and/or loss or damage, the School shall be entitled to the restitution of such loss or damage and shall be entitled to recover the amount of restitution from any moneys due to the Contractor from the School under this Contract or any other Contract.

Upon taking possession of the works under the Contract, the School shall take out parallel insurance, to insure all persons who are not the Contractor's or the Sub-Contractor's or the nominated Sub-Contractors or the Project Management Consultant's staff or the agent of the School's authorized representatives on getting the occupation certificate, the School will maintain their own insurance Policy and the Contractors will cease to be responsible for the insurance of School's personnel.

The Contractor shall ensure the validity of the insurance Policies. The Contractors shall hand over the insurance policies to the School through the **Architect/ Consultant**. Once delays are certified by the **Architect/ Consultant**, he shall have to ensure that the insurance Policies are progressively extended.

The Schools' insurance Policy shall cover the risk for the School's agents, Consultants, Architect/Consultants etc. appointed by the School.

The School shall insure the building in totality on obtaining possession of the building and other structures.

9.7.3 INSURANCE IN RESPECT OF DAMAGES TO PERSONS & PROPERTY

a. The contractor shall be responsible for all injury to persons, Neighboring Properties, animals or things, and for all structural and decorative damage to property which may arise from the operation or neglect of himself or of any nominated Sub-contractor's employees, whether such injury damage arise from carelessness, accident or any other cause whatever in any way connected with the carrying out of this contract. This clause shall be held to include inter alia, any damage to buildings, whether immediately adjacent or otherwise, and any damage to roads, streets, foot-paths, bridges or ways as well as all damage caused to the building and works forming the subject of this contract, by frost or other inclemency or whether. The Contractor shall indemnify the School from any such injury or damage to persons or property as aforesaid and also in any award of compensation or damages consequent upon such claims.

b. The Contractor shall reinstate all damage of every sort mentioned in the Clause, so as to deliver up the whole of the contract works complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damage to the property of third parties.

c. The Contractor shall indemnify the School against all claims, which may be made against the School by any member of the public or other third party in respect of anything which may arise in respect of the works or in consequence thereof and shall at his own expense arrange to effect and maintain, Until the virtual completion of the contract, with an approved Office a Policy of Insurance in the joint names of the School and the Contractor against such risks and deposit such Policy or Policies with the Architect from time to time during the currency of this Contract.

d. The Contractor shall similarly indemnify the School against all claims which may be made upon the School whether under The workmen's Compensation Act or any other statute in force during the currency of this Contract or at common law in respect of any employee of the Contractor or any Sub- Contractor and shall at his own expense effect and maintain, until the virtual completion of the contractor, with an approved office, a policy of Insurance in the joint names of the employee and the contractor against such risks and deposits such Policy or Policies with the Architect from time to time during the currency of this Contract.

e. The Contractor shall be responsible for anything, which may be excluded from the Insurance Policies above referred to, and also for all the damages to any property arising out of and incidental to the negligent or defective carrying out of this contract. He shall also indemnify the School in respect of any costs, charges and expenses arising out of any claim or proceedings and also in respect of any award of or compensation of damage arising there from.

f. The School with the concurrence of the Architect shall be at liberty and is hereby empowered to deduct the amount of any damage, compensation, costs, charges and expenses arising or occurring from or in respect of any such claim or damage from any sum or sums due or become due to the contractor.

9.7.4 FIRE INSURANCE:

a. The Contractor shall at the time of signing the Contract, Insure the works and keep them Insured until the virtual completion of the contract, against losses or damages by fire, as approved by the Architect, in the joint names of the School and the Contractor (the name of the former being placed first in the policy) for the full amount of the contract and for any further sum being allowed to the Contractor as an authorized extra. Such policy shall cover the property or the School only, fees for assessing the claim and in connection with his services generally therein and shall not cover any property of the contractor or of any sub-contractor of the School. The contractor shall deposit the policy and receipts for the premiums of the same with the Architect within Ten days of the signing the contract or on receipt of the Work order, whichever is earlier unless otherwise instructed by the Architect. In default of the contractor insuring as provided above, the School or the Architect on his behalf may so issue any may deduct the premium paid for any money due to the contractor. The contractor shall as soon as the claim under the policy is settled, or the work reinstated by the insurance office, should they elect to do so, proceed with all due diligence with

the completion or the work in the same manner as though the fire had not occurred and in all respects under the same conditions of the contract. The contractor shall be entitled to such extension of the time for completion as the Architect deems fit.

b. The amount so due as aforesaid shall be total value of the works duly executed and of the contract materials and goods delivered upon the site for use in the work up to and including a date not more than seven days prior to the date of the said certificate less the amount to be retained by the School (As hereinafter provided) and loss any installment, previously paid under this clause. Provided that such certificates shall only include the value of the said materials and goods as and from time they are reasonably, properly and not prematurely brought upon the site and then only if properly stored and/or protected weather.)

9.8 FAILURE OF PERFORMANCE

9.8.1 DAMAGES FOR NON-COMPLETION:

If the Contractor fails to complete any or all the works by the date/s named in the relevant clauses for "Date of Completion" and "Extension of Time" and if the **Architect/ Consultant/ School** shall certify in writing on or before the date of issue of the Certificate for the last payment to which the Contractor may become entitled hereunder that the works could reasonably have been completed by the date or within the said extended time, then the Contractor shall pay or allow the School the sum to be worked out as per **Appendix to General Conditions of Contract** per day to be recovered as Liquidated Damages (and not by way of penalty) for the delay, beyond the said date or extended time, as the case may be, during which the works shall remain unfinished and such damages may be deducted from any moneys due or which may become due to the Contractor. The maximum amount of Liquidated Damages shall be the amount not exceeding Total Security Deposit. The contractor shall be bound to extend validity of Insurance Cover till such period of completion as to be considered necessary at their cost.

9.8.2 FAILURE BY CONTRACTOR TO COMPLY WITH CONSULTANT'S INSTRUCTIONS:

If the Contractor after receipt of written notice from the **Architect/ Consultant** in prior consultation with the School requiring compliance with such further drawings and/or instructions to remove, fails within seven days to comply with the same, the **Architect/ Consultant** with prior consent of the School may employ other persons to execute any such work whatsoever as may be necessary to give effect thereto and all costs incurred in connection therewith shall be recoverable from the Contractor by the School on a certificate by the **Architect/ Consultant** as a debt to be deducted by him from any moneys due or to become due to the Contractor.

9.8.3 DETERMINATION OF CONTRACT:

If the Contractor except on account of any legal restraint upon the School preventing the continuance of the works, on account of any of the causes mentioned in Clause "Delay and Extension of time" in the case of a certificate being withheld or not paid when due, shall suspend the works, or, in the opinion of the **Architect/ Consultant/ School**, shall neglect or fail to proceed with due diligence in the performance of his part of the Contract or if he shall more than once make default in the respects

mentioned in Clause "Removal of improper work and materials", the School through the **Architect/ Consultant** shall have power to give notice in writing to the Contractor requiring that the works be proceeded with a reasonable manner and with reasonable dispatch. Such notice shall not be unreasonably given and must signify that it purports to be a notice under the provisions of this clause and must signify the act or defaults on the part of the Contractor upon which it is based. After such notice shall have been given, the Contractor shall not be at liberty to remove from the site of work, or from any ground contiguous thereto, any plant or materials belonging to him which shall have been placed thereon for the purpose of the works and the School shall have lien upon such plant and materials to subsist from the date of such notice being given until the notice shall have been complied with.

If the Contractor shall fail, for seven days after such notice has been given to proceed with the works as therein prescribed, the School may enter upon & take possession of the works and of all such plant and materials thereon intended to be used for the work, and the School shall retain and hold alien upon all such plant and materials until the works shall have been completed under powers hereinafter conferred upon him.

If the School shall exercise the above power, he may engage any other person to complete the works and exclude the Contractor, his agents and servants, from entry upon or access to the same, except that the Contractor or any person appointed in writing may have access at all reasonable times during the progress of the works to inspect, survey and measure the works.

Such written appointment or a copy thereof shall be delivered to the **Architect/ Consultant/ School** before the person so appointed comes on to the works, and the School shall take such steps as in the opinion of the **Architect/ Consultant** may be reasonably necessary for completion of the works, without undue delay or expenses, using for that purpose the plant and materials above mentioned in so far as they are suitable and adaptable to such use. Upon the completion of the work the **Architect/ Consultant/ School** shall certify the amount of the expenses properly incurred consequent on and incidental to the default of the Contractor as aforesaid and in completing the works by other persons. Should the amount so certified as the expenses properly incurred be less than the amount which would have been due to the Contractor upon the completion of the works by him, the difference shall be paid to the Contractor by the School, should the amount of the former exceed the latter, the difference shall be paid by the Contractor to the School.

The School shall not be liable to make any further payment or Compensation to the Contractor for or on account of the proper use of the plant for the completion of the works under the provision herein before mentioned other than such payment as included in the Contract.

After the works shall have been so completed by persons other than Contractor, under provision herein before contained, the **Architect/ Consultant/ School** shall give notice to the Contractor; to remove his plant and all surplus materials as may not have been used in the completion of the works, from the site.

If such plant and materials are not removed within a period of 14 days, after the notice shall have been given, the School may remove and sell the same, holding the proceeds, less the cost of the removal and sale, to the credit of the Contractor. The School shall not be so responsible for any loss sustained by the Contractor from the sale of the plant in the event of the Contractor not removing it after notice.

9.8.4 NOTICES:

Notices of the School to the **Architect/Consultant** or the Contractor may be served personally or by being left at or sent by registered post to the last known place of abode or business of the party to whom the same is given or in the case of the Contractor by being left on the works. In the case of company or

Corporation, notices may be served at or sent by registered post to the registered office of the Company or Corporation. Any notice sent by registered post shall be deemed to be served at the time when, in the ordinary course of post, it would be delivered.

9.8.5 TERMINATION OF CONTRACT BY THE SCHOOL

If the Contractor being an individual or a firm, commits any act of insolvency or shall be adjudged as Insolvent or being an incorporated Company shall have an order for Compulsory winding up or applies for voluntary winding up or subject to the supervision of the Court and of the Official Assignee or the Liquidator in such acts of Insolvency or winding up shall be unable within seven days after notice to him requiring him to do so, to show to the reasonable satisfaction of the **Architect/Consultant/School** that he is able to carry out and fulfill the Contract, and to give security therefore, if so required by the **Architect/Consultant/School or** if the Contractor (whether an individual firm or incorporated Company) shall suffer execution to be issued, or shall suffer any payment under this Contract, to be attached by or on behalf of any of the creditors of the Contractor.

Or

Shall assign or sub-let the Contract without the consent in writing of the **Architect/ Consultant/ School** first obtained

Or

Shall charge or encumber this Contract or any payments due or which might become due to the Contractor there under,

Or

If the **Architect/Consultant/School** shall certify in writing to the School that the Contractor.
Has abandoned the Contract,
Or

Has failed to commence the works, or has without any lawful excuse under these conditions suspended the progress of the works for seven days after receiving from the Consultant written notice to proceed,

Or

Has failed to proceed with the works with such due diligence and failed to make such due progress as would enable the works to be completed within the time agreed upon,

Or

Has failed to remove materials from the site or to pull down and replace work for seven days after receiving from the Consultant written notice that the said materials or work were condemned and rejected by the **Architect/ Consultant/ School** under these conditions,

Or

Has neglected or failed persistently to observe and perform all or any of the acts, matters or things by this Contract to be observed and performed by the Contractor for seven days after written notice shall have been given to the Contractor requiring the Contractor to observe or perform the same,

Or

Has to the detriment of good workmanship or in defiance of the **Architect/ Consultant /School** instructions to the contrary sublet any part of the Contract.

Then in any of the said cases the School may not withstanding any previous waiver, after giving seven days' notice in writing to the Contractor, determine the Contract but without thereby affecting the powers of the **Architect/ Consultant / School** or the obligations and liabilities of the Contractor, the whole of which shall continue in force as fully as if Contract has not been determined and as if the works subsequently executed had been executed by or on behalf of the Contractor. And further, the School, may enter upon and take possession of the work and all plant, tools, scaffoldings, sheds, machinery, steam and other power, utensils and materials lying upon the premises or the adjoining lands or roads and use the same as his own property or may employ the same by means of his own servants and workmen carrying on and completing the works or by employing any other Contractors or other persons to complete the works, and the Contractor shall not in any way interrupt or do any act, matter or things to prevent or hinder such other Contractor or other person or persons employed for completing and finishing or using the materials and plant for the works. When the works shall be completed or as soon thereafter as convenient, the **Architect/ Consultant/ School** shall give a notice in writing to the Contractor to remove his surplus materials and plant, and should the Contractor fail to do so within a period of 14 days after receipt thereof by him the School shall sell the same by public auction, or otherwise and shall give credit to the Contractor for the amount realized after deducting there from the costs of removal and sales by the School for the values of the said plant and material so taken possession of by the School and the expense or loss which the School shall have been put to in procuring the works to be completed and the amount, if any, owing to the Contractor and the amount which shall be so certified shall thereupon be paid by the School, to the Contractor, or, by the Contractor to the School, as the case may be, and the certificate of the **Architect/ Consultant / School** shall be final and conclusive between the parties. On termination of the Contract, the Contractor shall forthwith remove himself and his workmen from the works site.

9.8.6 TERMINATION OF THE CONTRACT BY THE CONTRACTOR:

If payment of the amount payable by the School under the Certificates of the **Architect/ Consultant/ School** with interest as provided for hereinafter shall be in arrears and unpaid for thirty days after notice in writing requiring payment of the amount with interest as aforesaid shall have been given by the Contractor to the School (or if the School interferes with or obstruct issue of any such Certificates), or the School commits any 'Act of Insolvency', or if the School being an individual, or firm shall be adjudged insolvent or (being an incorporated company)shall have an order made against it or pass an effective resolution for winding up either compulsorily or subject to the supervision of the court or Voluntarily, or if the official Assignee of the School being an individual, or firm shall be adjudged insolvent or (being an incorporated company) shall have an order made against it or pass an

effective resolution for winding up either compulsorily or subject to the supervision of the court or Voluntarily, or if the official Assignee of the School shall repudiate the Contract, or if the Official Assignee or the Liquidator in any such winding up fails within fifteen days after notice to him requiring him to do so, to show to the reasonable satisfaction of the Contractor that he is able to carry out and fulfill the Contract and to make all payments due, and to become due hereunder and if required by the Contractor, to give security for the same, or if the works be stopped for three months under an order of the Architect/Consultant or the School or by any injunction or other orders of any court of law, then and in any of the said cases the Contractor shall be at liberty to determine the Contract by notice in writing to the School, through the Architect/Consultant, and he shall be entitled to recover from the School payment for all works executed and for any loss he may sustain upon any plant or material supplied or purchased or prepared for the purpose of the Contract.

In arriving at the amount of such payment, the net rates contained in the Contractor's original tender shall be followed, or where the same may not apply, valuation shall be made in accordance with "Prices for Extras, etc. Ascertainment thereof".

9.8.7 FORECLOSURE OF CONTRACT IN FULL OR IN PART:

a. If at any time after acceptance of the tender the School/**Architect/Consultant** shall decide to abandon or reduce the scope of the works for any reasons whatsoever and hence not require the whole or any part of the works to be carried out he shall inform the Contractor in writing to that effect and the Contractor shall have no claim to any payment or compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the works in full but which he did not derive in consequence of the foreclosure of the whole or part of the works.

b. The Contractor shall be paid at the Contract rates full amount for woks executed at site, and in addition, reasonable amount as Certified by the **Architect/Consultant/School** for the value of such material (which material shall thereupon become the property of the School) and also such further allowances as the **Architect/Consultant** may think reasonable and fair in respect of:

   (i) Any expenditure incurred by the Contractor towards preliminary works etc. and
   (ii) Other reasonable and proper engagement the Contractor may have entered into for carrying out the work.

10 COMPLIANCE

10.1 COMPLIANCE TO THE LAWRENCE SCHOOL, SANAWAR /LEGAL NORMS

10.1.1 NOTICES:

The Contractor shall give all notices and pay all fees and shall comply with all Acts and Regulations for the successful completion of the Contract works.

10.1.2 AUTHORITIES, NOTICES, PATENTS, RIGHTS & ROYALTIES:

The Contractor shall conform to the provisions of all the statutes relating to the works, and to the Regulations and bye laws of any local Authority, and of any Water, Lighting, Electric supply, and of other Companies or Authorities with whose systems the structure is proposed to be connected, and shall before making any variation from the drawings or specifications that may be necessitated by so confirming, give to the **Architect/ Consultant** written notice, specifying the variations proposed to be made and the reason for making it, and apply for instruction thereon. In case the Contractor shall not within 10 days receive such instructions, he shall proceed with the work conforming to the provision or Regulations or Byelaws in question.

The Contractor shall bring to the attention of the **Architect/ Consultant/ School** all notices required by the said Acts, Regulations or Bye-laws to be given to any Authority by the School or the **Architect/ Consultant/ School** and pay to such Authority, or to any public Officer, all fees that may be properly chargeable in respect of the works, and lodge the receipts with the **Architect/ Consultant/ School.**

The Contractor shall indemnify the School against all claims in respect of patent rights, design, trademarks of name or other protected rights in respect of any constructional site, machine work or material used for or in connection with the works or temporary works and against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto. The Contractor shall defend all actions arising from such claims, unless he has informed the **Architect/ Consultant/ School** before any such infringement and received their permission to proceed, and shall himself pay all royalties, license fees, damages, costs and charges of all and every sort that may be legally incurred in respect thereof. All statutory fees, deposits etc. paid by the contractor for permanent works to be handed over to the school which shall be reimbursed to him by the School against documentary proof.

The Contractor shall assist and co-ordinate with the Architect/Consultant/School in obtaining all statutory approvals and/or amendments to such approvals as per the rules in force from Municipality and other local bodies. Any expenditure incurred in obtaining such approvals is deemed included in the rates quoted by the **Contractor.**

10.2 NOTICES TO LOCAL BODIES:

The Contractor shall comply with and give all notices required under any law, rule, regulations, or byelaw of parliament, State Legislature or Local Authority relating to works. The Contractor shall before commencing the execution of work issue a certificate to the **School/Architect/ Consultant** that he has obtained all the permissions Registrations and give all the notices as are required to be obtained or given under law particularly blasting permission the Police permission etc.

10.3 MUNICIPAL REGULATIONS:

The whole of the work is to comply with the requirements and byelaws of the concerned Municipal Corporation and local bodies.

10.4 WAGES OF LABOUR EMPLOYED BY THE CONTRACTOR:

The Contractor shall pay all labor employed by him at rates fixed by him at the commencement of the Contract as per the Labor Laws. Wages as applicable for the construction work as per norms stipulated by the local authorities, under whose jurisdiction the site falls, or any other statutory body or authority of the concerned State or Government of India shall be followed by the contractor. No violation of such statutory laws and rules shall be permissible. This will also include the minimum and the maximum allowable wages for various categories of labor to be employed by the contractor.

All wages shall be paid in full and without any deduction whatsoever at the approved rates and for full time actually worked during the wage period. Officers of **Architect/Consultant** or an Officer of the School as may be authorized in that behalf shall have power to exercise supervision over the labor employed by the Contractor, and for such other purpose any of these officers may inspect the wage books, muster books and other labor records of the Contractor. In the event of the report of such Officer/s showing that the proper rates of wages are not being paid, or that in any manner whatsoever the dealings between the Contractor and his labors are not satisfactory, the **Architect/Consultant**/School shall pass such orders upon the report as he considers desirable, and those orders shall be final and binding upon the Contractor.

The contractor shall indemnify and keep indemnified the **Architect/Consultant** and / or the School against any claim arising from failure of the Contractor to comply with such labor laws.

The contractor shall register with Assistant Labor Commissioner (Central) as contractor approved by the School.

10.5 DISPLAY OF NOTICES:

The Contractor shall display all permissions licenses registration certificates and other statements required to be displayed under various labor laws and other legislation's applicable to the works at the site office and also maintain the requisite register/records factually and up to date and keep them ready for inspection by the concerned authorities and also make available the same to the **Architect/ Consultant / School** for inspection.

10.6 INSURANCE POLICIES:

The Contractor shall not commence any work at site, until all the insurance Policies, as required here and in terms of the General Conditions of Contract, have been submitted to the School. Renewal of the same if required due to extension of time for completion or similar reasons is also the responsibility of the Contractor.

Notwithstanding anything to the contrary mentioned in the Contract, Contractors have to submit all Insurance Policies to the School directly to make the School satisfy themselves regarding adequacy of values of insurance, validity etc. as per contractual clauses.

The Contractor shall arrange for renewals of these policies on their own. Any omissions to do so or delay in non-receipt of any information will be no excuse for failure to renew them or keep them in force without a break.

10.7 INDEBTEDNESS AND LIENS:

The Contractor agrees to furnish the School from time to time during the progress of the work as requested, verified statements showing the Contractors' total outstanding indebtedness in connection with the work covered by the Contract.

Before final payment is made, the School may require the Contractor to furnish the School with satisfactory proof that there are no outstanding debts or liens in connection with the Contract. If during the progress of the work, the Contractor shall allow any indebtedness to accrue to Sub-Contractors or others and shall fail to pay or discharge same within Seven days after demand, then the School may withhold any money due to the Contractor until such indebtedness is paid, or apply the same towards the discharge thereof.

10.8 INDIAN STANDARDS CODE:

The relevant I.S. Code of practice shall be the latest version with its amendments/revisions. The Contractor shall keep and maintain copies of the latest editions of relevant I.S. Codes at the work site and make it available to **Architect/ Consultant** when required.

10.9 TREASURE TROVE:

Should any important and valuable materials/items be found while carrying out the works, the same shall be the property of the School. The Contractor shall give immediate notice to the **Architect/Consultant** of any such discovery and shall hand over any such treasure to the School on demand.

10.10 TECHNICAL AUDIT

The work is liable to be technically audited by the Schools expert committee if desired by school.

The School shall have a right to cause a technical examination and audit of works and final bills of the contractor including all supporting vouchers, abstract, etc. to be made at the time of payment of the bill. If as a result of this examination or otherwise any sum is found to have been overpaid in respect of any work done by the contractor under the contract the contractor shall be liable to return the amount of over payment and it will be lawful for the School to recover the same from any sum or sums due to him and in any other manner legally permissible and if it is found that the Contractor was paid less than what was due to him under the contract in respect of any work, executed by him under the contract, the amount of such under payment shall be duly paid by the School.

Any sum of money due and payable to the contractor (including security deposit returnable to him) under this contract may be appropriated by the School and set off against any claim of the School for the payment of a sum of money arising out of or under any other contract made by the Contractor with the School.

11 ROLE OF ARCHITECT /ARCHITECT/CONSULTANT

11.1 Architect/Consultant's duties are to design, control and supervise the works and to test any

materials to be used or workmanship employed in connection with the works, quality control, project scheduling and monitoring and co-coordinating with all other agencies and Civil Contractor, checking of measurements, certification of bills, preparing extra deviation items, preparing minutes of meetings etc.

11.2 Wherever it is mandatory by law that the **Architect/Consultant** so appointed by the School shall be registered with the council of architecture/Competent Authority.

11.3 The Contractor shall afford the **Architect/Consultant** every facility and assistance for examining the works and materials and checking and measuring time and materials. The **Architect/Consultant** shall have no power to revoke, alter, enlarge, or relax any requirements of this Contract, or to sanction any day-work, additions, alterations, deviations or omissions unless such an authority may be specially confirmed by a written order of the School.

11.4 The **Architect/Consultant** shall act in consultation with the School regarding quality of works, interpretation of drawings, contract documents and finalize the selection of finishing materials. The **Architect/ Consultant** shall check/ record the measurements made by Contractor's representative for all items of works and on completion hand over the records to the School.

11.5 The **Architect/Consultant** shall have the power to give notice to the Contractor or his Engineer In charge about the non-approval of any work or materials and such works shall be suspended or the use of such materials should be discontinued until the decision of the **Architect/Consultant** in consultation with the School if required is obtained. The work will from time to time be visited by the Architect/Consultant / School but such examination shall not in any way exonerate the Contractor from the obligation to remedy any defects which may be found to exist at any stage of the work or after the same is completed. Subject to the limitations of this clause, the Contractor shall take instructions only from the **Architect/Consultant** as the case may be. In other words the contractors shall take total responsibility for the execution of work/ items of work by using quality materials and providing best of workmanship to fulfill the true intent of the tender provision.

11.6 The **Architect/Consultant** shall have such other powers and discharge other functions as are specifically provided in this contract including such incidental or consequential powers or duties, subject always to such specific instructions or directions of the School, which shall be duly notified to the Contractor.

11.7 TO DEFINE TERMS AND EXPLAIN PLANS:

The various parts of the Contract are intended to be complementary to one another; but should any discrepancy appear, or any misunderstanding arise as to the import of anything contained therein, the explanations of the **Architect/Consultant** shall be final and binding. The correction of any errors or omissions of the Drawings and Specifications may be made by the **Architect/Consultant**, when such correction is necessary to bring out clearly the intention, which is indicated by a reasonable interpretation of the drawings & Specifications as a whole.

11.8 MATTERS TO BE FINALLY DETERMINED BY THE ARCHITECT/ CONSULTANT:

The **Architect/Consultant's** decision, opinion, direction, Certificates (except for payments) with respect to all or any of the matter and the schedule of rates, hereof shall be final and conclusive and binding on the parties hereto and shall be without appeal. School's instructions if any, in this regard in case of any urgency, shall also be confirmed/vetted by the **Architect/Consultant** at the earliest possible.

11.9 TYPOGRAPHICAL OR CLERICALERRORS:

The **Architect/ Consultant's** clarifications regarding partially omitted particulars or typographical or clerical errors shall be final and binding on the Contractor.

11.10 SITE VISITS:

The **Architect/Consultant /School** shall visit the site from time to time at their discretion, or when expressly called upon to do so, to co-ordinate various activities and/or to answer such queries that may be posed at site on interior drawings.

11.11 ADDRESS FOR SERVICE

All letters and Notices under or pursuant to these presents shall be hand delivered against acknowledgement or sent by Registered Post with Acknowledgement Due at the respective addresses mentioned below. Any change in the addresses shall be duly intimated by the concerned Party to all others.

Address for the School

The Headmaster.
The Lawrence School, Sanawar ,
Kasauli, Solan, Himachal Pradesh 173202
Email: _____

Address for the Architect

The name and address of the Architect is the same as mentioned on the first page of the tender.

Address for the Consultants: Name and Address of the Consultants are same as mentioned on the first page of the tender.

11.12 TAKING OVER:

Upon the successful completion of all the tests to be conducted at site on the materials/items executed by the contractor, the **Architect/Consultant** shall issue a recommendation letter to the School confirming that the interiors is ready to be taken over by the School. Issuance of such recommendation letter for taking over shall not relieve the contractor of any of his obligations under the terms and conditions of contract.

12.0 LIAISONING & CO- ORDINATION WITH LOCAL MUNICIPAL AUTHORITIES:

The contractor has to liaison and takes any clearance from local authorities /other authorities for approval to start works and during carrying out the works including Defect Liability Period if needed.

The contractor shall pay to the municipal, police or other authorities all the fees etc. that may be required by law and obtain requisite licenses for temporary constructions, enclosures required in the course of execution of the contract and pay all fees taxes and charges which shall be livable on that account. No extra claim will be entertained on this account. All licensing fees, royalty charges for property rights etc. shall be paid by the contractor direct to the authorities concerned. No extra claim will be entertained on this account.

NOC for Tree cutting before start of work. The official receipt deposited with authority for N.O.C. for tree cutting will be reimbursed by college.

13.0 RATES FOR EXTRA ADDITIONAL, ALTERED OR SUBSTITUTED WORK:

The rates for additional, altered or substituted work shall be worked out in accordance with the following provisions in their respective order.

a. If the rates for similar additional, altered or substituted work and directly available in the contract for the work, the contractor is bound to carry out the work at the same rates as are available in the contract for the work.

b. If the rates for additional, altered or substituted work are not directly available in the contract for the work the rates will be derived from the rates for a similar class of work as are specified in the contract for the work.

c. If the rates for the altered, additional or substituted work cannot be determined in the manner specified in sub-clause (i) to (ii) above, then the contractor shall within three days of the date of receipt of order to carry out the work, inform the Architect of the rate which it is intending to charge for such works supported by analysis of the rate or rates claimed (CPWD analysis). Rates finalized and approved by the Architect on the basis of these details will be final and binding. However, the architect by notice in writing will be at liberty to cancel his order to execute such work and arrange to carry it out in such a manner as he may deem advisable, but under no circumstances shall the contractor suspend the work once ordered in writing on the plea of non-settlement of rate.

d. In case of furniture items, the minor changes I modifications in the design shall not be considered as deviation, and no price adjustment shall be made against the rates agreed to as per the Schedule of Quantities of the contract. For major change in the design of any item of the furniture, the deviation shall be priced by the Architects as Extra, as per above however the decision of the Architects whether the charge / modification in the design of furniture items is minor or major, shall be final and binding on the contractor.

e. PAYMENTS:

Payments for executed work:

Billing: The Contractor shall prepare measured bills as directed by the Project Manager (detailed measurement, abstract sheet, purchase bills, and other supporting documents) once per month and submit the same to the Project Manager in quadruplicate for checking and issue of interim certificate.

Payment of Bills:

Running Account Bills: The Contractor has to submit the Running Account Bills in quadruplicate once in a month along with detailed measurements in serially machine numbered register, abstract sheets, deviation statement for ongoing and completed work, purchase bills, materials reconciliation statement and any specific instructions which may be given in this regard by the Project Manager.

Final Bill: Deduction towards Retention Money shall be made at 5% of the value of Work as certified by the Project Manager during each running bill. 50% Retention money will be released after issue of final completion certificate and on submission of bank guarantee of the same amount.

The rest shall be returned after 12 months of handing over of the buildings provided that the building is then free of defects and the Contractor has rectified all defects identified by the Project Managers, Architects and Owner. The Retention Money shall not carry interest.

The final bill shall be submitted by the Contractor within one month of the date fixed for Virtual Completion of the Work or of the date of the Virtual Completion Certificate whichever is later, issued by the Project Manager. The final bill will be certified by the Project Managers within 30 working days from the date of the bill submitted. The Contractor shall be paid by the Owner within 30 working days of receipt of the Project Manager's Certificate. The Contractor shall submit a list of the disputed items within thirty days from the disallowance thereof and if he fails to do this, his claim shall be deemed to have been fully waived and absolutely extinguished. No further claim shall be made by the Contractor after submission of the final bill and these shall be deemed to have been waived and extinguished.

The Project Manager may withhold payment or, on account of subsequently discovered evidence, nullify the whole or a part of any payment certificate to such extent as may be necessary to protect the Owner from loss on account of including but not limited to the following:

Defective work not remedied by the Contractor. Failure of the Contractor to make payments properly and regularly to his own workers, to his Sub Contractors, to his suppliers.
Damage by the Contractor to the work of other Contractors, Sub-Contractors or Vendors.

A reasonable doubt that the Contract cannot be completed for the balance unpaid amount.

A reasonable doubt that the Contractor intends to leave work items incomplete.
Failure of the Contractor to execute the Work in conformity with the Contract Documents.

Failure of the Contractor to meet or keep-up with the approved Construction Program on which the agreed payment schedule is based.

Failure of the Contractor to comply with and fulfil all contractual obligations and liabilities stipulated in the Contract Documents.

SPECIAL CONDITIONS OF CONTRACT

1. Tenderers shall go through all documents before quoting rates and provide for necessary cost as may be included in either bill or material or specifications.

2. Tenderers shall be given prices in blank column Entries in English made in ink. Arrive also at the grand total must also fill in all "rates only columns" and sign all corrections.

3. Tender shall be invalid unless all rates are filled in. No arbitrary condition shall be submitted. Tenders shall be signed by all the legal partners of the firm.

4. Each of the tender documents shall be signed by the Tenderer.

5. The Tenderer whose tender is accepted shall be bound to enter in to the contract within eight days of intimation from the **School**.

6. Work shall be done night and day without extra charge, if necessary.

7. Tenderer shall provide for stacking of materials in such a way as to facilitate rapid checking of quantities.

8. Materials supplied by owner shall be used only in owner's work.

9. Contractors shall pay any local charges relating to execution of work.

10. Contractor shall allow for all wastages in the rates.

11. Contractor shall arrange for all temporary connections.

12. No extras shall be paid, quantity sheets and drawings both are to be considered jointly and Architect/Consultant is the final authority for the interpretation.

13. Site instruction shall be deemed for proper execution, and shall be carried out without extra charge.

14. Order book with numbered pages shall be kept on site. Contractor shall carry out all instructions properly.

15. Contractors shall insure whole work against fire, PICT and third party.

16. Contractor should ensure the directives of Hon'ble National Green Tribunal orders dated 04-12-2014 and 10.04.2015 in O.A. No. 21 of 2014 and O.A. No. 95 of 2014 and MoEF guidelines of 2010 or any direction issued by Hon'ble NGT upto last date prescribed for submission of bid regarding dealing with Air Pollution from construction and demolition sites.

PREAMBLE AND SPECIFICATIONS

The quantities given in this schedule of quantities are approximate and subject to variations without vitiating the contract.

PRICING:

The rate for each item of work shall, unless expressly stated otherwise, include the following (but not limited to the list given below) for the completion of works in all respects as per conditions of Contract, technical specifications, drawing etc.:

All taxes such as GST, Sales tax, Work Contract Tax, Royalties, Transportation, Freights, Packing and forwarding charges Insurance etc.,

All requirements and expenses for completion of work as per Rules and Regulations of Local Bodies, State Government and Central Government of India.

All materials, equipment's, accessories, consumable, controls and instruments, tools, tackles, plants, scaffolding/double scaffolding labor, maintenance, fixing, cleaning, making good hauling, hoisting etc.,

WASTE ON MATERIAL AND LABOUR:

Loading, Unloading, handling/double handling, setting out protection from weather, temporary supports, platforms etc., and the maintenance, of the same, dismantling of temporary works, disposal of debris and all other labor necessary for the execution of works.

Testing the installation as often as necessary, Contractors to arrange for all special instruments and tools required for such testing.

Painting of all equipment, pipes, and supports etc., as per color codes to be decided for various systems.

Apportion of costs for general facilities to be used by the Contractor's staff such as lifts, electricity, telephones etc. during execution if such facilities are provided by other contractors and who arrange for such facilities in the first instance.

Fees for testing the materials, equipment or overall installation by appropriate authorities.

Supervising Civil/ Masonry / Carpentry Works done by other agencies on behalf of the School for Interior contractor.

ALL REQUIREMENTS OF SPECIFICATION AND DRAWINGS:

Description of work given in the schedule of quantities is a brief description and shall be read in conjunction with specifications and drawings.

REMOVAL OF POP COVERING AND CARTING AWAY ALL UNWANTED MATERIAL INCLUDING POP:

The rates quoted by the Tenderer will be deemed to be for the finished work complete in all respects with accessories, fitting, mounting arrangements normally provided with such equipment and/or needed for execution, completion, safe operation of equipment as required through they may not have been specifically mentioned in technical specifications, drawings and/or schedule of equipment.

All minor Masonry, Carpentry and Civil works such as cutting opening in Masonry Walls, Internal Partitions, Chasing on walls, etc. and making good the same to match existing works shall be provided by the contractor, whenever asked for by the Architect/Consultant.

SCHEDULE OF QUANTITIES:

All items of work contracted for shall be executed strictly in accordance with the description of the item in the Schedule of Quantities, relevant drawings and specifications read in conjunction with the appropriate Indian Standard specifications and conditions of the contract and established Engineering practices.

The rate for each item of work included in the schedule of quantities shall unless expressly stated otherwise include cost of:

All materials, fixing materials, accessories sequence of operations, appliances, tools, plant equipment, transport labor and incidentals required and completion of the work called for in the item and as per specifications and drawings completely

Wastage on materials and labor Loading transporting, unloading, handling as necessary, hoisting to all levels, and setting, fitting and fixing the position, protecting, disposal of debris as directed and all other labor necessary and to fully complete the job in accordance with contract documents, good practice and recognized principles of trade laid down in codes of practice.

LIABILITIES, OBLIGATIONS AND RISKS ARISING OUT OF CONDITIONS OF CONTRACT:

All requirements of specifications, whether such requirements are mentioned in the item or not shall be provided for the specifications and drawings where available are to be read as complimentary to any part of the schedule of quantities and any work called for in one shall be taken as required for all similar items.

In the event of conflict between Schedule of Quantities and other documents including the specifications the most stringent among them shall apply and the interpretations of the

consultants/owner shall be final and binding.
The Contractor shall be paid for the actual quantity of work executed by him in accordance with the drawings at the accepted rates.

This schedule shall be fully priced and the extensions and totals duly checked. The rates for all items shall be filled in INK. The entries under amount column shall be rounded off to the nearest Rupee.

No alterations whatsoever is to be made either to the description of items in the Schedule of quantities or specifications unless such alterations, is clarified in writing by the consultant/owner. Any such alterations, notes or additions shall unless clarified in writing be disregarded when tender documents are considered. Any observation on BOQ should be made in the letter accompanying technical bid for proper consideration and on disfiguring or overwriting in the documents is permitted.

In event of an error occurring in the amount column of the schedule, as a result of wrong extension of unit rate and quantity, the unit rate quoted by the Tenderer shall be regarded as firm and the extensions shall be amended on the basis of rates.

All errors in totaling in the amount column and in carrying forward totals shall be corrected.

Unless otherwise stated, all measurements shall be taken in accordance with Indian standard for building of Measurements IS 1200 latest revision effective on the date of measurement for interior items as applicable.

Any errors in quantity of items from the contract schedule shall not vitiate this contract but shall be corrected and deemed to be a variation by the Architect/Consultant/School.

DRAWINGS AND DATA:

Within two weeks of placement of order/letter of intent contractor shall furnish the following data in triplicate for approval by Architect/Consultant/School.

General arrangement drawing of the equipment on orders showing plan, elevations, and sectional views, mounting details.

BILL OF MATERIALS:

Descriptive catalogues, characteristic curves, duty point efficiency factor and technical particulars of all the various equipment’s offered.

SPARE PARTS AND MAINTENANCE FOR MATERIALS SUPPLIED

Tenderer shall offer along with the bid, duly recommended by manufacturer set of spare parts required for a period of 1 year’s continuous operation. Itemized unit prices with exact quantities recommended for these spares shall be separately indicated for consideration of the School/Consultant.

DOCUMENTS MUTUALLY COMPLIMENTARY:

The several documents forming the contract are to be read as mutually complementary to each other and in case of ambiguities/ discrepancies, the same shall be explained and clarified by the Consultant/School to the Contractor in what manner the work is expected to be carried out to meet the end requirements.

TECHNICAL SPECIFICATIONS

PLUMBING WORKS

SECTION – I: GENERAL REQUIREMENTS

1.0 SCOPE OF WORK

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

1.2 Work under this Contract shall consist of furnishing all labour, materials, equipment and appliances necessary and required. The Contractor is required to completely furnish all the plumbing and other specialised services as described hereinafter and as specified in the schedule of quantities and/or shown on the plumbing drawings.

1.3 Without restricting to the generality of the foregoing, the sanitary installations shall include the following:-

Plumbing Works

-Sanitary Fixtures
-Soil, Waste, Vent, Rainwater Pipes & Fittings
-Water Supply System
-Garden Irrigation System
-Sewerage & Storm Water Drainage
-Hot water Generation System

1.4 Services rendered under this section shall be done without any extra charge.

2.0 SPECIFICATIONS

2.1 Work under this Contract shall be carried out strictly in accordance with specifications attached with the tender.

2.2 Items not covered under these specifications or due to any ambiguity or misprints, or additional works, the work shall be carried out as per specifications of the latest Central Public Works Department with up to date amendments as applicable in the Contract.

2.3 Works not covered under Para 2.1 and 2.2 shall be carried out as per relevant Codes & Bureau of Indian Standards and in case of its absence as per British Standard Code of Practice.

3.0 EXECUTION OF WORK

3.1 The Contractor should visit and examine the site of work and satisfy himself as to the nature of the existing roads and other means of communication and other details pertaining to the work and local conditions and facilities for obtaining his own information on all matters affecting the execution of work. No extra charge made in consequence of any misunderstanding, incorrect information on any

of these points or on ground of insufficient description will be allowed.

3.2 The work shall be carried out in conformity with the Plumbing drawings and within the requirements of architectural, HVAC, electrical, structural and other specialised services drawings.

3.3 The Contractor shall cooperate with all trades and agencies working on the site. He shall make provision for hangers, sleeves, structural openings and other requirements well in advance to prevent hold up of progress of the construction schedule. All supports to the civil structure shall be provided with dash fasteners.

On award of the work, Contractor shall submit a schedule of construction in the form of a PERT chart or BAR chart for approval of the Project Manager/Architect/ Consultant. All dates and time schedule agreed upon shall be strictly adhered to within the stipulated time of completion/ commissioning along with the specified phasing, if any.

4.0 DRAWINGS

4.1 Contract drawings are diagrammatic but shall be followed as closely as actual construction permits. Any deviations made shall be in conformity with the architectural and other services drawings.

4.2 Architectural drawings shall take precedence over plumbing or other services drawings as to all dimensions.

Contractor shall verify all dimensions at site and bring to the notice of the Project Manager all Discrepancies or deviations noticed. Decision of the Project Manager shall be final.

Large size details and manufacturers dimensions for materials to be incorporated shall take precedence Over small scale drawing.

Any drawings issued by the Architects/Consultant for the work are the property of the Architects/ Consultant and shall not be lent, reproduced or used on any works other than intended without the Written permission of the Architects/Consultant.

5 INSPECTIONS AND TESTING OF MATERIALS

5.1 Contractor shall be required, if requested, to produce manufacturers test certificate for the particular batch of materials supplied to him. The tests carried out shall be as per the relevant Bureau of Indian Standards.

5.2 For examination and testing of materials and works at the site Contractor shall provide all testing and gauging equipment necessary but not limited to the following:

13.1 Steel tapes
13.2 Weighing machine
13.3 Plumb bobs, sprit levels, hammer
13.4 Micrometres
13.5 Hydraulic machine

5.3 All such equipment shall be tested for calibration at any approved laboratory, if required by the Project Manager. All testing equipment shall be preferably located in special room meant for the purpose.

5.4 Samples of all materials shall be got approved before placing order and the approved samples shall be deposited with the Project Manager.

6.0 METRIC CONVERSION

6.1 All dimensions and sizes of materials and equipment given in the tender document are commercial metric sizes.

6.2 Any weights, or sizes given in the tender having changed due to metric conversion, the nearest equivalent sizes accepted by Indian Standards shall be acceptable without any additional cost.

7.0 REFERENCE POINTS

7.1 Contractor shall provide permanent bench marks, flag tops and other reference points and check that with other agencies to confirm the same reference point for all the proper execution of work and these shall be preserved till the end of the work.

7.2 All such reference points shall be in relation to the levels and locations, given in the architectural and plumbing drawings

8.0 REFERENCE DRAWINGS

8.1 The Contractor shall maintain one set of all drawings issued to him as reference drawings. These shall not be used on site. All-important drawings shall be mounted on boards and placed in racks indexed. No drawings shall be rolled.

8.2 All corrections, deviations and changes made on the site shall be shown on these reference drawings for final incorporation in the completion drawings to be submitted by the contractor in fulfilment of the conditions of this contract.

8.3 On award of the work the contractor shall be issued four sets of consultant's working drawings stamped "good for construction" by the Project Manager. The consultant's drawings shall be the basis of contractor's shop drawings. In addition, the Project Manager shall also issue one copy of the Interior Designer's; Electrical & HVAC approved shop drawings relevant to his work

8.4 Shop drawings are detailed working drawings which incorporate the contractor's details for execution of the work and incorporate equipment manufacturer's details and dimensions to ensure that the same can be installed in the space provided.

8.5 All shop drawings should detailed pipe routing and levels, showing location of other services at crossings etc., cable runs, route cable trays and all allied works and must be fully co-ordinated with other services and approved by the Project Manager before execution of the works. Project Manager shall arrange to issue two copies/prints of services drawings from the respective contracting agencies. Additional copies/prints may be provided on payment of actual cost of the

copies/ prints. All drawings will valid only when stamped and issued by the Project Manager.

8.6 Shop drawings shall also be furnished for detailed layout of all equipment, foundation, bolting and vibration elimination details along with information on dead and dynamic load, vibration etc.

8.7 Six sets of manufacturer's equipment drawings, roughing in and wiring diagrams shall be submitted.

8.8 Contractor shall submit shop drawings furnishing all details of MCC panels, cable routes, wiring diagrams and connection details as required.

8.9 Three copies of each set of shop drawings shall be submitted for initial scrutiny, discussion and approval.

8.10 Each submission shall be accompanied by contractor's certificate stating that the shop drawings meet all the contract requirements and that the piping and equipment can be satisfactorily installed without any obstructions in the space available.

8.11 On approval of the above the contractor shall furnish six sets of the approved shop drawings for execution of the work.

9.0 COMPLETION DRAWINGS

9.1 On completion of work, Contractor shall submit one complete set of original tracings and two prints of "as built" drawings to the Project Manager. These drawings shall have the following information.

a) Run of all piping, diameters on all floors, vertical stacks and location of external services.

b) Ground and invert levels of all drainage pipes together with location of all manholes and connections up to outfall.

c) Run of all water supply lines with diameters, locations of control valves, access panels.

c) Location of all mechanical equipment with layout and piping connections and mechanical equipment.

d) All shop drawings shall be updated from time to time for the purpose of making completion drawings.

10.8.2.1 No completion certificate shall be issued unless the above drawings are submitted.

9.2 Contractor shall provide four sets of catalogues, service manuals, manufacturer's drawings, performance data and list of spare parts together with the name and address of the manufacturer for all electrical and mechanical equipment provided by him.

9.3 All "warranty cards" given by the manufacturers shall be handed over to the Project Manager.

10.0 CONTRACTOR'S RATES

10.1 Rates quoted in this tender shall be inclusive of cost of materials, labour, supervision, erection, tools, plant, scaffolding, service connections, transport to site, taxes, GST,octroi and levies, royalty, labour cess, breakage, wastage and all such expenses as may be necessary and required to completely do all the items of work and put them in a working condition.

10.2 Rates quoted are for all heights and depths and in all positions as may be required for this work.

10.3 All rates quoted must be for complete items inclusive of all such accessories, fixtures and fixing arrangements, nuts, bolts, hangers as are a standard part of the particular item except where specially mentioned otherwise.

10.4 All rates quoted are inclusive of cutting holes and chases in walls and floors and making good the same with cement mortar/concrete/water proofing of appropriate mix and strength as directed by the Project Manager. Contractor shall provide holes, sleeves, recesses in the concrete and masonry work as the work proceeds. All hot and cold water supply pipes crossing masonry walls shall be provided with G.I. pipe sleeves. The annular space between the pipe and sleeve shall be filled up with fire proof sealant after testing. Contractor shall give the pipe sleeves to the civil contractor well in time so that the same can be fixed along with civil works. Any co-ordination gap shall be of contractor’s responsibility.

10.5 The Contractor shall furnish the Project Manager with vouchers & test certificates, on request, to prove that the materials are as specified and to indicate that the rates at which the materials are purchased in order to work out the rate analysis of non-tendered items which he may be called upon to carryout.

11.0 TESTING

11.1 Piping and drainage works shall be tested as specified under the relevant clauses of the specifications.

11.2 Tests shall be performed in presence of the Project Manager and test records for the tests shall be duly signed by Contractor and the Project Manager.

11.3 All materials and equipment found defective shall be replaced and whole work tested to meet the requirements of the specifications.

11.4 Contractor shall perform all such tests as may be necessary and required by the local authorities to meet municipal or other bye-laws in force.

11.5 Contractor shall provide all labour, equipment and materials for the performance of the tests.

12.0 SITE CLEARANCE AND CLEANUP

12.1 The Contractor shall, from time to time, clear away all debris and excess materials accumulated at the site.

12.2 After the fixtures, equipment and appliances have been installed and commissioned, Contractor

shall clean-up the same and remove all plaster, paints, stains, stickers and other foreign matter or discolouration leaving the same in a ready to use condition.

12.3 On completion of all works, Contractor shall demolish all stores, remove all surplus materials and leave the site in a broom clean condition, failing which the same shall be done by the Project Manager at the Contractor's risk and cost. Cost of the cleanup shall be deducted from the contractor's bills on pro-rata basis in proportion to his contract value.

13.0 LICENCE PERMITS AND AUTHORITIES

13.1 Contractor must hold a valid plumbing or any other as required licence by the municipal authority or other competent authority under whose jurisdiction the work falls.

13.2 Contractor must keep constant liaison with the local development, municipal/statutory authority and obtain approval of all drainage, water supply, fire suppression and other works carried out by him.

13.3 Contractor shall obtain, from the municipal and other authorities 'C' & 'D' & other forms as required for approval of drainage and water supply works during execution and the completion certificate with respect to his work as required for occupation of the building. Contractor shall obtain permanent water supply and drainage connections from authorities concerned. CLIENT shall reimburses the fees paid to the authorities towards the connection charges on production of receipts for money paid.

13.4 Contractor shall get any materials tested from the appropriate authority if so required with no cost to the CLIENT.

14.0 RECOVERY OF COST FOR MATERIALS ISSUED TO CONTRACTORS FREE OF COST

If any material issued free of cost by the CLIENT to the contract for use on the work and the same is lost, stolen ,pilfered or broken while in contractor' possession, the cost of the same shall be recovered from the Contractor on the basis of actual cost to CLIENT. The cost shall include the cost paid, freight, transportation, excise duty, sales tax, octroi, import duty and other levies, plus 100% as penalty. The decision on the actual cost given by the CLIENT shall be final and binding on the Contractor.

a. Contractor has to keep full records of material issued by the CLIENT with reference and challans etc. Contractor has to give account of all such materials to the Project Manager.

15.0 CUTTING OF WATER PROOFING MEMBRANE:

No walls terraces shall be cut for making and opening after water proofing has been done without written approval of project manager. Cutting of water proofing membrane shall be done very carefully so as other portion of water proofing is not damaged. On completion of work at such place the water proofing membrane shall be made good and ensured that the opening/cutting is made fully water proof as per specifications and details of water proofing approved by Project Managers.

16.0 CUTTING OF STRUCTURAL MEMBERS

No structural member shall be chased or cut without the written permission of the Project Manager.

17.0 MATERIALS SUPPLIED BY CLIENT.

The Contractor shall verify that all materials supplied by the CLIENT conform to the specifications of the relevant item in the tender. Any discrepancy found shall be brought to the notice of the Project Manager.

18.0 MATERIALS

Unless otherwise specified and expressly approved in writing by the Project Manager, only materials of makes and specification as mentioned in the list of approved makes attached with the specifications shall be used.

If required, the Contractor shall submit samples of materials proposed to be used in the works. Approved samples shall be kept in the office of the Project Manager.

SECTION – II : SANITARY FIXTURES

1.0 SCOPE OF WORK

1.1 Work under this section shall consist of furnishing all materials & labour necessary and required to completely install all sanitary fixtures, chromium plated fittings and accessories as required by the drawings specified hereinafter and given in the Schedule of Quantities.

1.2 Without restricting to the generality of the foregoing the sanitary fixtures shall include the following:-

a) Sanitary fixtures
b) Chromium plated fittings
c) Accessories e.g., toilet paper holders, soap dish, coat hooks etc.
d) Connections to all kitchens, equipment, pump headers and other equipment requiring water and drainage connections.

1.3 Whether specifically mentioned or not all fixtures and appliances shall be provided with all fixing devices, nuts, bolts, screws, hangers as required.

1.4 All exposed pipes within toilets and near fixtures shall be chromium plated brass or copper unless otherwise specified.

2.0 GENERAL REQUIREMENTS

2.1 Sanitary fixtures and C.P. fittings in manufacturer's packing as specified in the schedule of quantities shall be supplied by the Contractors.

All fixtures and fittings shall be provided with all such accessories as are required to complete the item in working condition whether specifically mentioned or not in the Schedule of Quantities, specifications, drawings. Accessories shall include proper fixing arrangement, brackets, nuts, bolts, screws and required connection pieces, WC flexible connectors etc.

2.3 Fixing screws shall be half round head chromium plated brass screws with C.P. washers where necessary.

2.4 Contractor shall furnish without cost all such accessories and fixing devices that are necessary and required but not supplied along with the Plumbing Fixtures & CP Fittings by the manufacturers as a part of the original and standard supply.

2.5 All fittings and fixtures shall be fixed in a neat workmanlike manner true to level and heights shown 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, tiling or terrace shall be made good at Contractor's cost.

2.6 Contractor shall seal all fixtures fixed near wall, marble and edges with an approved type of poly-sulphide sealant appropriate for its application.

3.0 EUROPEAN W.C

3.1 European W.C. shall be wash down or symphonic type floor or wall mounted set flushed by means of porcelain/ plastic flushing cistern, which will be an integral part of the WC system. Framework, walling and finishing will not form a part of the contractor's work. Where applicable flush pipe/ bend shall be connected to the W.C. by means of a suitable rubber adapter. Wall hung W.C. shall be supported by C.I. floor mounted chair.

3.2 Each W.C. set shall be provided with a plastic seat shall be with rubber buffers and chromium plated hinges.

3.3 Plastic seat shall be so fixed that it remains absolutely stationary in vertical position without falling down on the W.C. Each W.C. shall be suitable for flushing in low volume of water 3-6 litres.

3.4 Flushing cistern when provided shall be provided with all internal flushing mechanism, 15 mm dia ball cock with unbreakable polythene float and overflow pipe. Any frame work required for fixing cistern has to be provided by the contractor.

4.0 URINALS

4.1 Urinals shall be white glazed vitreous china of size, shape and type specified in the Schedule of Quantities.

4.2 Bowl urinals shall be provided with 15 mm dia C.P. spreader, 32 mm dia stainless steel domical waste and C.P. cast brass bottle trap with pipe and wall flange, and shall be fixed to wall by C.I. brackets and C.I. wall clips as recommended by manufacturers complete as directed by Project Manager.

4.3 Urinals shall be fixed with C.P. brass screws and shall be provided with 32 mm dia domical waste leading to urinal's trap.

4.4 Flush pipes shall be G.I. pipes concealed in wall chase but with chromium plated bends at inlet and outlet or as given in Schedule of Quantities.

4.5 Urinals shall be flushed by means of fully automatic no-touch flush valve with solenoid valves.

4.6 Waste pipes for urinals shall be G.I pipes (Medium class) to IS: 1239 or uPVC class III (6 kg/sqcm) conforming to IS: 4985 as given in schedule of quantities.

4.7 Waste pipes may be exposed on wall or concealed in chase as directed by the Project Manager. Specifications for waste pipes shall be same as given in Section II.

5.0 WASH BASINS

5.1 Wash basins shall wall mounted type or Counter top type as specified in the BOQ.

5.2 Each basin shall be supported on MS galvanized or CI brackets and clips and the basin securely fixed to wall or on the counter. The design of the brackets shall suit the basin selected and as

recommended by the manufacturer.

5.3 Each basin shall be provided with 32 mm dia C.P.waste with overflow, pop-up or standard waste with rubber plug and chain, 32 mm dia C.P. brass bottle trap with CP pipe to wall and flange.

5.4 Each basin shall be provided with a Hot & cold CP mixer with pop up waste fittings, 32 mm dia. CP cast brass bottle trap with outlet pipe and wall flange.

5.5 Some of the selected wash basins as identified in the BOQ shall be similar to the one described above but the supply tap shall be a Magic Eye Infrared operated automatic hot and cold mixing fittings.

5.6 Washbasins shall be fixed at proper heights as shown on drawings. If height is not specified, the rim level shall be 79 cms or as directed by Project Managers.

6.0 ACCESSORIES

6.1 Contractor shall install all chromium plated and porcelain accessories as shown on the drawings or directed by the Project Manager.

6.2 All C.P. accessories shall be fixed with C.P. brass half round head screws and cup washers in wall with rawl plugs or nylon sleeves and shall include cutting and making good as required or directed by Project Manager.

6.3 Recessed porcelain accessories shall be fixed in walls and set in cement mortar 1:2 (1 cement: 2 coarse sand) and fixed in relation to the tiling work as per Interior Designer's drawings.

7.0 URINAL PARTITIONS

7.1 Urinal partitions shall be white glazed vitreous china, marble, granite or any other material selected by the Project Manager.

7.2 Urinal partitions shall be fixed at proper heights with C.P. brass bolts, anchor fasteners And M.S. Clips as recommended by the manufacturer and directed by Project manager

8.0 MEASUREMENT

8.1 Sanitary fixtures and accessories shall be measured by numbers in the unit given in the Schedule of Quantities.

8.2 Rates for all items shall be inclusive of cutting holes and chases and making good the same, C.P Brass screws, nuts, bolts and any fixing arrangements required and recommended by manufacturers, testing and commissioning.

SECTION III : SOIL, WASTE, VENT & RAINWATER PIPES & FITTINGS

1.0 SCOPE OF WORK

1.1 Work under this section shall consist of furnishing all labour, materials, equipments and appliances necessary and required to completely install all soil, waste, vent and rainwater pipes and fittings as required by the drawings, and given in the Schedule of Quantities.

1.2 Without restricting to the generality of the foregoing, the soil, waste & vent and rainwater piping system shall include the following:-

a) Vertical and horizontal soil, waste & vent and rainwater pipes and fittings, joints, clamps and connections to fixtures.
b) Connection of all pipes to sewer lines as shown on the drawings at ground floor levels.
c) Floor and urinal traps, cleanout plugs, inlet fittings and rainwater heads.
d) Testing of all pipe lines.

2.0 GENERAL REQUIREMENTS

2.1 All materials shall be new of the best quality conforming to specifications and subject to the approval of Engineer-in-Charge.

2.2 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner.

2.3 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.

2.4 Pipes shall be securely fixed to walls and ceilings by suitable clamps a intervals specified.

2.5 Access doors for fittings and cleanouts shall be so located that they are easily accessible for repair and maintenance.

3.0 UPVC PIPES & FITTINGS

3.1 Pipes

3.1.1 uPVC pipes for drainage system shall be un-plasticized (rigid) PVC pipes conforming to I.S:13592 as specified in schedule of quantities.

3.1.2 Fittings for the pipes shall be injection moulded with approved type of sockets and 'O' rings joints/solvent welded joints as per recommendations of the manufacturers.

3.1.3 Jointing shall be done as per the manufacturers recommendation. The pipes and fittings must have matching dimensions for a perfect joint. Loose or excessively tight joints in the system shall not be accepted. Fittings must have sufficient gap (approx. 10 mm) for permissible thermal expansion of pipes.

3.1.4 uPVC pipes shall be clamped to the wall with approved type uPVC saddle clamps.

3.2 Fittings

Fittings shall conform to the same Indian Standard as for pipes. Contractor shall use pipes and fittings of matching specifications.

Fittings shall be of the required degree of curvature with or without access door.

Access door shall be made up with 3 mm thick insertion rubber washer and white lead. The bolts shall be lubricated with grease or white lead for easy removal later. The fixing shall be air and water tight.

3.3 Fixing

All vertical pipes shall be fixed by M.S. clamps truly vertical. Branch pipes shall be connected to the stack at the same angle as that of the fittings. No collars shall be used on vertical stacks. Each stack shall be terminated at top with a cowl (terminal guard).

Horizontal pipes running along ceiling shall be fixed on structural adjustable clamps of special design shown on the drawings or as directed. Horizontal pipes shall be laid to uniform slope and the clamps adjusted to the proper levels so that the pipes fully rest on them.

Contractor shall provide all sleeves, openings, hangers, inserts during the construction. He shall provide all necessary information to the building Contractor for making such provisions in the structure as necessary. All damages shall be made good to restore the surfaces.

4.0 CLAMPS

4.1 Holder bat clamps shall be of standard design and fabricated from M.S. flats 40x3 mm thick and 12 mm dia M.S. Rod and 6 mm nuts and bolts. They shall be painted with two coats of black bitumen paint before fixing. Holder bat clamps shall be fixed in cement concrete 1:2:4 mix blocks 10x10x10 cms deep.

4.2 Where holder bat clamps are to be fixed in RCC column or slotted angles, walls or beam they shall be fixed with 40x3 mm flat iron "U" type clamps with anchor fasteners of approved design or 6 mm nuts and bolts.

4.3 Structural clamps shall be fabricated from M.S. structural members e.g. rods, angles, channels flats as per detailed drawing or as directed. Contractor shall provide all nuts, bolts, welding material and paint the clamps with one coat of red oxide and two or more coats of black enamel paint.

4.4 Slotted angle/channel supports on walls shall be provided wherever shown on drawings. Angles/channels shall be of sizes shown on drawings or specified in schedule of quantities. Angles/channels shall be fixed to brick walls with bolts embedded in cement concrete blocks and to RCC walls with suitable anchor fasteners. The spacing of support bolts horizontally shall not exceed 1 m.

4.5 Wherever M.S. clamps are required to be anchored directly to brick walls, concrete slabs, beams or columns, nothing extra shall be payable for clamping arrangement and making good with cement concrete 1:2:4 mix (1 cement :2 coarse sand :4 mm stone aggregate 20 mm nominal size) as directed by the Engineer-in-Charge.

5.0 TRAPS

5.1 Nahni trap or floor traps: Nahni traps or floor traps shall be Upvc, deep seal with an effective seal of 50 mm. The trap and waste pipes shall be set in cement concrete blocks firmly supported on the structural floor. The blocks shall be in 1:2:4 mix (1 cement :2 coarse sand :4 stone aggregate 20 mm nominal size) and extended to 40 mm below finished floor level. Contractor shall provide all necessary shuttering and centering for the blocks. Size of the block shall be 30x30 cms of the required depth.

5.2 Urinal traps: Urinal traps shall be Upvc P or S traps with or without vent and set in cement concrete block specified in Para above without extra charge.

5.3 Floor trap inlet: Bath room traps and connections shall ensure free and silent flow of discharging water. Where specified, Contractor shall provide a special type Upvc inlet fitting hoper fabricated from 110 mm Upvc (IS:13592) pipe without or with one, two or three inlet sockets to receive the waste pipe (s). Joint between waste and hopper inlet socket shall be solvent cement/ring joint. Hopper shall be connected to aUpvc P or S trap with at least 50 mm seal (hopper and traps shall be paid for separately.)Floor trap inlet hoppers and the traps shall be set in cement concrete blocks as specified in Para above without extra charge.

5.4 Floor Trap Grating: Floor and urinal traps shall be provided with 75-150mm square or round C.P./Stainless steel grating, with rim of approved design and shape. Minimum thickness shall be 4 mm (for C.P. brass) or 1.2 mm (for SS), as specified in the Schedule of Quantities.

6.0 JOINTING

Soil, waste vent, anti-syphonage and rainwater pipes shall be jointed with solvent cement/ring joint.

7.0 END CAP

Contractor shall provide cast brass end cap as required. End cap shall be threaded and provided with key holes for opening. End cap shall be fixed to the pipe by a Upvc socket and cement solvent joint.

8.0 WASTE PIPE FROM APPLIANCES

8.1 Waste pipe from appliances e.g. washbasins, sinks and urinals shall be of Upvc as given in the Schedule of Quantities.

8.2 All pipes shall be fixed in gradient towards the outfalls of drains. Pipes inside a toilet room shall be in chase unless otherwise shown on drawings. Where required pipes may be run at ceiling level in suitable gradient and supported on structural clamps. Spacing for clamps for such pipes shall be as follows:-

	Vertical	horizontal
UPVC PIPES	180 cms.	120 cms.

9.0 KHURRAS

9.1 The khurras shall be constructed before the brick masonry work in parapet wall is taken up and it shall be 45cmx45cm unless otherwise specified in the description of the item and shall be formed of cement concrete 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) or other mix as stipulated in the description of the item.

9.2 Laying:

9.2.1 A PVC sheet 1mx1mx400 micron shall be laid under the khurras and then cement concrete shall be laid over it to average thickness of 50mm with its top surface lower than the level of adjoining roof surface by not less than

a) 20mm in case of roof surface finished with lime concrete terracing.
b) 70 mm in case of roof surface finished with lime concrete terracing covered with brick tiles.
c) 50mm in case of roof surface finished with mud phuska with brick tile covering.

9.2.2 The concrete shall be laid to a size greater than the stipulated size of the khurras in such a way that the adjoining terracing whether of lime concrete or of the tile brick shall overlap the concrete on its three edges by not less than 7.5 cm. The concrete will slope uniformly from the edges to the outlets the slope as being as much as possible and in no case less than 20mm cement concrete at outlet. The concrete shall be continued at the same slope through the width of the wall into the outlet opening to ensure a water tight joint.

9.2.3 The khurras and the side of the outlet shall than be rendered with 12mm coat of cement plaster 1:3 mix ((1 cement:3 coarse sand) or other mix as stipulated in the description of the item. This shall be done when the concrete is still green and shall be finished with floating coat of neat cement. The sides of the khurras and the sides of the outlet opening shall be well rounded. The size of the finished outlet opening shall be 10cm wide by 20 cm high or as directed by Engineer -in-charge.

As a safeguard against choking of rainwater outlet through rain water pipes at terrace level, Cast Iron
Rainwater outlet fitting with aluminium ring and aluminium domical head (fixed with SS screw) of size
250x100 mm shall be provided as directed by the Engineer in-Charge.

10.0 CEMENT CONCRETE

10.1 Upvc soil and waste pipes under floor in sunken slabs and in wall chases (when cut specially for the pipe) shall be encased in cement concrete 1:2:4 mix (1 cement :2 coarse sand :4 stone aggregate 12 mm size) 75 mm in bed and all-round. When pipes are running well above the structural slab, the encased pipes shall be supported with suitable cement concrete pillars of required height at intervals of 1.8 m. Rate for concrete round pipes shall be inclusive of pillars,

supports, shuttering and centering.

11.0 CUTTING AND MAKING GOOD

Pipes shall be fixed and tested as building proceeds. Contractor shall provide all necessary holes cut outs and chases in structural members as building work proceeds. wherever holes are cut or left originally, they shall be made good with cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 stone aggregate 20 mm nominal size) or cement mortar 1:2 (1 cement: 2 coarse sand) and the surface restored as in original condition.

12.0 TESTING

12.1 Before use at site all Upvc soil pipes shall be tested by filling up with water for at least 10 minutes. After filling, pipes shall be struck with a hammer and inspected for blow holes and cracks. All defective pipes shall be rejected and removed from the site within 48 hours. Pipes with minor sweating may be accepted at the discretion of the Engineer-in-Charge.

12.2 Pipes shall be tested after installation, by filling up the stack with water. All opening and connections shall be suitably plugged. The total head in the stack shall be however not exceed 3 m.

12.3 Alternatively Contractor may test all soil and waste stacks by a smoke testing machine. Smoke shall be pumped into the stack after plugging all inlets and connections. The top end shall, however, be left open. The stack shall then be observed for leakages and all defective pipes and fittings removed or repaired as directed by the Engineer-in-Charge.

12.4 A test register shall be maintained and all entries shall be signed and dated by Contractors and Engineer-in-Charge.

13.0 MEASUREMENTS

13.1 General

a. Rates for all items quoted shall be inclusive of all work and items given in the above mentioned specifications and Schedule of Quantities and applicable for the work under floors, in shafts or at ceiling level at all heights and depths.

b. All rates are inclusive of cutting holes and chases in RCC and masonry work and making good the same.

c. All rates are inclusive of pre testing and on site testing of the installations, materials and commissioning.

13.2 Pipes (Unit of measurement: Linear meter to the nearest centimeter)

a. All uPVC soil, waste, vent, anti-syphonage and rain water pipes shall be measured net when fixed correct to a centimeter including all fittings along its length. No allowance shall be made for the portions of pipe lengths entering the sockets of the adjacent pipes or fittings. The above will apply to both case i.e. whether pipes are fixed on wall face or pillars or embedded in masonry or pipes running at ceiling level.

Cement concrete around pipes shall be measured along the centre of the pipe line measured per linear metre and include any masonry supports, shuttering and centering cutting complete as described in the relevant specifications.

b. Slotted angles/channels shall be measured per linear metre of finished length and shall include support bolts and nuts embedded in masonry walls with cement concrete blocks and nothing extra will be paid for making good the same.

c. Fittings: Unit of measurement shall be the number of pieces. All urinal traps, trap gratings, hoppers, end cap shall be measured by number per piece and shall include all items described in the relevant specifications and Schedule of Quantities.

13.3 Painting: Painting of pipes shall be measured per running metre and shall be inclusive of all fittings and clamps. No deduction for fittings shall be made.

13.4 Excavation for soil, waste, anit-siphonage and rainwater pipes: - no extra payment shall be admissible with respect to excavation, refilling and disposal of surplus earth for uPVC pipes.

13.5 Khurras shall be counted in numbers. The rate for each completed khurra of the specified size shall include the cost of all materials and labour involved in forming the khurraan the outlet opening as described in specifications above, except for the rainwater head grating, which shall be paid separately.

SECTION – IV:WATER SUPPLY SYSTEM

1.0 SCOPE OF WORK

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

1.2 Without restricting to the generality of the foregoing, the water supply system shall include the following:-

a) Distribution system from main supply headers to all fixtures and appliances for cold & hot water. Cold water supply lines from city water connections to Under Ground Water Tank.
c) Garden irrigation system
d) Excavation and refilling of pipes trenches.
e) Pipe protection and painting.
f) Control valves, masonry chambers and other appurtenances.
g) Connections to all plumbing fixtures, tanks, appliances and municipal mains
h) Inserts for R.C.C. tanks

2.0 GENERAL REQUIREMENTS

2.1 All materials shall be new of the best quality conforming to specifications. All works executed shall be to the satisfaction of the Project Manager.

2.2 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner.

2.3 Short or long bends shall be used on all main pipe lines as far as possible. Use of elbows shall be restricted for short connections.

2.4 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.

2.5 Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals specified.

2.6 Clamps, hangers and supports on RCC walls, columns & slabs shall be fixed only by means of approved made of expandable metal fasteners inserted by use of power drills.

2.7 All pipe clamps, supports, nuts, bolts, washers shall be galvanised MS steel throughout the building. Painted MS clamps & MS nuts, bolts & washers shall not be accepted.

2.8 Valves and other appurtenances shall be so located as to provide easy accessibility for operations, maintenance and repairs.

3.0 WATER SUPPLY SYSTEM

3.1 Contractor should study the site plan and the water supply systems one for domestic water supply.

Source

Water supply will be acquired from Municipal Corporation water mains (as available) to a service Connection and collected in water storage tanks located underground.

The system has been connected to a gravity feed system from overhead tanks to all parts of the Building. It is proposed to provide flushing cistern for all WCs. Infra-red NO-TOUCH flush valves Shall be provided for Urinals. These will be fed from overhead tank by gravity.

Domestic water supply shall be provided with cold water system only. Hot water provisions to kitchen And all toilets connected to a local electric hot water storage geyser other than add on solar system at Terrace for inlet of geyser in kitchen etc.

4.0 (CPVC) G.I. PIPES, FITTINGS & VALVES

4.1 All pipes inside the buildings for domestic hot and cold water supply shall be CPVC conforming to CTs SDR-13.5 at a working pressure of 320 PSI at 23 deg.C. and 80 PSI at 82 deg. C.

4.2 Solvent welded CPVC fittings etc. tees, elbows, couplers, unions, reducers, brushing etc. including transition fittings (connection between CPVC and metal pipes/G.I. ie. Brass adopters conforming to ASTM D-2846) shall be provided.

4.3 All pipes shall be fixed in accordance with layout and alignment shown on the drawings. Care

shall be taken to avoid air pockets. G.I. pipes inside toilets shall run above false ceiling with vertical drop in wall chases for all fixtures. No pipes to run inside sunken floor as far as possible. Pipes may run under the ceiling or floors and other areas as shown on drawings.

4.4 Joining Pipes & Fittings

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. All burrs should be removed for proper contact between pipe and fittings during jointing.

Solvent Cement Application

Only CPVC solvent cement conforming to ASTM-F-493 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.

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.

Testing

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 the replaced with new one.

4.5 Transition of Flow guard CPVC in 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 torque.

Threaded sealants

Teflon tape shall be used to make threaded connections leak proof.

Solvent Cement

Only CPVC solvent cement conforming to ASTMF 493 should be used for joining pipe with fittings and valves.

Hangers and supports

For Horizontal runs, support should be given at 3 feet (90 cms) intervals for diameters of one inch and below and at 4 feet (1.2 m) intervals for larger sizes.

Supports should be as per the below mentioned table:

Size of pipe	20ºC	49ºC	71ºC	82ºC
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
1¼"	7.0	6.0	3.5	3.5
2"	7.0	6.5	4.0	3.5

4.7 Anchor Fasteners

4.7.1 All pipe supports, hangers and clamps to be fixed on RCC walls, beams, columns, slabs and masonry walls 230mm thick and above by means of galvanised expandable anchor fasteners in drilled holes of correct size and model to carry the weight of pipes. Drilling shall be made only by approved type of power drill as recommend and approved by manufacturer of the anchor fasteners. Failure of any fastening devices shall be the entire responsibility and contractor shall redo or provide additional supports at his own cost. He shall also compensate the DPL for any damage that may be caused by such failures.

4.8 Unions

Contractor shall provide adequate number of unions on all pipes to enable easy dismantling later when required. Unions shall be provided near each gunmetal valve, stop cock, or check valve and on straight runs as necessary at appropriate locations as required and/or directed by Project Manager.

4.9 Flanges

Flanged connections shall be provided on pipes as required or where shown on the drawings, all equipment connections as necessary and required or as directed by the Project Manager. Connections shall be made by correct number and size of GI nuts, bolts & washers with 3 mm thick gasket. Where hot water connections are made insertion gasket shall be of suitable high temperature grade and quality approved by the Project Manager. Bolt hole dia for flanges shall conform to match the specification for C.I. sluice valve to I.S. 780. and C.I. butterfly valve to IS: 13095.

4.10 Trenches

All water supply pipes below ground shall be laid in trenches with a minimum cover of 60 cms. The width and depth of the trenches shall be as follows:-

Dia of pipe	Width of trench	Depth of trench
15 mm to 50 mm	30 cms	75 cms

65 mm to 150 mm	45 cms	100 cms

4.11 Sand filling

G.I. pipes in trenches shall be protected with fine sand 15 cms all round before filling in the trenches.

4.12 Painting (Painting for CPVC pipes not required)

4.12.1 All pipes above ground shall be painted with one coat of red lead and two coats of synthetic enamel paint of approved shade and quality. Pipes shall be painted to standard colour code given in this documents or specified by Project Manager.

4.13 Pipe protection (Protection for CPVC pipes not required)

4.13.1 All G.I. pipes in wall chase /below floors or laid underground shall be protected against corrosion by the application of two coats of bitumen paint covered with polythene tape and a final coat of bitumen paint.

4.13.2 G.I. waste pipes buried in ground or sunken slab shall be protected with multilayer bitumen membrane tape 3mm thick with a final coat of hot or cold applied bitumen. Pypkote or equivalent.

4.14 Valves

4.14.1 Ball Valves

Valves upto 40 mm dia. shall be screwed type Ball Valves with stainless steel balls, spindle, teflon seating and gland packing tested to a hydraulic pressure of 25 kg/cm2, and accompanying couplings and steel handles.(to BS 5351)

4.15 Butterfly Valves

4.15.1 Valves 50 mm dia and above shall be cast iron butterfly valve to be used for isolation. The valves shall be bubble tight, resilient seated suitable for flow in either direction and seal in both direction with accompanying flanges and steel handle.

4.15.2 Butterfly valve shall be of best quality conforming to IS: 13095.

4.16. Non Return Valve (Slim Type)

Where specified non return valve (swing check type) shall be provided through which flow can occur in one direction only. It shall be single door swing check type of best quality.

4.16.1 Each Butterfly and Slim Type Swing Check (NRV) Valve shall be provided with a pair of flanges screwed or welded to the main line and having the required number of galvanised nuts, bolts and washers of correct length.

4.16.2 Storage tanks Underground & Overhead Tank. (Accessories & Connections)

4.16.3 Storage tanks for water supply shall be in reinforced cement concrete built by the building Contractor.

4.16.4 Each tank shall be provided with lockable type manhole cover fabricated from M.S. sheets. Manhole covers shall be 450-500 mm dia and fully galvanised after fabrication or as approved by the Project Manager.

4.17 Storage Tanks

4.17.1 Underground

Underground storage tanks for water supply shall be reinforced cement concrete built by the building contractor.

Each tank shall be provided with lockable type manhole cover fabricated from M.S. sheet or standard cost iron tank covers. Manhole covers shall be 450-500 mm dia or as approved by local municipal authority.

4.18 Outlets and overflow

All nozzles for puddle flanges in RCC tank for inlet, outlet, overflow and scour etc. shall be provided by civil contractor or as given in the Schedule of Quantities. Further connections and accessories shall be provided under this contract.

4.19 Testing

a. All pipes, fittings and valves after fixing at site, shall be tested by hydrostatic pressure of 1.5 times the working pressure or 10 kg/cm2 whichever is more. Pressure shall be maintained for a period of at least thirty minutes without any drop.

b. A test register shall be maintained and all entries shall be signed and dated by Contractor (s) and Project Manager.

c. 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.

d. 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.

4.20 Measurement

CPVC or G.I. pipes above ground shall be measured per linear meter (to the nearest cm) and shall be inclusive of all fittings e.g. coupling, tees, bends, elbows, unions, flanges and U clamps with nuts,

bolts& washers fixed to wall or other standard supports.

Jointing with teflon tape, white lead and insertion gasket of appropriate temperature grade.

Cutting holes, and chases in walls, floors, any pipe support required for pipes below ground & making good the same.

Excavation, back filling, disposal of surplus earth and restoring the ground & floor in original condition.

4.21 Pipe Supports.

Fabricated and galvanised supports shall be measured by weight. Weight for each type of clamp shall be calculated on basis of the quantity of structural and MS used from the theoretical weight calculated on basis of the components theoretical weight of the sections.

4.21.1 Rate quoted for supports & hangers shall be inclusive of:-

a) Expandable anchor fastens.
b) Galvanising of all supports & hangers.
c) Cutting holes in walls, ceilings on floors and making good where permitted.
d) Nuts, bolts and washers for fixing and assembling.
e) Wooden/PVC pipe saddles for vertical or horizontal runs.

4.21.2 Valves

Gunmetal, cast iron, butterfly and non return valves and puddle flanges shall be measured by numbers and shall include wheels/caps, GI nuts, bolts, washers and insertion gasket.

4.21.3 Painting/pipe protection/insulation

Painting/pipe protection/insulation for pipes shall be measured per linear metre over finished surface and shall include all valves and fittings for which no deduction shall be made. No extra payment shall be made for fittings, valves or flanges.

SECTION – V : GARDEN IRRIGATION SYSTEM

1 SCOPE OF WORK

Work under this section consists of furnishing all labour, materials equipment and appliances necessary and required to install garden hydrants and sprinklers and drip Irrigation water supply system as required by the drawings, specified hereinafter and as given in the Schedule of Quantities (BOQ).

1.1 Without restricting to the generality of the foregoing, the water supply system shall include the following:-

a) Connections from the water supply system to all hydrants, sprinklers and drip irrigation points.

b) Garden hydrants, surface sprinklers & pipe emitters.

c) Excavation and refilling of pipes trenches.

d) Control valves, masonry chambers and other appurtenances.

e) Connections to all pumps & appliances.

2 THE SYSTEM

The garden hydrant and sprinkler irrigation system will be new and fully working system in the complex.

2.2 System components shall be pipes, valves, controllers, various types of sprinklers and drip irrigation lines with emitters as approved by the Project Manager.

3.0 GENERAL REQUIREMENTS

3.1 All materials shall be new of the best quality conforming to specifications. '

All works executed shall be to the satisfaction of the Project Manager.

Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner.

Short or long bends shall be used on all main pipe lines as far as possible. Use of elbows shall be restricted fur short connections.

Pipes shall be laid in a manner as to provide as far as possible easy accessibility for repair and maintenance. Pipes under roads shall be laid in RCC pipe sleeves.

Valves and other appurtenances shall be so located as to provide easy accessibility for operations, maintenance and repairs.

HDPE Pipes and Fittings.

Garden hydrant mains shall be HDPE pipes conforming to IS: 4984 of class specified. If class is not mentioned in the schedule of quantities the same shall be Material Grade PF100, unless other materials like uPVC schedule 40 or uPVC as per IS 4985 in accordance to specifications given above are specified in the BOQ.

Fittings for HDPE pipes shall be injection moulded fitting suitable for thermal weld joints. Fittings must
have suitable provision for expansion and shall be rated for the same working pressure as the pipeline, unless other materials like uPVC schedule 40 or uPVC as per IS 4985 in accordance to specifications given above are specified in the BOQ.

Thermal Joints shall be made in an approved manner as recommended by the manufacturer.

Provide flanges at intervals of 20-25 m. for all pipes 65 mm dia and above.

Provide suitable adapters for connection between pipes & valves.

Provide cement concrete supports and anchor blocks at all bends, tees and other locations as directed by the Project Manager. Connections at garden hydrant outlet, near valves must also be anchored.

Drip Irrigation Pipes

Pipes shall be LLDPE pies of UC 7510 resin conforming to ASAE S-435 standard.

G.I. Pipes & Fittings

Vertical connection for garden hydrant points shall be galvanised steel tubes to IS12:1239 (medium class) with matching malleable iron fitting of approved make.

Sprinklers

Pop-up Sprinklers Pop-up sprinklers shall be underground with rugged plastic high impact case with precision jet spray guide arm control with brass head, Sprinklers shall be suitable for pressure and coverage given in the schedule of quantities.

SECTION VI - EXTERNAL SEWERAGE & EXTERNAL RAIN WATER DISPOSAL

1. SCOPE OF WORK

1.1 Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install all the drainage system as required by the drawings and specified hereinafter or given in the Schedule of Quantities.

1.2 Without restricting to the generality of the foregoing, the drainage system shall include:-

a) Sewer lines including excavations, pipe lines, manholes, drop connections and connections to the municipal or existing sewer.
b) Storm water drainage, excavation, pipe lines, manholes, catch basins and connections to the existing municipal storm water drain.

2. GENERAL REQUIREMENTS

2.1 All materials shall be of the best quality conforming to specifications and subject to the approval of the Engineer-in-Charge.

2.2 Drainage lines and open drains shall be laid to the required gradients and profiles.

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

2.4 Contractor shall obtain necessary approval and permission for the drainage system from the municipal or any other competent authority.

2.5 Location of all manholes, etc. shall be got confirmed by the Engineer-in-Charge 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 Engineer-in-Charge.

3. EXCAVATION

3.1 Alignment and grade: The sewer pipes shall be laid to alignment and gradient shown on the drawings but subject to such modifications as shall be ordered by the Engineer-in-Charge from time to time to meet the requirements of the works. No deviations from the lines, depths of cutting or gradients of sewers shown on the plans and sections shall be permitted except by the express direction in writing of the Engineer-in-Charge.

3.2 Excavation in tunnels: The excavation for sewer works shall be open cutting unless the permission of the Engineer-in-Charge for the ground to be tunneled is obtained in writing. Where sewers have to be constructed along narrow passages, the Engineer-in-Charge may order the excavation to be made partly in tunnel and in such cases the excavated soil shall be brought back later on for refilling the trenches or tunnel.

3.3 OPENING OUT TRENCHES: In excavating the trenches, etc. The solid road metalling,

pavement, kerbing, etc. And turf is to be placed on one side and preserved for reinstatement when the trenches or other excavation shall be filled up. Before any road metal is replaced, it shall be carefully sifted. The surface of all trenches and holes shall be restored and maintained to the satisfactions of the Engineer-in-Charge and of the owners of the roads or other property traversed and the Contractor shall not cut out or break down any live fence of trees in the line of the proposed works but shall tunnel under them, unless the Engineer-in-Charge shall order to the contrary. The Contractor shall grub up and clear the surface over the trenches and other excavations of all trees, stumps roots and all other encumbrances affecting execution of the work and shall remove them from the site to the approval of the Engineer-in-Charge.

3.4 OBSTRUCTION OF ROADS: 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 Engineer-in-Charge in writing before closing any road to vehicular traffic and the foot walks must be clear at all times.

3.5 REMOVAL OF FILTH: All night soil, filth or any other offensive matter met with during the execution of the works, immediately after it is taken out of any trench, sewer or cess pool, shall not be deposited on to the surface of any street or where it is likely to be a nuisance or passed into any sewer or drain but shall be at once put into the carts and removed to a suitable place to be provided by the Contractor.

3.6 EXCAVATION TO BE TAKEN TO PROPER DEPTHS: The trenches shall be excavated to such a depth that the sewer shall rest on concrete as described in the several clauses relating there to and so that the inverts may be at the levels given in the sections. In bad ground, the Engineer-in-Charge may order the Contractor to excavate to a greater depth than that shown on the drawings and to fill up the excavation to the level of the sewers with concrete, broken stone, graven or other materials. For such extra excavation and concrete, broken stone, gravel or other materials, the Contractor shall be paid extra at rates laid down for such works in the schedule, if the extra work was ordered by the Engineer-in-Charge in writing, but if the Contractor should excavate the trench to a greater depth than is required without a specific order to that effect in writing of the Engineer-in-Charge the extra depth shall have to be filled up with concrete at the Contractor's own costs and charges to the requirements and satisfactions of the Engineer-in-Charge.

3.7 REFILLING: After the sewer or other work has been laid and proved to be water tight, the trench or other excavations shall be refilled. Utmost care shall be taken in doing this, so that no damage shall be caused to the sewer and other permanent work. The filling in the haunches and up to 75 cms above the crown of the sewer shall consist of the finest selected materials placed carefully in 15 cms layers and flooded and consolidated. After this has been laid, the trench and other excavation shall be refilled carefully in 15 cms layers with materials taken from the excavation, each layer being watered to assist in the consolidation unless the Engineer-in-Charge shall otherwise direct.

3.8 CONTRACTOR TO RESTORE SETTLEMENT AND DAMAGES: The Contractor shall, at his own costs and Charges, make good promptly during the whole period the works are in hand, any settlement that may occur in the surfaces of roads, beams, footpaths, gardens, open spaces etc. Whether public or private caused by his trenches or by his other excavations and he shall be liable

for any accidents caused thereby. He shall also, at his own expense and Charges, repair and make good any damage done to buildings and other property. If in the opinion of the Engineer-in-Charge he fails to make good such works with all practicable dispatch, the Engineer-in-Charge shall be at 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 in any other manner according to the law of the land.

3.9 DISPOSAL OF SURPLUS SOIL: 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 the surplus soil shall be immediately removed, the surface properly restored and roadways and sides left clear.

3.10 TIMBERING OF SEWER AND TRENCHES:

a) The Contractor shall at all times support efficiently and effectively the sides of the sewer trenches and other excavations by suitable timbering, piling and sheeting and they shall be closed, timbered in loose or sandy strata and below the surface of the sub soil water level.

b) All timbering, sheeting and piling with their walling 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.

c) The Contractor shall be held responsible and will be accountable for the sufficiency of all timbering, bracings, sheeting and piling used as also for, all damage to persons and property resulting from improper quality, strength, placing, maintaining or removing of the same.

3.11 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.

3.12 Removal Of Water From Sewer, Trench Etc:

a) The Contractor shall at all times during the progress of the work keep the trenches and excavations free from water which shall be disposed of 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 roads or streets, nor cause any interference with the use of the same by the public.

b) If any excavation is carried out at any point or points to a greater width than the specified cross section of the sewer with its envelope, the full width of the trench shall be filled with concrete by the Contractor at his own expenses and charges to the requirements of the Engineer-in-Charge.

3.13 WIDTH OF TRENCH: The Engineer-in-Charge shall have power by giving an order in writing to the Contractor to increase the maximum width in respect of which payment will be allowed for excavation in trenches for various classes of sewer, manholes, and other works in certain lengths to be specifically laid down by him, where on account of bad ground or other unusual conditions, he considers that such increased widths are necessary in view of the site conditions.

3.14 Recommended Width Of Trenches at the Bottom Shall Be As Follows:-

1.	100 mm dia pipe	55 cms
2.	150 mm dia pipe	55 cms
3.	225-250 cmsdia pipe	60 cms
4.	300 mm dia pipe	75 cms

Maximum width of the bed concrete shall also be as above. No additional payment is admissible for widths greater than Specified.

4.0 SALT GLAZED STONEWARE PIPES

4.1 Stoneware pipes shall be of first class quality salt glazed and free from rough texture inside and outside and straight. All pipes shall have the manufacturers name marked on it and shall comply to I.S. 651-1971 approved makes Perfect or Burn.

4.2 Laying and jointing of stoneware salt glazed pipes

a) Pipes are liable to be damaged in transit and out withstanding tests that may have been made before dispatch each pipe shall be examined carefully on arrival at site. Each pipe shall be rung with a wooden hammer or mallet and those that do not ring true and clear shall be rejected. Sound pipes shall be carefully stacked to prevent damage. All defective pipes should be segregated, marked in a conspicuous manner and their use in the works prevented.

b) The pipes shall be laid with sockets leading uphill and should rest on solid and even foundations for the full length of the barrel. Socket holes shall be formed in the foundation sufficiently deep to allow the pipe jointer room to work right round the pipe and as short as practicable to admit the socket and allow the joint to be made.

c) Where pipes are not bedded on concrete the trench bottom shall be left slightly high and carefully bottomed up as pipe laying proceeds so that the pipe barrels rest on firm ground. If excavation has been carried too low it shall be made up with cement concrete at the Contractor's cost and Charges.

d) If the bottom of the trench consists of rock or very hard ground that cannot be easily excavated to a smooth surface, the pipes shall be laid on cement concrete bed to ensure even bearing.

4.3 Jointing of pipes

a) Tarred gaskin shall first be wrapped round the spigot of each pipe and the spigot shall then be placed into the socket of the pipe previously laid, the pipe shall then be adjusted and fixed in its correct position and the gaskin caulked tightly home so as to fill not more than one quarter of the total length of the socket.
b) The remainder of the socket shall be filled with stiff mix of cement mortar (1 cement: 1 clear sharp washed sand). When the socket is filled, a fillet should be formed round the joint with a trowel forming an angle of 45 degrees with the barrel of the pipe. The mortar shall be mixed as needed for

immediate use and no mortar shall be beaten up and used after it has begun to set.

c) After the joint has been made any extraneous materials shall be removed from inside of the joint with a suitable scraper of "badger". The newly made joints shall be protected until set from the sun, drying winds, rain or dust. Sacking or other materials which can be kept damp shall be used. The joints shall be exposed and space left all round the pipes for inspection by the Engineer-in-Charge. The inside of the sewer must be left absolutely clear in bore and free from cement mortar or other obstructions throughout its entire length, and shall efficiently drain and discharge.

4.4 Testing

a) All lengths of the sewer and drain shall be fully 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 subjected to a test pressure of at least 1.5 metre head of water. The test pressure shall, however, not exceed 6 meter head at any point. The pipes shall be plugged preferably with standard design plugs with rubber plugs on both ends. The upper end shall, however, be connected to a pipe for filling with water and getting the required head.

b) 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 should roll down the invert of the pipe and emerge at the lower end,

(ii) means of a mirror at one and a lamp at the other end. If the pipe line is straight the full circle of light will be seen otherwise obstruction of deviation will be apparent.

c) The Contractor shall give a smoke test to the drains and sewer at his own expense and charges, if directed by the Engineer-in-Charge.

d) A test register shall be maintained which shall be signed and dated by Contractor, Engineer-in-Charge and representative of Architects/Consultants (WAC Engineers).

4.5 Gully traps: Gully traps shall be of the same quality as described for stoneware pipes in clause 5. Gully traps shall be fixed in cement concrete 1:5:10 mix and a brick masonry chamber 30x30 cms inside in cement mortar 1:5 with 15x15 cms grating inside and 30x30 cms SFRC cover as per standard drawing. Where necessary, sealed cover shall be replaced with C.I. grating of the same size (1 cement : 5 coarse sand: 10 stone aggregate 40 mm nominal size).

5. REINFORCED CEMENT CONCRETE PIPES

5.1 All underground storm water drainage pipes and sewer lines where specified (other than those specified cast iron) shall be centrifugally spun RCC pipes of specified class. 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, when directed a certificate to that effect from the manufacturer.

5.2 Laying: R.C.C. spun pipes shall be laid on cement concrete bed or cradles as specified and shown on the detailed drawings. The cradles may be 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 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 bonding rods etc. Cradles or concrete bed may be omitted, if directed by the Engineer-in-Charge.

5.3 Jointing: After setting out the pipes the collar shall be centered over the joint and filled in with tarred gaskin, so that sufficient space is left on either side of the collar to receive the mortar. The space shall then be filled with cement mortar 1:2 (1 cement: 2 fine sand) and caulked by means of proper tools. All joints shall be finished at an angle of 45 degrees to the longitudinal axis of the pipe on both sides of the collars neatly.

5.4 Testing: All pipes shall be tested to a hydraulic test of 1.5 m head for at least 30 minutes at the highest point in the section under test. Test shall also be carried out similar to those for stoneware pipes given above .the smoke test shall be carried out by the Contractor, if directed by the Engineer-in-Charge, at the expense and charges of the Contractor. A test register shall be maintained which shall be signed and dated by Contractor,/Engineer-in-Charge and representative of Architects/Consultant.

6. CEMENT CONCRETE AND MASONRY WORKS (FOR MANHOLES AND CHAMBERS ETC.)

Materials

a) Water: Water used for all the constructional purposes shall be clear and free from oil, acid, alkali, organic and other harmful matters, which shall deteriorate the strength and/or durability of the structure. In general, the water suitable for drinking purposes shall be considered good enough for constructional purpose.

b) Aggregate for concrete: The aggregate for concrete shall be in accordance with I.S.383 and I.S. 515.in general, these shall be free from all impurities that may cause corrosion of the reinforcement. Before actual use these shall be washed in water, if required as per the direction of Engineer-in-Charge. The size of the coarse aggregate shall be done as per I.S.383.

c) Sand: Sand for various constructional purposes shall comply in all respects with I.S. 650 and I.S. 2116. It shall be clean, coarse hard and stone, sharp, durable, uncoated, free from any mixture of clay, dust, vegetable matters, mica, iron impurities soft or flaky and elongated particles, alkali, organic matters, salt, loam and other impurities which may be considered by the Engineer-in-Charge as harmful for the construction.

d) Cement: The cement used for all the constructional purposes shall be ordinary Portland cement or rapid hardening Portland cement conforming to I.S.269.

d) Mild steel reinforcement: The mild steel for the reinforcement bars shall be in the form of round bars conforming to all requirements of I.S. 432 grade I.

e) Bricks: Brick shall have uniform colour, thoroughly burnt but not over burnt, shall have plain rectangular faces with parallel sides and sharp right angled edges. They should give ringing sound when struck. Brick shall not absorb more than 20% to 22% of water, when immersed in water for

24 hours. Bricks to be used shall be approved by the Engineer-in-Charge.

f) Other materials: Other materials not fully specified in these specifications and which may be required in the work shall conform to the latest I.S.. All such materials shall be approved by the Engineer-in-Charge before use.

Cement concrete (plain or reinforced)

a) Cement concrete pipes bedding, cradles, foundations and R.C.C. slabs for all works shall be mixed by a mechanical mixer where quantities of the concrete poured at one time permit. Hand mixing on properly constructed platforms may be allowed for small quantities by the Engineer-in-Charge. Rate for cement concrete shall be inclusive of all shuttering and centering at all depth and heights.

b) Concrete work shall be of such thickness and mix as given in the Schedule of Quantities.

c) All concrete work shall be cured for a period of at least 7 days. Such work shall be kept moist by means of gunny bags at all times. All pipes trenches and foundations shall be kept dry during the curing period.

6.3 Masonry work: Masonry work for manholes, chambers, septic tanks, and such other works as required shall be constructed from Ist class bricks or 2nd class as specified in the Schedule of quantities in cement mortar 1:5 mix (1 cement: 5 coarse sand). All joints shall be properly raked to receive plaster.

6.4 Cement concrete for pipe support:

a) Wherever specified or shown on the drawings, all pipes shall be supported in bed all round or in haunches. The thickness and mix of the concrete shall be given in the Schedule of Quantities. Width of the bedding shall be as per Para 4.14.

b) Unless otherwise directed by the Engineer-in-Charge cement concrete for bed, all round or in haunches shall be laid as follows:-

	upto 1.5 m depth	upto 3 m depth	beyond 3 m depth
Stoneware pipes all round in haunches all round in open ground (no sub soil water)	(1:5:10)	(1:5:10)	(1:5:10)
R.C.C or S.W. All round in haunches in haunches in sub soil water	(1:3:6)	(1:3:6)	(1:3:6)
C.I. Pipes all round in haunches in haunches	(1:3:6)	(1:3:6)	(1:3:6)
R.C.C. Pipes all round all round all round or C.I. pipes	(1:3:6)	(1:3:6)	(1:3:6)

d) R.C.C. pipes or C.I. pipes may be supported on brick masonry or precast R.C.C. or in situ cradles. Cradles shall be as shown on the drawings.

e) Pipes in loose soil or above ground shall be supported on brick or stone masonry pillars as shown on the drawings.

7. MANHOLES AND CHAMBERS

7.1 All manholes, chambers and other such works as specified shall be constructed in brick masonry in cement mortar 1:4 (1 cement: 4 coarse sand) or as specified in the Schedule of Quantities.

7.2 All manholes and chambers, etc. shall be supported on base of cement concrete of such thickness and mix as given in the Schedule of Quantities or shown on the drawings. Where not specified, manholes shall be constructed as follows:-

	Size of manhole (all dimensions internal clear in cms)			
	90x80	120x90	90 dia	120 dia
Type	Rect	Rect	Conical	Conical
Maximum depth	150	250	167	230
Average thickness of R.C.C slab	15	15	-	-
Size of cover and frame	60x45	50 dia	56 dia	56 dia
Weight of cover and frame	As per IS: 12592 requirements	As per IS: 12592 requirements	As per IS: 12592 requirements	As per IS: 12592 requirements

7.3 All manholes shall be provided with cement concrete benching in 1:2:4 mix. The benching shall have a slope of 10 cms towards the channel. The depth of the channel shall be full diameter of the pipe. Benching shall be finished with a floating coat of neat cement. (1cement: 2 coarse sand: 4 stone aggregate 20 mm nominal Size)

7.4 All manholes shall be plastered with 12/15 mm thick cement mortar 1:3 (1 cement: 3 coarse sand) and finished with a floating coat of neat cement inside. Manhole shall be plastered outside as above but with rough plaster.

7.5 All manholes with depths greater than 1 m. shall be provided with 20 mm square plastic foot rests set in cement concrete blocks 25x10x10 cms in 1:2:4 mix 30 cms vertically and staggered.

7.6 All manholes shall be provided with SFRC covers and frames and embedded in reinforced cement concrete slab. Weight of cover, frame and thickness of slab shall be as specified in the Schedule of Quantities or given above.

8. 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.

9. MEASUREMENT

9.1 Excavation

9.1.1 Measurement for excavation of pipe trenches shall be made per linear meter under the respective category of soil classification encountered at site.

a) Ordinary soil
b) Hard soil (hard moor & soft rock)
c) Hard rock requiring chiseling
d) Hard rock requiring blasting.

9.1.2 Trenches shall be measured 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 m or as given in the Schedule of Quantities.

9.1.3 Payment for trenches more than 1.5 m in depth shall be made for extra depth as given in the schedule of quantities and above the rate for depth up to 1.5 m.

9.1.4 Timbering and Shoring: Timbering and shoring as described above shall be measured per sq.m and paid for as per the type of timbering of shoring done at site and as per the relevant item in the Schedule of Quantities. Rate for timbering and shoring shall be for all depths and types of soil classifications including saturated soil.

Saturated Soil: No extra payment for pumping and bailing out water shall be made for excavation with an average depth of 1.5 m in saturated soil, surface water from rain falls or broken pipes lines, or sieves and other similar sources. An extra rate as quoted in the schedule of quantities shall be paid for excavation in saturated soil for pipe trenches above average depth of 1.5 m. No payment is admissible for water collected from surface sources and broken pipe lines or sewers.

Refilling, Consolidation and Disposal of Surplus Earth: Rate quoted for excavation of trenches shall be inclusive of refilling, consolidation and disposal of surplus earth within a lead of 200 m.

Stoneware Pipes/RCC/C.I. pipes: Stoneware R.C.C./C.I. pipes shall be measured for the finished length of the pipeline per linear metre.

a) Lengths between manholes shall be recorded from inside of one manhole to inside of other manhole.

b) Length between gully trap and manhole shall be recorded between socket of pipe near gully trap and inside of manhole. Rate shall include all items given in the schedule of quantities and specifications.

9.3 Gully Traps: Gully traps shall be measured by the number and rate shall include all excavation, foundation, concrete brick masonry, cement plaster inside and outside, C.I. grating and sealed cover and frame.

9.4 Cement Concrete for Pipes: Cement concrete in bed and all round or in haunches shall be paid per running metre between the outside wall of manholes at bottom of the trench. No additional payment is admissible in respect of concreting done for widths greater than specified, for shuttering or centering and concreting in sub soil water conditions.

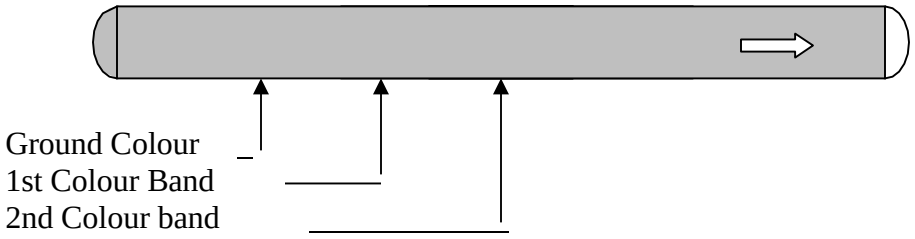
Manholes:

a) All manholes shall be measured by numbers and shall include all items specified above and necessary excavation, refilling & disposal of surplus earth.
b) Manholes with depths greater than specified under the main item shall be paid for under "extra depth" and shall include all items as given for manholes. measurement shall be done to the nearest cm. Depth of the manholes shall be measured from top of the manhole cover to bottom of channel.

9.6 Making Connections: Item for making connection to municipal sewer shall be paid for by number and shall include all items given in the Schedule of Quantities and specifications.

SECTION – VII PIPE COLOUR CODE

This Colour Code is as per I.S. 2379.



Proportional width of band 4:1
Note:-Arrow indicating the direction of flow.

Pipe lines	Ground Color	1st Color	2nd Color
1. Drinking water (all cold water lines after filter)	Sea green	French blue	Signal red
2. Treated water (soft water)	Sea green	Light orange	
3. Domestic hot water	Sea green	Light grey	
4. Drainage Sewer /SWD	Black		
5. Fire services	Fire red		

This Color Code is as per I.S. 2379.

TECHNICAL SPECIFICATIONS: HVAC WORKS

SECTION 1.0
SPECIAL CONDITIONS

1. **PRICES**:

The prices to be quoted by the intending tenderer shall include the supply and installation, at the site, of all equipment, ancillary material and other items whatsoever required for carrying out the job to fulfill the intent and purposes as laid down in the specifications and/or the drawings.

The Tenderer's price shall be deemed to include all nuts, bolts, shims, clamps, supports etc, as required for proper fixing and/or grouting of equipment, ancillary items etc. Whether specifically mentioned or not the Contractor shall also include, in his price, all taxes duties or other levies (viz. Excise duty, customs duty, sales tax, octroi, works contract tax etc.,) which are legally livable on the air-conditioning equipment and installation. Failure to include all livable taxes and duties will not entitle the Contractor to any extra claims from the employer. The Contractor's rate shall remain firm and fixed during the execution of the Contract. However, the price shall be subject to adjustment, in case of statutory variation in the rate of any taxes or duties due to an act of legislature, within the originally agreed period, for the completion of the work.

2. **ASSEMBLY AND INSPECTION**:

Shop assembly of all parts shall be made to ensure that all parts are properly fitted to minimize erection problems.

The purchaser reserves the right to inspect any machinery, material and equipment (hereinafter collectively called "Apparatus") finished or used by the Contractor under this Contract and may reject which is defective in workmanship or design or otherwise unsuitable for the use and purpose intended or which is not in accordance with the intent of this Contract. The Contractor shall on demand by the purchaser, remedy/replace at the Contractor's expenses any such defective or unsuitable apparatus. The Contractor shall advise the purchaser in advance when apparatus is ready for inspection in the Contractor's workshop and/or in his sub supplier's workshop.

The purchase inspector shall at all times have access to all parts of shop where apparatus is being manufactured and also shall be provided with all reasonable inspection facilities by the Contractor and his sub supplier.

None of the apparatus to be furnished or used in connection with this Contract will be supplied until shop inspection and performance testing, wherever possible, satisfactory to the purchaser's inspector has been made. Such shop inspection of the apparatus shall not however, relieve the Contractor from full responsibility for furnishing the apparatus confirming to the requirements of this Contract not prejudice any claim, right or privilege which the purchaser may have because of the supply of defective or unsatisfactory apparatus. Should the purchaser waive the right to inspect any apparatus, such waiver shall not relieve the Contractor from his obligation under this Contract.

3. WORKING DRAWINGS, MAINTENANCE MANUALS ETC :

On the award of the work, the Contractor shall immediately proceed with the preparation of detailed working drawings detailing the equipment that are to be installed and the ancillary works that are to be carried out. Three sets of all such working drawings shall be submitted to the engineer-in-charge, for his approval to ensure that the works will be carried out in accordance with the specifications and drawings, including such changes as may have been mutually agreed upon. All the drawings shall be received by the engineer-in-charge for his approval within three weeks of the award of work. The approval of the drawings by the engineer-in-charge shall in no way relieve the Contractor from his obligations to provide a complete and satisfactory plant and installation as per intent. Omissions and/or errors shall be made good or rectified whether or not the drawings are approved. Prior to the completion of the work the Contractor shall furnish (4) four sets of comprehensive manuals, describing all components, furnishing a list of instructions for the operations and maintenance of the plant.

The Contractor shall also fix in the plant room neatly typed and framed, instructions in detail, for the starting and running of the plant.

Any special tools required for the operation or the maintenance of the plant shall be supplied free with the plant.

4. ERECTION AND COMMISSIONING:

The Contractor shall carry out the complete erection and commissioning. All work shall commence on previously prepared foundation. The Contractor shall move all the materials from their place of storage into the plant. The Contractor shall make his own arrangement to off load equipment/material received at respective rail/road transport terminal points, dispatched to site and to store all material received at site. The purchaser shall provide clear storage and erection space only. The Contractor shall provide all erection programs.

All consumables required for erection such as cotton waste, kerosene oil, emery paper, coil string, bamboos and planks for scaffolding etc as well as necessary welding rods, gases etc shall be provided by the Contractor. The Contractor shall carry out protective and finish painting. Carbon steel surface shall be thoroughly cleaned before painting. The Contractor shall indicate the water and electricity requirements during erection. The Contractor shall remove all the waste material or rubbish from and about the work site and leave the job thoroughly cleaned up and ready to use.

5. TESTING:

All types of routine and type tests shall be carried out at the works of the Contractor or the manufacturers of the components. The Engineer-in-Charge/Architect shall be free to witness any or all tests if he so desires.

On the completion of the installation, the Contractor shall arrange to carry out various initial tests as detailed below in the presence of and to the complete satisfaction of the engineer-in-charge, and their Architects or their representatives. Any defects or shortcomings found during the tests shall be speedily rectified or made good by the Contractor at his own expense.

The initial tests shall include but not be limited to the following:
To operate and check the proper functioning of all electrically operated components viz., blowers, air handling units as well as other electrical motors.

To check the air distribution in the system and to provide design air flow in all areas specifically shown on the drawings by adjusting the grills, diffusers and dampers, which should be provided by the Contractor wherever required whether they are specifically shown on the drawings or not.

To check the system against leaks in different circuits, alignment of motor, 'V' belt adjustments.

Control setting and all such other tests, which are essential for smooth functioning of the plant.

On the satisfactory completion of all 'Initial' tests, the plant shall be considered to be 'Virtually Complete' for the purpose of taking over by the employer.

In addition to the 'initial' tests the Contractor shall also give three continuous running tests of the plant of 24 hours duration each. The running tests shall be taken on the completion of the initial tests.

The Contractor shall provide all necessary tools, instruments, gauges, flow meter ammeter etc. as may be required for conducting the various tests. He shall also provide necessary lubricants and the required personnel for the tests. However, the employer shall provide water and power for the tests.

6. REJECTION OF DEFECTIVE PLANT:

If on test any portions of the plant, equipment or components are found to be defective or not fulfilling the intent or the meaning of the specifications, the same shall be replaced or repaired to the entire satisfaction of the engineer-in-charge, and their Architects.

In case the Contractor fails to remove the defects, within a period considered reasonable, the employer reserves the right to take necessary remedial measures through other agencies and all expenses thus incurred would be recovered from the Contractor.

The employer reserves the right to operate all the equipment and complete system whether or not the plant is taken over after the initial test and commissioning. Any defects found during the initial or running tests shall be removed at a suitable time as decided upon by the employer and/or their Architects.

7. MAINTENANCE OF THE PLANT AND TRAINING OF PERSONNEL:

The Contractor shall arrange to provide, at no extra cost necessary personnel and material to carry out all routine and special maintenance of the plant as required regularly for a period of (12) twelve months from the date of commissioning.

7.1 Operation Contract (HVAC system)

18 hours a day, year round during working hours for full load.
All stand-by equipment to be operated as per mutually agreed programs.

Proper entry and upkeep of relevant log books.
Maintain complaints register. Submit weekly report.
Proper housekeeping of all areas under the contract.

Prepare daily consumption report and summary of operation.

7.2 All Inclusive Maintenance Contract

Scope

The AMC shall cover all the items installed by the contractor including consumable like gas, oil replacement of all gaskets, rings, broken / damaged parts etc.

Routine Preventive Maintenance Schedule To Be Submitted

Schedule to cover manufacturer's recommendation and/or common engineering practice (for all plant and machinery under contract)

Plant and machinery history card giving full details of equipment and frequency of checks and overhaul.
Monthly status report.

Entire HVAC installation to be painted in fourth year (from commissioning) before the expiry of operation and maintenance contract.

Uptime During Maintenance Contract

1. 98% uptime of all systems under contract.

2. Up time shall be assessed every month and in case of shortfall during any month the contract shall be extended by a month.

3. There shall be no reimbursement for the extended period.

4. Breakdowns shall be attended to within ten hours of reporting.

5. Spare compressor/motor assembly to be made available within seven calendar days in case of total breakdown/burnout.

Man power

- Adequate number of persons to the satisfaction of the owner's site representative shall be provided including relievers.
- Statutory requirements of EPF, ESIC and other applicable labor legislations to be complied with; and monthly certification to that effect to be submitted.
- Duty allocation and roaster control shall be contractor's responsibility.
- No overtime shall be payable by owner for any reason whatsoever.

Shutdowns

- Routine shutdowns shall be permitted in consultation with owner.
- Contractor shall be at liberty to carry out routine maintenance as and when required but with prior permission of the owner.
- Routineshutdowns shall be permitted in consultation with owner.
- Contractor shall be at liberty to carry out routine maintenance as and when required but with prior permission of the owner.

The contractor shall also train the employer's personnel to operate the plant and carry out routine checks during the period of installation and testing. If found necessary, the employer shall train such personnel at his works at no extra cost to the employer

8. COMPLETENESS OF THE PLANT:

The Contractor shall provide all the required materials, equipment, ancillary items etc, to install a complete and satisfactory plant and system capable of fulfilling the intent and purpose of the Contract whether or not each and every item is mentioned in the specifications and/or drawings. Any shortcomings notified at any stage shall be made good at no extra cost.

9. GUARANTEE :

The Contractor shall guarantee that all the material, machinery and components supplied, fabricated, designed and installed by him shall be free from defects due to faulty design material and/or workmanship, that the plant shall perform satisfactorily and the efficiency of the system and all the components shall not be less than the values laid down in the specifications and the capacities shall be within + or – 3% of the specified values. In case of deviation greater than + or – 3%, the Contractor shall replace the necessary components at no extra cost or alternately the employer shall be entitled to deduct a proportionate amount from payments due to the Contractor.

The period of the guarantee shall be (12) twelve months from the date of commissioning, during which period any or all components found to be defective shall be replaced free of charge and any

shortcomings found in the system as specified shall be removed at no extra cost. The Contractor shall provide the necessary personnel and tools for fulfilling the above guarantee.

If for any reason the commissioning cannot be carried out then the plant shall carry a guarantee for a period of (15) fifteen months from the date of completion of erection at site.

If the defects are not removed within a reasonable time the employer may arrange to do so at the Contractor's risk and cost, without prejudice to any other's rights.

10. PERFORMANCE GUARANTEE:

The Contractor shall guarantee that the capacity of various components as well as the whole system shall not be less than specified.

11. PAINTING

All equipment and ancillary items such as piping, supports etc. will be painted in approved manner, using color scheme as approved by the Architect.

SAFE CUSTODY AND STORAGE:

Safe custody of all machinery and equipment supplied by the Contractor shall be his own responsibility till the final taking over by the employer. He should, therefore, employ sufficient staff for watch and ward at his own expenses. The employer may, however, allow the Contractor to use the Plant/AHU rooms, etc. for temporary storage of his equipment if such spaces are ready and available.

12. BYE-LAWS AND REGULATIONS:

The installation shall be in conformity with the Bye-laws, regulations and standards of the local authorities concerned, but if these specifications and drawings call for a higher standard of material and equipment than those required by above regulations and standards, then these specifications and drawings shall take precedence over said regulations & standards.

13. QUIET OPERATION AND VIBRATION ISOLATION:

All equipment shall operate under all conditions of load without any sound or vibration, which is objectionable in opinion of the supervisor. In case of rotating machinery, sound or vibration noticeable outside the room, if considered objectionable shall be corrected by Contractor at his own expense. All vibrating equipment located on terrace shall be mounted on steel structure and suitably vibration isolated.

Where manufacturer has furnished specific instructions, relating to the material and equipment used in this project, covering points not specifically mentioned in these documents, each instructions shall be followed in all cases.

14. BALANCING, TESTING AND COMMISSIONING:

Balancing of all air and water systems and all tests as called for the specifications shall be carried out by the contractor through a specialist ground, in accordance with the specifications and ASHRAE guide lines and standards. Performance test shall consist of three days of 10 hour each operation of system for each season.

The results for summer and monsoon air conditioning in quadruplicate shall be submitted for scrutiny. Four copies of the certified manufacturer's performance curves for each piece of equipment, high lighting operational parameters for the project, shall be submitted along with the test certificates. Contractor shall also provide four copies of record of all safety and automatic control settings for the entire installation.

The installation shall be tested again after removal of defects and shall be commissioned only after approval by the owner's representative. All tests shall be carried out in the presence of the representatives of the architect/engineer.

15. VARIATION IN QUANTITIES:

The quantities of ducting, insulation, grills & diffusers given in the 'schedule of quantities' are indicative only and may vary as per the final approved drawings. In case there is any variation in the quantities of the items actually installed from the quoted quantities, the same shall be adjusted based on the units rates available in the contract. The rates shall remain firm till the completion of the project.

16. CLEARING:

Before commissioning of the plant, all mechanical equipment and ductwork shall be flushed / blown clear to ensure that they are thoroughly cleaned.

17. ACCESSIBILITY:

The contractor shall verify the sufficiency of size of all equipment rooms, shaft openings and clearances for proper installation of equipment and ducting/piping. The contractor shall locate all equipment, which must be serviced, operated or maintained in fully accessible positions.

18. INTERPRETATION IN CASE OF CONTRADICTION WITHIN CONTRACT DOCUMENT:

In case of any contradictions between general conditions of contract, technical specifications, special conditions, bill of quantities, consultant's drawings or contractor's drawings, the most stringent of the lot shall prevail and interpretation by owner in this regard shall be final.

19. COORDINATION WITH OTHER AGENCIES:

The contractor shall maintain close coordination with other connected agencies and offer maximum cooperation to ensure that the project can be smoothly completed in time.

20. TECHNICAL SUBMITTAL:

The contractor shall submit within 10 days from award of work & release of advance payment and

obtain approval of the consultant of item-wise selection of equipment, design calculations, duct sizes, pipe sizes and all distribution supported by calculations, tables/charts to the consultant's satisfaction.

21. COMPLETION PERIOD:

The entire work is required to be completed in all respects including testing and commissioning within four months of award of letter of intent.

Timely completion will be the essence of the contract. Bidder shall furnish a Bar Chart indicating all the activities and showing their completion.

SECTION 2.0
BASIC SYSTEM DESIGN

1. SCOPE

1.1 Air conditioning system has been designed for HVAC system of **LAWRENCE SCHOOL AT SANAWAR KASAULI.**

1.2 The system is designed to cater air conditioning requirement with Split type system**.** The Toilets and other services rooms are mechanically ventilated.

2. BASIS OF DESIGN

2.1. REFERENCES FOR DESIGN PARAMETERS:

S.No.	Design Parameters	References
1.	Outside Conditions	ISHRAE-2014
2.	Fresh Air/Occupancy	ASHRAE-62.1-2010
3.	Ventilation Rate (ACPH)	NBC-2016

2.2 Roof Insulation

All exposed roof shall be insulated with 50 mm thick Glass wool with density of 48 Kg/m³.

3. ESTIMATED LOAD

On the basis of data given above, the estimated load for the air conditioning system is summarized below.

(Tenderer shall work out the heat loads on their own and satisfy them-selves that the plant specified in this tender shall be able to maintain the inside conditions as per specification.)

4. SYSTEM DESIGN

- The stale air from the common toilets would be exhausted by means of mechanical exhaust system.

- The capacity of mechanical exhaust and make up air fans capacity shall be of 6-12 air changes per hour.

5. **INDOOR AIR QUALITY**:

Due consideration has been given for good indoor air quality.

Outdoor air ventilation rates have been maintained as per ASHRAE standard 62.1.2010 (Ventilation for acceptable indoor air quality).

SECTION 3.0

SPLIT SYSTEM

1. GENERAL

1.1 Air cooled split units shall (Heating/Cooling) be as per approved make, energy efficient Scroll compressor complete with vibration isolators and factory installed controls (like HP & LP cutouts, inter locking fan & compressor, thermostat with selector switch etc.), Stabilizers & accessories including wiring.

2. INDOOR COOLING UNIT

2.1 Efficient cooling/Heating coil shall be selected for low velocity with 3/8"/1/2" OD copper tubing having extended aluminum fins. The fins shall be bonded to tube using Hydraulic expansion of tubes to ensure tight bonding between tubes and fins for high heat transfer.

2.2 Tubes shall be arranged in staggered design for best air contact thus giving low bypass.

2.3 The cooling coil circuits shall be complete with an expansion valve and a distributor.

2.4 Ductable units shall be hanged with the ceiling.

2.5 Blower of evaporating unit shall be statically and dynamically balanced and shall be selected to give required air flow.

2.6 Filters shall be removable synthetic washable type.

2.7 Drain pipe shall be insulated with expanded polyethylene foam.

3. AIR COOLED CONDENSER

3.1 Remote air cooled condensing unit shall have efficient condenser coils made out of copper tubing with extended aluminum fins.

3.2 Tubes shall be arranged in a staggered design for better efficiency.

3.3 Condenser fans shall be selected to operate quietly for required CFM to keep condensing temperature low.

3.4 The compressor shall be capable of operating continuously even at high ambient of 46 deg. C (115 deg. F).

3.5 The condensing unit shall be installed with MS base frame with neoprene rubber pads.

4. MISCELLANEOUS

4.1 Interconnected refrigerant piping between outdoor unit and indoor unit shall be of heavy gauge copper complete with insulation.

4.2 The units shall be tested in accordance with IS 1392.

4.3 The power supply shall be provided at outdoor/indoor unit as per manufacturer's requirement.

SECTION -4.0 :
PROPELLER FANS – SPECIFICATIONS

PROPELLER FANS

Propeller fans shall be direct driven, three or four blade type mounted on a steel mounting plate with orifice ring.
Mounting plate shall be of steel construction, square with streamlined venturi inlet coated with baked enamel paint. Mounting plate shall be of standard size, constructed of 12 to 16 gauge steel sheet depending upon the fan size. Orifice ring shall be correctly formed by spinning or stamping to provide easy passage of air without turbulence and to direct the air stream.

Fan blades shall be constructed of aluminum or glass reinforced polypropylene. Fan hub shall be of heavy welded steel construction with blades bolted to the hub fan blades and assembly shall be statically and dynamically balanced

Shaft shall be of steel accurately ground and shall not pass through first critical speed through entire range of specified fan speed.

Motor shall be standard permanent split capacitor of shaded pole for small sizes, totally enclosed with pre-lubricated sleeve or ball bearings, designed for a quiet operation with a maximum speed of 1000

RPM for fans 60 cm dia. or larger and 1440 RPM for fans 45 cm dia. and smaller. Motors for larger fans shall be suitable for 415 ± 6% volts. 50 cycle 3-phase power supply and for smaller fans shall be suitable for 220 ± 6% volts, 50 cycles single-phase power supply. Motors shall be suitable for horizontal or vertical service as indicated in drawings and Schedule of Quantities.

Propeller fans shall be provided with following accessories: -

Wire guard and bird-screen

Gravity louvers at outlet

Regulator for controlling fan speed for single-phase fan motor.

Single-phase preventors for 3 phase fans.

Wiring between regulator and fan motor including termination at both ends.

PERFORMANCE DATA

All fans shall be selected for the lowest operating noise level. Capacity rating, power consumption with operating points clearly indicated shall be submitted and verified at the time of testing and commissioning of installation.

TESTING

Capacity of all fans shall be measured by an anemometer. Measured airflow capacities shall conform to the specified capacities and quoted ratings, power consumption shall be computed from measurements of incoming voltage and incoming current.

SECTION – 5.0 :

SAFETY CODES - SPECIFICATIONS

1. SCOPE

The scope of this sub-section is the minimum safety requirements to be observed during manufacture and erection of the HVAC system as specified herein in addition to the safety norms generally followed:-

2. I.S. STANDARDS

The safety code for mechanical refrigeration IS: 660 and safety code for air conditioning IS: 659 shall be observed.

3. SAFETY REQUIREMENTS

Some of the important safety requirements are as under but not limited to the same:-

a) There shall be maintained in a readily accessible place, first aid appliances including adequate supply of sterilized dressings and cotton wool.

b) The injured person shall be taken to a public hospital without loss of time.

c) Suitable and strong scaffolds shall be provided for workmen for all works that cannot be safely done from ground.

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

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

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

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

h) Workers employed on mixing and handling materials such as asphalt, cement mortar or concrete & lime mortar shall be provided with protective footwear and rubber hand gloves.

i) Those engaged in welding works shall be provided with protective eye shields and glove.

j) No paint containing lead or lead products to be used except in the form of paste or readymade paint.

k) Suitable facemasks shall be supplied for use of workers when the paint is applied in the form of spray or surface having lead paint dry rubbed and scraped.

l) Overalls shall be supplied by the Contractor to the painter and adequate facilities shall be provided to enable the working painter to wash during cessation of the work.

m) The ropes used in hoisting or lowering material or as a means of suspension, shall be of adequate quality and adequate strength and free from defects.

n) All site personnel shall wear safety helmets whenever they are in the construction/erection areas.

SECTION – 6.0:

TECHNICAL SCHEDULE OF EQUIPMENTS

The capacity/ratings of various equipment's in this contract are for guidance purpose only. a/c contractor shall check in details the design/selection of equipment's. a/c contractor shall be finally responsible for maintaining the desired inside conditions and shall not deprive him of the responsibility if selection of equipment's is not thoroughly checked. in case of shortfall the a/c contractor shall replace/modify equipment's for achieving desired parameters without any extra cost to owner/employer.

SECTION – 7.0:

APPROVED MAKES OF EQUIPMENT & MATERIALS

S.No	Equipment / Material	Approved Makes
	HVAC WORKS	
1	Split Type Ac	Mitsubishi /O'General / Daikin
2.	Propeller Fans	Crompton/ Khaitan/ Alstom/ Bajaj/GE

Note : For any other item required for successful completion, but not included in the above list the Contractor shall take prior written approval from the Consultant/ Owner.

SECTION – 8.0 :
LIST OF BUREAU OFINDIAN STANDARD CODES

IS 1239 (Part– I) 1979	Mild Steel Tube
IS 1239 (Part – I) 1982	Mild Steel Tubular and Other Wrought Steel Pipe Fittings
IS 4736 – 1986 (Reaffirmed)	Hot Dip Zinc Coatings of Steel Tubes
IS 823-1964	Code of Procedure For Manual Metal Arc Welding of Mild Steel
IS 780-1984	Service Valves For Water Works Purpose
IS 778-1980	Copper Alloy Gate, Globe and Check Valves For Water Works Purpose
IS 1536-1976	Flanges Configuration
IS 5312 (Part –I) 1984	Swing Check Type Reflux Non Return Valves For Water Works
IS 2379-1963	Color Code For Identification of Pipelines
IS 554-1975	Dimension For Pipe Thread Where Pressure Tight Joints Are Required On Threads
IS 655-1963 (Reaffirmed 1991)	Metal Air Ducts
IS 277-1992	Galvanized Steel Sheet For Fencing
IS 4064 Part II-1978	Specific Requirements For Direct Switches of Individual Motors
IS 3854-1969	Switches For Domestic & Similar Purpose
IS 732 (Part III-1902)	Inspection and Testing of Installation
IS 659 – 1964 (Reaffirmed 1991)	Air Conditioning Safety Code
IS 660 – 1963 (Reaffirmed 1991)	Mechanical Refrigeration (Safety Code)
IS 4894 – 1991	Test Code For Centrifugal Fan
IS 3103 – 1975 Reaffirmed 1994	Code of Practice For Industrial Ventilation
IS 7240 – 1981	Application & Finishing of Thermal Insulation Material
IS 325	Specifications For Three Phase Erection Motor
IS 3142 – 1993	V Grooved Pulley
BS-EN-779 – 1993	Particulate Air Filters For General Ventilation
IS 702 – 1988	Industrial Bitumen
IS 8183 – 1993	Bonded Mineral Wool
IS 2494 – 1993	V Belts For Industrial Purposes
IS 2062 – 1992	General Purpose Steel

TECHNICAL SPECIFICATIONS FOR ELECTRICAL WORKS

GENERAL REQUIREMENTS

1 GENERAL

To provide a complete electrical system for the distribution of electric power from the point of supply (Existing) to the utilization equipment, all as shown in the drawings and described in these specifications. The quantities mentioned in BOQ are tentative. It will be the bidder's responsibility to work out the exact quantities from drawings or from work site, which trade provides said equipment, materials, tools and labour.

2 SCOPE

The bidder shall supply, install and commission along with requisite spare, maintenance tools and tackles the following equipment and system in the Project. The scope also covers the detailed engineering and calculations of the various equipment/system mentioned hereunder and the same shall be approved by the Engineer-in-charge prior to execution of the job.

- Medium voltage switchgear.
- Earthing.
- Lightning protection system.
- Distribution Boards / Sub-Distribution Board.
- Complete internal building wiring as per specification.
- Safety to personnel and equipment during both operation and maintenance.
- Reliability of Service.
- Minimum fire risk.
- Ease of maintenance and convenience of operation.
- Automatic protection of all electrical equipment through selective relaying system.
- Electrical supply to equipment and machinery within the design operating limits.
- Adequate provision for future expansion and modification.
- Maximum interchange ability of equipment.
- Fail-safe feature.
- Suitability for applicable environmental factors.

This specification defines the basic guidelines to develop a suitable electrical system as necessary for the commercial complex. All data required in this regard shall be taken into consideration to develop a detailed engineering of the system. Site conditions as applicable are mentioned elsewhere.

Compliance with these specifications and/or approval of any of the Contractor's documents shall in no case relieve the Contractor of his contractual obligations.

All work to be performed and supplies shall be affected as a part of contract requires specific approval/ review of Engineer-in-charge or his authorized representative. Major activities requiring approval/ review shall include but not be limited to the following:

The engineering activities shall comprise the submission for approval of the following:

- Basic engineering documents e.g. overall single line diagram, area classification drawing, overall cable layout, testing, type test report, guaranteed particulars of all equipment and maintenance manuals.
- Quality assurance procedures.
- Field testing and commissioning procedures.
- Basic engineering calculations viz. load analysis; load flow, fault level calculations, and voltage drop calculations during motor start-up/re-acceleration etc.
- Control and protection schemes.
- Load sharing and annunciation scheme,
- Sizing calculation for cable trays/cable trenches.
- Area-wise illumination level calculation and preparation of power supply distribution drawing.
- Calculation for earthing system and lightning protection.

The Contractor shall be responsible for:

- Detailed co-ordination with other services, shop drawings for various electrical layouts such as equipment layout, lighting layouts, cabling layouts, earthing and lightning protection layouts, including equipment installation and cable termination details etc. prior to start of work.
- Preparation of bill of materials for cabling, lighting, earthing and miscellaneous items etc.
- Cable schedule.
- Lighting/power panel schedule.
- Interconnection drawing.
- Protection co-ordination drawings/tables for complete power system.
- Shop inspection and testing procedures.
- Field testing and commissioning procedures.
- Preparation of as built drawings for all services.
- Any other work/activity which is not listed above however is necessary for completeness of electrical system.

3 CODES & STANDARDS

The design engineering manufacturing and the installation shall be in accordance with established codes, sound engineering practices, and specifications and shall conform to the statutory regulations applicable in the country. Contractor shall obtain all approvals from statutory authorities' e.g.

Electrical inspector, pollution control boards, SEB as applicable before commissioning of electrical/DGs.

- Indian Electricity Act.
- Indian Electricity Rules.
- Factory Act.
- Pollution Control Act.

Code of practice for electrical wiring installation system voltage not exceeding 650V.

IS-3043: Earthing.

IS-62305: Code of practice for the protection of buildings and allied structure against Lightning

IS-7689: Guide for control of undesirable static electricity.

IS-3716: Insulation co-ordination application guide.

IS-8130: Conductors for insulated electrical cables and flexible cords.

IS-5831: PVC insulation and sheath of electric cables.

IS-3975: Mild steel wire, strips & tapes for armouring cable.

IS-3961: Current rating of cables

IS-694: PVC insulated (heavy duty) electric cables for working. Voltage up to and including 1100 volts.

IS-424- 1475 (F-3): Power cable flexibility test.

IEC-439/IS-7098: Specification for cross linked polyethylene insulated PVC sheathed cable for working voltage up to 1.1 KV.

IS-1554: PVC insulated cables up to 1100 volts.

IS-10810: Test procedures for cables.

IS-6121: Cable glands.

IS-10418: Cable drums.

IEC-754(1): FRLS PVC insulated cable.

ASTM-D-2863: Standard method for measuring minimum oxygen concentration to support candle-like combustion of plastic (oxygen index).

ASTM-D-2843: Standard test method for measuring the density of smoke from burning or decomposition.

ASTM E-662/IEC 754(A) Standard test method for specific optical density of smoke generated by solid materials.

IEEE-383: Standard for type test class-IE, electric cables, field splicers and connections for power generation station.

IS-1248: Direct acting indicating analogue electrical measuring instruments and testing accessories.

IS-13779: Digital measuring instruments and testing accessories.

IS -2147: Degree of protection provided by enclosures for low voltage.

PART I, II,III Switchgear and control gear

BS-162: Safety clearance

IS-3202: Code of practice for climate proofing of electrical equipment.

IS-375: Marking and arrangement for switchgear, bus bars, main connections and auxiliary wiring.

IS-722: Ac electric meters

IS-3231 /IEC-255: Electrical relays for power system protection.

IS-5082: Electrolytic copper/aluminum bus bars

IS-2713: Steel tubular pole

IS-335: Specification for insulating oil

IS-3837: Specifications for accessories for rigid steel conduit for electrical wiring.

IS-2274: Code of practice for electrical wiring installation system voltages exceeding 650 volts.

IS-6665: Code of practice for industrial lighting

IS-3646: Interior insulation part 1&2

IS-1944: Code of practice for lighting of public through fares.

IS-13346: General requirement for electrical for explosive gas atmosphere.

IS-13408: Code of practice for the selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres

IS-5572: Classification of hazardous area for electrical installations.

IS-5571: Guide for selection of electrical equipment for hazardous area.

IS-1646: Code of practice for fire safety of buildings electrical installation

IS-3034: Code of practice for fire safety of industrial building-electrical generating and distribution station

IP-30: National electrical code (NEC) BIS publication.

IS-4722: Rotating electrical machines.

IS-4889: Method of determination of efficiency of rotating electrical machines.

IS-325: Three phase induction motors.

IS-4729: Measurement and evaluation of vibration of rotating electrical machines.

IS-900: Installation and maintenance of induction motors.

IS-4029: Air break switches.

IS-9537: Rigid steel conduit.

IS-1030-1982: Specification for carbon steel castings for general engineering purpose.

Any other standard may be followed provided it is equivalent or more stringent than the standards specified above.

In case of any deviation /conflict of this specification with the codes & standards, the following order of precedence shall govern.

a) Specification, particular specification if any, and drawings.

b) Indian regulations/codes and standards.

4 DESIGN CRITERIA

I **Control Supply for Electrical System** :- The various supply voltage to be used in the control panels for main equipment are

a	Spring Charge Motor	Volt A/C
b	Closing/Trip Coil	V DC / 230V AC
c	Alarm/ Indication/ Relay	V DC/ 230 V AC
d	Heaters	V AC
II	Power Supply Load Control / Distribution Panel.	433 V TPN / 240 V 1 phase A.C. (other supply if required shall be derived by package vendor
III	Painting of Cable Tray & Structure Steel.	Powder coated of approved shade

5 CABLE DETAILS

Internal Wiring.	Copper conductor PVC insulated 1.1 KV grade as called for in BOQ.
Power Cables (L.T.).	XLPE insulated Al. Armoured Cable as per BOQ.
Grounding Conductor.	Copper/G.I. strip as per BOQ.
Lightning Conductor.	G.I. Strip.

CHAPTER B

TECHNICAL SPECIFICATIONS – ELECTRIFICATION

1.0 L.T. PANELS & SWITCHGEARS

GENERAL

The contractor shall consider the following details in their scope of works no additional cost shall be paid, wherever required:

- Supporting rigid steel framework.
- Cubicle type, 14 gauge CRCA sheet steel enclosed.
- Complete with interconnections and distribution bus bars.
- Proper bonding to earth.
- Painting/ lettering on Breakers and distribution boards, the location they serve, providing on each panel its circuit diagram.
- Providing cable clamps / supports within distribution boards cable alley.
- TPN ACB's / MCCB's shall mean 3 pole ACB's / MCCB's with adequate size of neutral link.
- All MCB's /MCCB shall be of minimum KA breaking capacity as per CPWD General Specification Part-IV Substation
- All motor feeders MCCBs shall be of motor duty.
- Distribution panels shall be Powder Coated with Siemens gray paint shade no. RAL-7032 of IS-5 or as power direction of EIC.
- Degree of protection for following type of distribution panel enclosure shall be as per IS: 13947-1993.
- All MCCB's shall be provided with operating mechanism for door interlock.
- Current density of aluminium shall be 1.0 amp per sq. mm for rated current of bus bars and current density of copper shall be 1 sq.mm for 1.3 amps for rated current of bus bars.
- Tinned copper earth bus shall be provided throughout the length of each board.
- All measuring instruments (Meters) shall be of digital electronic with LED of approved make and compatible with BAS.
- All hinged door shall be earthed through 2.5 sq mm tinned braided copper wire.
- All panels shall have provision of the following:
- Pad locking of Switch board doors.
- Pad locking of MCCB's handles in "OFF" Position.
- Additional set of C.T.s, potential free contacts, connectors, contactors with wiring etc are to be provided for BAS including space required for various transducers in Main Switch Board sections. Only transducers shall be supplied by BAS contractor.

- All MCB's used for protection of resistive and lightly inductive load shall be type "B" characteristic and inductive (motor) load shall be of type "C" characteristic and discharge lamps and UPS etc. shall be of type D characteristic.
- All incoming and outgoing air circuit breakers shall be placed on middle portion of the vertical in single tier formation.
- All PTs / control transformer shall be provided with centre tap earth secondary.
- All DOL & Star-Delta Starters shall be provided with SPPR (single phase preventor relay) and 2 nos. of Aux.Contacts for Remote operation/monitor.
- The Panel fabricator shall provide Al./ Copper Bus-bars link from Breakers wherever more than two nos. of cables are terminated in the breakers.
- Readymade 16SWG Sheet steel Enclosure with cut out For MCBs
- The breaking capacity of MCCB's are mentioned panel wise. All MCCB's shall be with thermal magnetic releases upto 200 amps and microprocessor based above 200 amps capacity, unless specified otherwise.

  Medium voltage switch boards/distribution boards, the combination of both these and components shall conform to the equipment's of the latest revision including amendments of the following codes and standards.

  The drawings, specification and BOQ complement each other and which is shown or called for one shall be interpreted as being called for on both. Material, if any, which may not have been specified but fairly required to make a complete assembly of switch gear as shown on the drawing, specifications shall be construed as being required and no extra charges shall be payable on this account.

CODES & STANDARDS

The design, manufacture and performance of equipment shall comply with all the currently applicable statues, safety codes, relevant Bureau of Indian Standards (BIS), British Standards (B.S.), International Dutro Technical Commission (IEC) Publication, NEMA, IDE & DEMA standard as amended upto date.

a) IS: 13947- 1993/IEC 60947-1989: Air circuit breaker/moulded case circuit breaker.

b) IS:3156 Voltage transformers.

c) IS:2705 Current transformers for metering and protection with classification Part-I, II burden and insulation & III 1964

d) IS:9224 Low voltage fuse and protection.

e) IS:3231 Specification for electrical relays for power system protection.

f) IS:8623 Specification for factory built assemblies of switchgear and control gear for voltage upto and including 1000-V AC/1200 V-DC.

g) IS:4237 General requirements for switch gear and control gear for voltage not exceeding gear.

h) IS:2147 Degree of protection provided by enclosures for low voltage switch gear and control gear.

i) IS:1018 Switchgear and control gear selection/installation and maintenance.

j) IS:1248 Direct acting electrical indicating instruments.

k) IS:375 Arrangement for switchgear, bus bars, main connections, auxiliary wiring and marking.

l) IS:2959 AC contactors for voltage not exceeding 1000V.

m) IS:5578 Guide for marking of insulated conductors.

n) IS:11050 Guide for forming system of marking and identification of conductors & apparatus terminal.

o) IS:1248 Direct acting indicating analogue electrical measuring instruments and Testing accessories.

p) IS:600 Code of practice for phosphating of iron & steel.

The board shall be metal enclosed single front, indoor, floor mounted, free standing type or wall mounting type as mentioned in BOQ. The panel shall be designed for a degree of protection of IP-55. However bus bar chamber shall have IP: 42 degree of protection incase bus bar rating exceed 1600 Amps. Keeping in view the operating height of the top switch 1750mm from finish floor. 400mm clear space shall be left throughout the panel at bottom. The cold rolled sheet steel will be of 2mm thick. The structure shall be mounted on a rigid base frame of folded sheet steel of minimum 3mm thickness and 50mm height.

All cutouts and covers shall be provided with synthetic rubber gaskets (preferably neoprene).

The panel shall be divided into distinct vertical sections each comprising of:

i) Complete enclosed bus bar compartment for running horizontal and vertical bus bars.

ii) Complete enclosed switchgear compartment one for each circuit for housing air circuit breaker, MCCB/MPCB with starters etc.

iii) Compartment for power and control cables of at least 300mm width covering entire height provided.

iv) The panel shall have sufficient space at least 20% of outgoing feeders for future use.

The front of each compartment shall be provided with hinged single leaf door with locking facilities. Panel shall be provided with suitable lifting facilities. Isolators and MCCB/ACBs and accessories shall be of fixed/draw out type as per BOQ.

Each feeder shall have compartmentalized or non-compartmentalized for MCB feeders only. Ri-tall type with separate construction cable entry shall be from top/bottom (3mm thick gland plate with suitable numbers & sizes of knockout holes (as called for in schematic/ fabrication drawings) shall be provided.

The panel shall be provided with three phase buses & neutral bus bars of high conductivity electrolytic copper/Aluminium sections throughout the length of the panel & shall be adequately supported and braced to withstand the stressed due to the short circuit current of 35 KA rms. for 1 sec. as called for in BOQ/Data Sheet. Maximum temperature rise of bus bars and bus bar connection while carrying rated current shall not exceed 40 Deg.C over an ambient temperature of 50 Deg.C. The Current density of Bus Bar shall be 1.0 Amp/mm^2 for Aluminium and 1.5 Sq.mm/mm^2 for copper.

The minimum clearance in air between phases and between phases and earth for the entire run of the bus bar connections shall be 32mm minimum. Bus bars support insulators shall be made of non-hydroscopic non-combustible track resistant and high strength SMC or polyester fiberglass moulded

material.

All bus bars shall be colour coded as per IS: 375.

Copper /G.I./Aluminium earth bus of suitable size shall be provided at the bottom of the panel throughout the length. Similarly suitable size of strip in each vertical section for earthing the individual equipment/accessories shall be provided and connected to main horizontal bus.

Sheet steel hinged lockable doors shall be interlocked with MCCB to prevent opening of the panel when MCCB is on position. Safety interlock with operating handle shall be provided.

Contactors shall be electromagnetic type with interrupted duty as per IS: 2959. The main contacts shall be of silver or silver alloy, provided with minimum 2 NO and 2 NC auxiliary contacts. The push button should be of shrouded type and each should be provided with 1 NO and 1 NC contact. Colour coding shall be as per IS: 6875 (Part-II).

General Note for ACBs/MCCBs/MCBs

Preferred Specification/Selection of Air Circuit Breaker and Moulded Case Circuit Breakers; These should be confirmed entering into the agreements:-

(I) MCCBs: MCCBs should preferably be used for loads below 800 Amperes.

(1) Upto 160 A MCCBs shall be of > 20 Ka (Ics=Icu) at 433 V Short CKt. Current rating and should be Thermal Magnetic.

(2) From 200 A- 250 A MCCBs shall be of > 35 Ka (Ics= Icu) at 433 V Short Ckt. Current rating and should be Thermal Magnetic.

(3) From 300A0 onwards MCCBs shall be of > 50 Ka (Ics=Icu) at 433 V Short Ckt. Current rating and should be microprocessor based having over load and short circuit protection. If used as incomer should also have earth fault protection &time delay. Earth leakage modules are not acceptable.

MOULDED CASE CIRCUIT BREAKER (MCCB)

MCCB shall confirm to the latest IS13947-1993/IEC 60947. The Service Short Circuit Breaking Capacity (Ics at 415 VAC) should be as specified.

MCCB shall be Current Limiting and comprise of Quick Make – Quick Break switching mechanism & Double Break Contact system. The arc extinguishing device and the tripping unit contained in a compact, high strength, heat resistant, flame retardant, insulating molded case with high withstand capability against thermal and mechanical stresses. All MCCBs shall be capable of defined variable overload short circuit and earth fault adjustment with thermo- magnetic releases upto 250A and with electronic release above 250A onwards.

The Service Short Circuit Breaking Capacity (Ics at 415 VAC) should be as called for in BOQ and is the required minimum value for that feeders/ panel, however if the rating of feeder mentioned is not available, the contractor shall used next higher rating without any extra charges. The service short circuit breaking capacity shall be equal to ultimate breaking capacity of MCCB, i.e. Ics= 100%Icu

The trip command shall over ride all other commands. MCCB shall employ maintenance free double break contact system to minimize the let thru' energies and capable of achieving discrimination upto the full short circuit capacity of downstream MCCB. The manufacturer shall provide both the discrimination tables and let thru' energy curves. The MCCB shall not be restricted to Line/Load connections.

The handle position shall give positive indication of 'ON', 'OFF' or 'Tripped' thus qualifying to disconnection as per the IS/IEC indicating the true position of all the contacts. In case of 4 pole MCCB the neutral shall be defined and capable of offering protection upto full rating. The remote tripping coil should be of continuous duty. The general-purpose control switch shall be provided for ON/OFF Auto/Manual. The switch shall be provided with engraving plates on the front with the complete inscription.

The switch shall be normally a fixed control box type heavy-duty unit.

Indicating lamps shall be of the panel mounting, LED type and shall have execution plates marked with its function wherever necessary. The color of the lamp cover shall be red for 'ON' and green for 'OFF' indicating lamps shall be provided with series resistor. MCCB shall be provided with interlocking devise for interlocking the door of switchboard. Following shall be included if specified in the drawing or in the schedule of quantities:

- Under voltage trip
- Shunt trip
- Alarm Switch
- Auxiliary switch

CONTACTORS

The contactors should comply with the latest IEC947-4 and the corresponding IS13947-4 standardds. They shall have UL and CSA approval. The contactors should be rated for AC3 duty at 415V and 50Hz. The contacts should be fast closing and fast opening type. The making and breaking capacity values of the contactors should be as follows (as per IEC947-4):

For AC3 Duty

- Making Capacity equal to or more than 10 Ie
- Breaking Capacity equal to or more than 8 Ie

For AC4 Duty

- Making Capacity equal to or more than 12 Ie
- Breaking Capacity equal to or more than 10 Ie

The contactors should be capable of frequent switching and should operate without derating at 600C for AC3 applications. They should be climate proof as standard .The coil of the contactor should have class H insulation to support frequent switching.

The rated voltage of the contactor shall be equal or superior at 690 V, and rated insulation voltage shall be 690 V. The rated impluse voltage of the contactor should be 8 KV.

The contactor should be modular in design with minimum inventory requirements and built in mechanically interlocked 1NO 1NC auxiliary contact up to 32A. They should be suitable for the addition of auxiliary contacts and other electrical auxiliaries without any compromise on the performance or the operation of the contactors .The contactors from 4 KW to 400 KW will be associated with the same auxiliary contact block range.

Wherever D.C control is required, the contactor should have wide range (0.7 to 1.25Uc) D.C coil with built in interference suppression as standard.

The control and power terminals should be at separate layers preferably with colour coding (black for power and white for control)

All contactors power connection will be finger safe (IP2X) as standard.

They should be capable of being integrated into automated system (PLCs etc.) without any interposing components in minimum operating conditions.

The thermal over load relay if used will be directly mounting under the contactor without any specific connections.

NAME PLATES & LABELS

i) Panel and all modules shall be provided with prominent engraved identification plates. The module identification designation. For single front switchboards, similar panel and board identification labels shall be provided at the rear also.

ii) All nameplates shall be of non-rusting metal or 3-ply lamicold, with white engraved lettering on black background. Inscription and lettering sizes shall be subject to MoHFW's approval.

iii) Suitable stenticilled paint marks shall be provided inside the panel/module identification of all equipment's in addition to the plastic sticker labels. These labels shall be partitioned so as to be clearly visible and shall have the device number, as mentioned in the module wiring design.

PAINTING

All steel work shall be pretreated in tanks and finally powder coated of approved shade.

WIRING

Control and protective wiring shall be done with copper conductor PVC insulated 1100 volts grade multi-stranded flexible wire of 2.5sq.mm cross section. The colour coding shall be as per latest edition of IS: 375.

Each wire shall be identified by plastic ferrule. All wire termination shall be made with type connection. Wire shall not be taped or spliced between terminal points.

Terminal blocks shall preferably by grouped according to circuit function and each terminal block group shall have at least 20% spare capacity.

Not more than one wire shall be connected to any terminal block. All doorframe of L.T. switchboard shall be earthed with bare braided copper wire.

TESTING & INSPECTION

After completion of all work at the manufacturer's works the switchboards shall be inspected and tested in presence of Purchaser's representative. However, stage inspection may be carried out from time to time to check progress of work and workmanship. The following tests shall be carried out:

i) All routine tests specified in relevant Indian/British Standards shall be carried out on all circuit breakers.

ii) Test for protective relay operation by primary or secondary injection method.

iii) Operation of all meters.

iv) Secondary wiring continuity test.

v) Insulation test with 1000 Volts megger, before and after voltage test.

vi) HV test on secondary wiring and components on which such test is permissible (2 KV for one minute)

vii) Simulating external circuits for remote operation of breaker, remote indicating lights and other remote operations, if any.

viii) Measurement of power required for closing/trip coil of the breaker.

ix) Pick up and drop out voltages for shunt trip and closing coils.

x) CT Polarity test.

Vendor shall provide all facilities such as power supply, testing instruments and apparatus required for carrying out the tests. Required copies of test certificates for all the tests carried out alongwith copies of type test certificates and certificates from Sub-Vendor for the components procured from them are to be submitted before dispatch of switchboards.

DRAWINGS AND INFORMATION

The Vendor shall furnish following drawings/documents in accordance with enclosed requirements:

i) General Arrangement drawing of the Switchboard, showing front view, plan, foundation plan, floor cutouts/trenches for external cables and elevations, transport sections and weights.

ii) Sectional drawings of the circuit breaker panels, showing general constructional features, mounting details of various devices, bus bars, current transformers, cable boxes, terminal boxes for control cables etc.

iii) Schematic and control wiring diagram for circuit breaker and protection including indicating devices, metering instruments, alarms, space heaters etc.

iv) Terminal plans showing terminal numbers, ferrules markings, device terminal numbers, function etc.

v) Relay wiring diagrams.

vi) Equipment List.

Vendor shall furnish required number of copies of above drawings for Purchaser's review, fabrication of switch boards shall start only after Purchaser's clearance for the same. After final review, required number of copies and reproducible shall be furnished as final certified drawings.

The information furnished shall include the following:

i) Technical literature giving complete information of the equipment.

ii) Erection, Operation and Maintenance Manual complete with all relevant information, drawings and literature for auxiliary equipment and accessories, characteristics curves for relays etc.

iii) A comprehensive spare parts catalogue.

TOOLS

One complete set of all special or non-standard tools required for installation, operation and maintenance of the switchboard shall be provided. The manufacturer shall provide a list of such tools with his quotation.

SPARES

The manufacturer/tenderer shall also supply a complete list of commissioning spares and tools. The same shall be included in the bid price. No extra payment shall be made on account of non-availability of spares during commissioning.

QUALITY ASSURANCE

Quality Assurance shall follow the requirements of MoHFW as applicable.

Quality Assurance involvement will commence at enquiry and follow through to completion and acceptance thus ensuring total conformity to Purchaser's requirements.

DEVIATIONS

Deviation from specification must be stated in writing at the quotation stage.

In absence of such a statement, it will be assumed that the requirements of the specifications are met without exception.

2.0 EARTHING (MAINTENANCE FREE CHEMICAL EARTHING)

A. INTRODUCTION

An Earthing System is a basic requirement of any electrical & electronics installation as it forms a primary line of protection for equipment and the operator. The object or an earthing system is to provide as nearly as possible a surface under and around a station which shall be at a uniform potential and as nearly zero or absolute earth potential as possible. The purpose of this is to ensure that, in general, all parts of apparatus other than live parts, shall be at earth potential, as well as to ensure that operators and attendants shall be at earth potential at all times. Also, by providing such an earth surface of uniform potential under and surrounding the station, there can exist no difference of potential in a short distance big enough to shock or injure an attendant when short-circuits or other abnormal occurrences take place. A well-designed low resistance earthing system is must for dissipation of heavy fault current and electrical surge to protect the equipment & user with minimizing the downtime, service interruption and replacement cost etc.

B. SCOPE

This document covers technical specification for Maintenance Free Earthing System. The specification will cover the scope of work which will includes supply, installation and testing of Maintenance Free Earthing System. The material offered shall conform to relevant standard with high quality and good workmanship capable to perform continuous and satisfactory operations in the actual service conditions at site.

The specifications will consist the details of the Earthing Rod i.e. Copper Bonded Steel Rods, Backfill Compound i.e. an Earth Enhancement Compound and permanent earthing joint solutions Exothermic Weld along with the procedure for constructing the earth pit for the maintenance free earthing system to ensure that the resistance to earth is near to acceptable values (<1Ω) throughout the year without any frequent maintenance or any replacement. The earthing system to be adopted for electronics equipment should be able to save the system components which are more susceptible to damage due to surge, transient and over voltage encountered due to various reasons.

C. REFERENCES

This specification will meet the requirements of mentioned documents & also working as a reference

standard:

IS 3043-2018 Indian standard Code of Practice for Earthing

IEEE 80:2013 IEEE guide for safety in AC Sub-Station Grounding

IEEE 837 Standard for qualifying permanent connections used in substation grounding

IEC 62561-7 Requirements for Earthing Enhancing Compounds

IEC 62561-2 Requirements for Conductors and Earth Electrodes

UL-467 Standard for Grounding and Bonding Equipment

BS 7430:2015 British standard- Code of Practice for Earthing

NBC: 2016 National Building Code

D. APPLICATIONS OF MAINTENANCE FREE EARTHING SYSTEM

Earthing systems covered in this document shall be for providing effective grounds for:

1. Earth grid/mesh for power equipment (Transformers, generators, Inverters, DC equipment, etc.)
2. Earth grid/mesh for Electronics equipment
3. Earthing for Lightning Protection System
4. Earthing for Surge Protection Devices

E. MAINTENANCE FREE EARTHING SYSTEM

The Maintenance Free Earthing System shall include:

1. An earth mesh with copper coated/bonded steel conductor sizing based on fault current.
2. An earth pits with solid copper coated/bonded steel rods for uniform dissipation of fault current.
3. An earth enhancement material to offer better performance in high resistivity soil.
4. An Exothermic weld, a permanent jointing solution for buried earthing joints.

E.1 EARTH MESH/ MAT: COPPER COATED STEEL SOLID CONDUCTORS

An earth mat shall comprise of copper coated steel round conductors. Copper coated steel conductor is having a core of mild steel with pure electrolytic copper coating. It shall be made up of high tensile low carbon steel molecularly bonded by 99.99% pure high conductivity copper on outer surface with copper coating minimum thickness of 250 microns complying UL 467. The conductor shall be suitable to achieve calculated fault current. The manufacturer shall provide the conductor sizing calculation which shall be done as per IEEE 80:2013. Based on conductor sizing calculation, the cross section of conductor is determined and the length of the copper coated shall depend upon the required mesh size. The manufacturer shall ensure the single length of copper coated steel conductor up to 6 meters. The copper coated steel conductor shall offer a life of +25 years.

E.2 EARTH RODS: COPPER COATED STEEL SOLID RODS

The earth electrode/rod is the main component of the earthing system which is in direct contact with the ground and thus provides a means of releasing or collecting any earth leakage currents. The material should have good electrical conductivity and should not corrode in a variety of soil conditions. For an effective earthing system, Copper Bonded Steel Rod can be used as described here:

E.2.1 High tensile-low carbon steel rod having diameter 25 mm complying UL467, IEC 62561-2 & IS

3043 2018, NBC 2016 molecularly bonded by 99.99% pure high conductivity copper on the outer surface with copper coating thickness 250 micron or more, Length 10 feet or more as per requirement. In case of deep earthing, the manufacturer shall provide an earth electrode of single length up to 6 meters.

E.2.2 Fault current carrying capacity: an earth electrode/grid should be able to withstand the fault current up to 40kA (Peak) for 1 second.

E.2.3 Acceptable earth resistance values: The acceptance earth resistance of an earth grid (Combination of Multiple Earthing connected in parallel shall be designed as per Soil Resistivity Report) shall be <1 ohm for power components Main Earth Mat &<1 ohm for electronics component (Clean Earth).

E.2.4 Testing of Copper Coated/ Bonded Steel Rods:

- The copper bonded steel rod along with exothermically welded copper bus bar shall be tested for fault current withstand capacity of 40 kA from CPRI.

- The laboratory test must be in accordance with IEC 62561-2:2018.

- As per IEC 62561-2, Earth rods shall be mechanically robust to ensure correct installation. The material of choice shall be sufficiently malleable to ensure that no cracking of the rod takes place during installation. It shall also exhibit good corrosion resistance.

E.3 EARTH ENHANCEMENT COMPOUND

Role/ Need of Earth Enhancement Compound:

As per IEEE 80: 2013, clause 14.5, Pg. No.- 78, "It is often impossible to achieve the desired reduction in ground resistance by adding more grid conductors or ground rods. An alternate solution is to effectively increase the diameter of the electrode by modifying the soil surrounding the electrode. Thus, the Ground Enhancement Material are typically placed around the rod in an augured hole or around grounding conductors in a trench, in either a dry form or premixed in slurry".

As per IEC 62561-7:2018, clause 4.3, Pg. No. 8, "the material of the earth enhancing compound shall be chemically inert to subsoil. It shall not pollute the environment. It shall provide a stable environment in terms of physical and chemical properties and exhibit low resistivity. The earthing enhancing compound shall not be corrosive to the earth electrode being used.

Earth enhancement material is a superior conductive material that improves earthing effectiveness, especially in areas of poor conductivity (rocky ground, areas of moisture variation, sandy soils etc.). It improves conductivity of the earth electrode and the ground contact area. It shall be tested and confirm to the requirements of IEC 62561-7 having the following characteristics: -

• RoHS tested Earth Enhancement Compound tested by NABL accredited lab in compliance to IEC 62561-7 with a resistivity some with a resistivity of less than 0.12 ohm-m.

• An earth enhancing compound shall be tested for Leaching Test, Corrosion Test, and Resistivity Test &Sulphur Test as per IEC 62561-7.

• It shall be a carbon-based material and shall be free from bentonite and other hazardous substances. It shall be permanent and offers +25 years of life.

• It shall be a non-corrosive material which does not leach out any chemicals into the ground. It shall retain moisture even in high soil resistivity areas. It shall lower an earth resistance value and shall offer a constant desirable performance.

• Shall be carbon based with min 95% of fixed carbon content premixed with corrosion resistant cement to have set properties.

• Shall have high conductivity, improves earth's absorbing power and humidity retention capability.

• Shall be suitable for installation in dry form or in a slurry form.

• Shall not depend on the continuous presence of water to maintain its conductivity.

• Shall be permanent & maintenance free and in its "set form", maintains constant earth resistance with time.

• Shall be thermally stable between -100 C to +600 C ambient temperatures.

• Shall not dissolve, decompose or leach out with time.

• Shall not require periodic charging treatment nor replacement and maintenance.

• Shall be suitable for soils of different resistivity.

• Shall not pollute the soil or local water table and meets environmentally friendly requirements for landfill, shall not be explosive & shall not cause burns, irritation to eye, skin etc. In this regard "Safety Data Sheets "shall be submitted by the manufacturers.

• Marking: The Earth enhancement material shall be supplied in sealed, moisture proof bags. These bags shall be marked with Manufacturer's name or trade name, quantity etc.

E.3.1 Test Certificate and Approval for Earth Enhancement Compound

• The laboratory test must be in accordance with IEC 62561-7:2018.

• The compound shall be tested for Leaching Test, Sulphur determination Test, Resistivity Test, and

Corrosion Test.

• Earth enhancement compound shall be tested for ROHS Restrictions of Hazardous Substances.

• As per IEEE 80, the compound shall be carbon based and shall have resistivity less than 0.12 Ω-m.

E.4 EXOTHERMIC WELDING SYSTEM

Electrical jointing or connection reliability is critical to the long-term integrity of the electrical system. Over the period of time, due to ageing, less maintenance and changing weather conditions the joints are becoming low performing joints as it gets corroded or loosen due to temporary jointing techniques.

Recommended by IEEE 80, BS 7430, NBC 2016, an exothermic welding system is used for making electrical connections of copper to copper, copper to steel or copper to cast iron for grounding and cathodic applications. An exothermic welded connection shall be suitable for exposure to the elements of direct burial in earth or concrete without degradation over the lifetime of the grounding system.

An Exothermic Welding System complying IEEE 837, has come up as a robust solution for these problems. Today, Exothermic Welding is a globally accepted method to make reliable and safe connections between two or more conductors. This technology is highly portable and does not require any external source of heat to make a joint offering in permanent molecular bonding among metallic conductors.

• All the buried joints shall be exothermically welded.

• The molecular bonding shall offer complete surface contact hence an electrolyte cannot penetrate between the conductors which provide integrity to the joints.

• Permanent molecular bonding protects against humid or chemical environments or bonds directly buried in the ground.

• Exothermically welded connections achieve 100% surface area which eradicates possibilities of leakage current.

• The melting temperature of Exothermic Weld connection is higher than the melting temperature of copper(1083°C) offers high fault current carrying capacity.

• Exothermic Weld connections form a solid bond around the conductors assuring continuity.

• Standard Exothermic Weld has a cross section greater than that of the conductor to be joined, the weld will always remain cooler than the conductor under fault conditions.

• Superior electrical conductivity of the conductors themselves.

• Does not corrode, oxidize or degrade with time and is resistant to galvanic coupling.

• Able to withstand repeated electrical discharges.

• Has greater mechanical and squeezing resistance than the conductors themselves.

• No environmental impact.

• Water proof and corrosion resistant joints.

• Compared to other forms of welding, exothermic bonds have a higher mechanical strength.

E.4.1 Testing of Exothermic Welding

- The laboratory test must be in accordance with IEEE 837.

F. INSTALLATION OF EARTH MESH/MAT & EARTH RODS:

1. An earthing mat shall be properly installed at depth of not less than 500 mm from the ground level

2. The spacing or mesh size shall be between 3 m – 7 m (10 – 20 ft apart in a grid pattern.

3. An earth electrode shall be driven in the center of the bore hole of diameter 100-250 mm with depth in respect to rod length and voids surrounding it shall be filled with slurry of earth enhancing material 500 mm below the ground surface level and leave it to set.

4. Sleeve the soil digged and remove the gravels and stones. If soil quality is good then add some quantity of earth enhancement material in the soil for using as backfill.

5. If the soil seems unusable (containing large quantity of gravel, stones, murum, sad etc.) then replace the soil with black cotton soil.

6. Insert the electrode at the center of the earth pit and arrange to keep it vertical in the pit.

7. Arrange for adequate quantity of water supply for the earth pit. (Approx. 600 liters)

8. Fill the pit with the backfill and keep on adding the earth enhancement material surrounding the electrode and simultaneously watering the pit.

9. With a steel bar or pipe, keep on poking the soil gel and stirring intermittently for removing the air pockets and proper settlement of the pit.

10. The procedure to be repeated till completion of the filling of the earth pit along with the packing material and sufficient watering adequate ramming.

11. The pit should be very compactly rammed and watering for 2-3 days and addition of soil if

required be done.

12. Make trench of 600 mm (depth) x 300 mm (wide) from the earth pit to the nearest point of connection.

13. Construct inspection chamber with cover for the installation.

14. GI strip for connection with equipment shall be fixed on well, if required, of the appropriate size of plastic /Fiber glass/insulating material saddles with SS screws and plastic gitty.

15. Fixing of connection strip with equipment shall be done by polishing its surface at the end at least up to 150 mm and surface of equipment with SS nut bolts for tight gripping.

All electrical equipment is to be earthed by connecting two earth tapes from the frame of the equipment to a main earth ring. The earthing ring will be connected via several earth electrodes. The cable armour will be earthed through cable glands. Earthing shall be in conformity with provision of rules 32, 61, 62, 67 & 68 of Indian Electricity Rules 1956 and as per IS-3843-1966.

The following shall be earthed:

1. SDB PANEL.
2. Non-current carrying metallic parts of electrical equipment such as switchgear, bus ducts, rising mains, panel boards, motor control centres, power panels, distribution boards, cable trays, metal conduits, welding sockets etc.
3. All fixtures, sockets outlets, fans, switch boxes and junction boxes etc. shall be earthed with PVC insulated copper wire as specified in item of work. The earth wires ends shall be connected with solderless bottle type copper lugs.
4. The third pin of Outlets on UPS shall be provided with a separate PVC insulated Cu. Wire (green with yellow stripe) as Isolated ground earth wire apart from the earthing of box.

The earth connections shall be properly made. A small copper loop to bridge the top cover of the transformer and the tank shall be provided to avoid earth fault current passing through fastened bolts, when there is a lightning surge, high voltage surge or failure of bushings.

The shop drawing for earthing system shall be prepared by the contractor and be got approved by Engineer-in-charge. The work shall be done in accordance with approved drawings.

All earth electrodes shall be given to a depth sufficient to reach permanently moist soil. Their location shall be marked and approval taken from Engineer-in-Charge before excavation for the same.

The earth electrodes shall be tested for earth resistance by means of a standard earth test ohms meter. All tests shall take place during the dry months, preferably after a protected dry spell.

The resistance between earthing system and the general mass of earth shall not be greater than 1 ohm.

The earth loop resistance to any point in the electrical system shall not be in excess of 1 ohm in order to ensure satisfactory operation of protective devices.

The resistance to earth shall be measured at the following: -

a) At each electrical system ground or system neutral ground.

b) At one point on each grounding system used to ground electrical equipment enclosures.

c) At one point on each grounding system used to ground wiring system enclosures such as metal conduits and cable seaths or armoured.

All earthing conductors shall be of high conductivity copper/ G.I. as per B.O.Q. and shall be protected against mechanical damage. The cross-sectional area of earth conductors shall not be smaller than half that of the largest current carrying conductor. However, the contractor shall use the sizes specified in the bill of quantities of the Tender.

Pipe Earth Electrode

G.I. pipe shall be of medium class and of the size and dia as specified in BOQ. G.I. Pipe electrode shall be cut tappered at bottom and provided with holes of 12mm dia drilled not less than 7.5cm from each other upto 2m of length from bottom. The electrode shall be burried in the ground vertically with its top not less than 20cm below ground level.

Plate Earth Electrode

The plate earth electrode shall consist of copper plate or G.I. plate as per item of work. The plate electrode shall be burried in ground with its faces vertical and top not less than 2.5m below Ground level. The plate shall be filled with charcoal dust and common salt filling, extending 15cm around it on all sides.

A watering pipe as specified in BOQ, of medium class G.I pipe shall be provided. The top of the pipe shall be provided with a funnel and a G.I. mesh screen for watering the earth. In the case of pipe electrode a removable plug shall be provided as per drawing. This will be housed in a masonry sump (with cement plastering) of not less than 40 cm square and 40 cm deep. A C.I. frame with hinged cover of 10mm thickness and locking arrangement shall be suitably provided over the sump. The earthing lead from electrode onwards shall be suitably protected from mechanical injury by a suitable dia medium class PVC/ HDPE pipe. The overlapping in G.I. strips in joints shall be rivetted with rivets and welded in approved manner. The protection pipe within ground shall be burried at least 30 cm deep (to be increased to 60cm in case of road crossing and pavements). The portion within the building shall be recessed in walls and floors to adequate depth. In the case of plate earth electrode, two nos. 50mm x 6mm GI/Cu. Strip the earthing lead shall be securely bolted to the plate with two zinc passivated bolts, nuts, checknuts and washers. In case of pipe electrode, it shall be connected by means of a through bolt, nuts and washers and cable socket. Main earthing conductor is taken from the earth electrode with which the connection is to be made.

No earth pit shall be fixed within 2.5M of a wall of foundation. The location of the earth electrode will be such where the soil has reasonable chance of remaining moist. Effort shall be made to locate them in grass lawns or near flowerbeds or water taps. The distance between two earthing stations shall be at least 3.0 meters.

Testing and Commissioning

Testing and commissioning shall be done as per the programme/ instructions to be given by MoHFW'sauthorised representative. All testing equipment's necessary to carry out the tests shall be arranged by the electrical Contractor.

Before the electrical system is made live, the electrical Contractor shall carry out suitable tests to the

satisfaction of MoHFW that all equipment wiring and connections have been correctly done and are in good working condition and will operate as intended.

All tests shall be conducted in the presence of the MoHFWauthorised representative by the electrical Contractor and shall be notified one week before tests are to take place.

All measurements shall conform to establish minimum acceptable test values. MoHFW's Engineer reserves the right to approve all test results before circuit or equipment's are energized for the first time.

3.0 LIGHTNING PROTECTION SYSTEM

GENERAL

There are no devices or methods capable of modifying the natural weather phenomena to the extent that they can prevent lightning discharges. Lightning flashes to, or nearby, structures (or lines connected to the structures) are hazardous to the structures, their contents and installations as well as to lines. This is why lightning protection measures are essential.

Lightning Protection System shall be in accordance with IS IEC 62305-3 & NBC-2016 amended till date. Lightning Protection consists of external Protection for the building with Air termination, Down Conductors and Earthing and Internal protection for power lines with Surge Protective devices.

Generally lightning between cloud and ground creates failures. However inter-cloud and intra-could lightning also can create potential differences and failures in electronic installation. More than 95 % of Lightning strikes are of Negative impulse and less than 5 % are of positive impulse. Positive impulses are mainly due to dry lightning in cold areas.

Current parameters as per IS/IEC 62305 and the effects of lightning are as below

Current Parameters	Symbol	Unit	Lightning Protection Level				Effect
			I	II	III	IV	
First positive Impulse							
Peak Current	I	kA	200	150	100		Mechanical
Impulse charge	Q_{SHORT}	C	100	75	50		Thermal (arc)
Specific Energy	W / R	MJ/Ω	0	5.6	2.5		Mechanical & Thermal
Average Steepness	d_i / d_t	kA / µS	20	15	10		Surges and flashover
Time Parameters	T_1 / T_2	µS / µS	10/350				
First Negative Impulse							
Peak Current	I	kA	100	75	50		Mechanical
Average Steepness	d_i / d_t	kA / µS	100	75	50		Surges and flashover
Time Parameters	T_1 / T_2	µS / µS	1 / 200				

Damages from lightning strike are due to Peak Current (I), Charge (C), Specific Energy (W/R) & Rate of change of current (di/dt). Lightning protection is designed to take care of these effects of lightning and hence the following parameters shall be strictly followed.

Effect of Lightning On External Lps (Air Termination, Down Conductor And Earthing)

Effects on air-termination systems arise from both mechanical and thermal effects. Effects on down-conductors are thermal effects due to resistive heating & mechanical effects in parallel conductors and in Bends. The real problems with earth-termination electrodes are linked with chemical corrosion and mechanical damage caused by forces other than electro dynamic forces.

Sizing and fixing of Materials are selected to handle the mechanical and thermal effects. Bends in down conductor shall strictly NOT be at 90 degree (right angles) & should have a curved path of 45 degree bend. Earth electrodes are selected based on the current handling capacity up to 1 second. To avoid corrosion problems as explained in IS/IEC 62305 (clause E.4.3.4 and E.5.4.3.2), GI is strictly not recommended inside concrete and in soil.

Effect of Lightning On Internal Lps (Spd's For Power, Data Lines Etc)

Effect on internal LPS is mainly due to coupling and the rate of change of current. Due to Very high di/dt of the first negative stroke. The expected problem is the response time of SPD and the voltage drop in the connecting wires. SPD's at the incoming panels shall have a response time less than 1 nano sec & shall be of BUSBAR Mounted type to avoid connecting wire length.

LPL (Lightning Protection Level)

LPL is a number associated with a set of lightning current parameters relevant to the probability that the associated minimum & maximum values do not exceed the normally occurring lightning. LPL can be determined by Risk analysis as explained in IS IEC 62305-2 or can be selected based on the guideline in NBC-2016 amended till date.

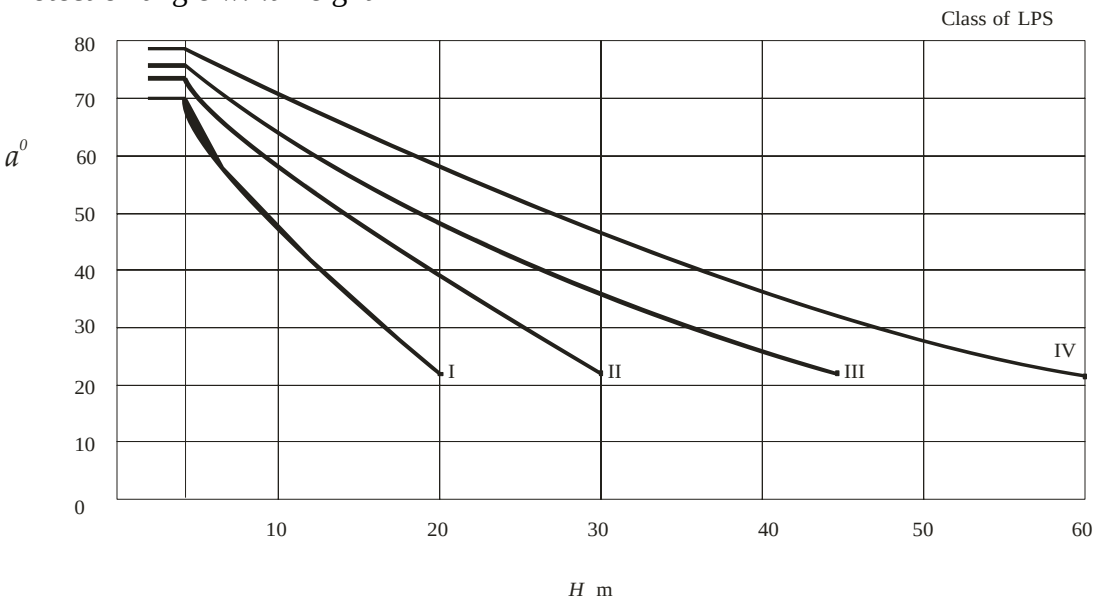
Application	LPL*
Computer Data Centers, Military Applications, Nuclear Power Stations, High raise Hotels/Hospitals, airports, essential services such as telecom towers	1
EX-Zones in the industry and chemical sector, Low raise Hospitals & Hotels, fuel retail outlets, gas station, compressor station etc	2
Schools, Banks, Residential Buildings, Temple, Churches, Mosques	3/4

LPL levels, probability and basic design consideration:

Class of LPS	Lightning current MINIMUM	Lightning current MAXIMUM	Interception probability	Rolling sphere radius (m)	Mesh size (m)	Down Conductor Spacing
1	3 kA	200 kA	98%	20	5*5	10

2	5 kA	150 kA	95%	30	10*10	10
3	10 kA	100 kA	88%	45	15*15	15
4	16 kA	100 kA	81%	60	20*20	20

Protection angle w.r.t Height



Air termination system:

Material, Configuration and Minimum cross sectional area of air terminal & down conductors

Air Termination mesh conductor and down conductors: 8 mm Aluminium alloy round conductor (50 mm2)
Air Termination Rod: 10 mm, 16 mm & 40 mm solid Aluminium rods (combination of sizes) (tubes are not allowed)
Joints / Connectors / Fixing materials:

Connection materials	Connector type	GI fixing materials shall not be used
Aluminium to Aluminium	Aluminium or SS	
Aluminium to Steel	SS	

Aluminium accessories if connection is between Aluminium materials are necessary. SS accessories if connections are between aluminium and copper / copper coated materials.
Earth Termination Conductor: 10 mm solid copper coated steel conductor (100 microns min coating)
Earth Termination Joints in soil: Exothermic welding
GI material for earthing shall not be used as per the recommendation in IS/IEC62305 as well

as Kerala electrical inspectorate guideline.

If the structure height is more than 60 meters, top 20% of the height of the structure shall be protected with a lateral air termination system. This is needed because the probability of flashes to the side is generally more for structures more than 60 meters in height. More importance need to be provided to Corners, Edges and significant protrusions such as balconies. Metallic handrails/ Aluminium frame of wall cladding if used in balconies shall be conned to air termination / down conductors.
In PEB / Steel buildings where GI sheet roofing, air termination mesh / Rod shall be directly mounted on the sheet. Fixing materials used shall be in good electrical contact with the sheet, shall not create water leakage.

No drilling is allowed in the terrace for fixing the air terminal, if the roof is made of concrete. Parapet wall is exception to this.

Air terminal holder:

Concrete Roof structure: Conductors shall be securely fixed on the terrace by means of concrete air terminal holders with suitable fixing materials which is fixed on the roof by adhesive or cement mortar taking care of varying weather conditions. Plastic air termination conductor holder is not allowed. The minimum height of this air terminal holder shall be 50 mm to avoid the contact of conductor with water

Metal Roof structure: Conductors shall be securely fixed on the terrace by means of air terminal holder which is fixed on the roof by metal conductor holder made of Stainless steel. As metal roof structures are normally tapered at an angle, there are no min height criteria for metal conductor holder.
Recommended fixing distance of air terminal and down conductors

Arrangement	Recommended distance	
	Tape / Strip	Round
Horizontal conductor on horizontal surface	500 mm	1000 mm
Horizontal conductor on vertical surface	500 mm	1000 mm
Vertical conductor from Ground to 20m height	1000 mm	1000 mm
Vertical conductor above 20m height	500 mm	1000 mm

If antenna, Chillers or any other roof top electrical equipment is present in terrace, the same have to be protected by using vertical air terminal after calculating the safety or separation distance. The vertical air terminal has to have suitable supports to hold it. Wind speed need to be taken into account. Vertical air terminal must be connected to horizontal air terminal by using suitable connectors.
At the crossings of the horizontal air terminals, suitable Cross connector has to be used.

Safety or Separation distance: (not required for LPS using structural natural components)
To avoid flash over to electrical/electronic apparatus, this equipment shall be kept at a distance away from LPS components more than the safety distance as per the following calculation.

Safety/Separation distance (S) in m = (ki * kc*L) / km
Coefficient ki depends on class of LPL/LPS (ki = 0.08 for LPL1, 0.06 for LPL 2, 0.04 for LPL3 and 4)
Coefficient kc depends on no of down conductors: kc = 0.66 for 2 down conductors, kc = 0.44 for 3 or more down conductors
Value of coefficient km = 1
Value of L is the total distance between the equipment to be protected (for e.g. Antenna) to the equi-potential bonding bar situated just above the ground.

Expansion piece

In order to take care the expansion of the metal in summer and contraction of the metal in winter, expansion piece with suitable connectors have to be used at every 20m distance of horizontal air termination mesh.

Joints and Bends

The lightning protective system shall have few joints as far as possible & air terminal & down conductor have to be straight. Where it is not possible, it should NOT be bent at 90 degree (right angles) & should have a curved path of 45 degree bend.

Down conductor system

In order to reduce the probability of damage to electronic/electrical equipment, the down conductors shall be arranged in equi distance in such a way that from the point of strike to earth, several parallel current paths should exist & length of the current path should be minimum. Down conductors should be installed at each exposed corner of the structure as a minimum. Maximum distance between down conductors shall be as per the table above.

Test joints:

At the connection to the earth conductor, a test joint should be fitted on each down conductor at a height of 1 m from the ground, except in the case of natural down conductors combined with foundation earth electrode. The purpose of test joint is to measure the earth resistance value. The remaining portion of down conductor (i.e., after the test joint should be mounted inside a plastic pipe of minimum 3 mm thickness.)

Earth Terminations

For earth termination system, 2 basic types of earth electrode arrangements are applicable. Type A& Type B arrangement.

Type A arrangement:

Comprises of horizontal or vertical earth electrode installed outside the structure to be protected connected to each down conductor. Minimum Length of vertical earth electrode shall be as below

Class of LPS	Typical Length of each vertical earth electrode based on Soil resistivity			
	Up to 500 Ω M	1000 Ω M	2000 Ω M	3000 Ω M
1	2.5 meter	10 meters	25 meters	40 meter
2	2.5 meter	5 meter	15 meters	22 meter
3	2.5 meter	2.5 meter	2.5 meter	2.5 meter
4	2.5 meter	2.5 meter	2.5 meter	2.5 meter

If horizontal electrodes are used, the length shall be double. In type A arrangement, the total number of earth electrodes shall not be less than two. Type A arrangement is suitable in places where electronic equipment are not located.

Type B arrangement:

This type of arrangement comprises either a ring conductor external to the structure to be protected, in contact with the soil for at least 80% of its total length or a foundation earth electrode. Ring earthing must be 1 meter away from the building and 0.5m below the ground as a closed loop. Such earth electrodes can also be meshed. For structures with extensive electronic systems or with high risk of fire, type B earthing is most preferable method. There is no limit in the resistance of Ring Earthing if the ring radius of the ring is larger than 50 meters or 80 meters for LPL 1 and 2. For LPL 3 and 4 this radius is about 5 meters. The overall resistance of earthing system shall not exceed 10 ohms.

Galvanized steel (GI) as earthing material shall not be used.

Lightning Counters: At least 2 down conductors in an installation shall have a lightning counter tested as per IEC 62561. The counter shall be digital type with replaceable battery. Battery life shall be minimum 3 years. The minimum measuring current is 1KA (8/20) and the maximum is 100 KA (10/350). The counter shall be outdoor type, IP65 and shall be able to record date, time and no of strikes.

Quality and Confirmations

All materials and accessories shall be tested as per IEC 62561 for its mechanical / corrosion resistant / electrical conductivity. Vendor shall provide test reports along with completion certificate. GI (Hot dip galvanized or zinc electroplated) fixing materials and fasteners are not allowed.

References:

IS/IEC62305 – PROTECTION AGAINST LIGHTNING:
Part 1: General Principles
Part 2: Risk Management
Part 3: Protection of structures
Part 4: Protection of Electrical & Electronic equipment within structure
NBC-2016: National Building Code of India – 2016
IS3043: 1987: Code of practice for earthing.

4.0 L.T. CABLES & WIRE

a) Wires

The design manufacture, testing and supply of single core **LEAD FREEFRLS PVC** insulated 1.1 KV grade multi-stranded twisted wires under this specification shall comply with latest edition of following standards.

IS : 3961 Current rating for cables.

IS: 5831 PVC insulation and sheath of electric cables.

IS : 694 PVC insulated cables for working voltage upto and including 1100 volts.

IEC: 754(i) FRLS PVC insulated cable.

Copper multi-stranded twisted conductor FRLS PVC insulated wires shall be used in conduit as per item of work.

The wires shall be colour coded R Y B, for phases, Black for neutral and Green for earth.

Progressive automatic in line indelible, legible and sequential marking of the length of cable in metres at every one metre shall be provided on the outer sheath of wire.

The material & insulation of wires shall be **ROHS compliant** (Reduction Of Hazardous Substance) and shall comply the following directives:

- EU Directive 2002/95/EC Issued Jan 2003
- EU Directive 94/62/EC and 2004/12/EC (amendment)
- EU Directive 91/338/EEC
- EU Directive 91/157/EEC & 98/101/EC (amendement)

Summary on related directives

Directive Ref.	Date	Objective	Remarks
2002/95/EC	27Jan03	Restriction of the use of certain hazardous substances in electrical and electronic equipment (**EEE**) and to contribute to the protection of human health and the	6 banned materials included Pb (Lead), Hg (mercury), Cr6+ (Hexavalent Chromium), Cd (Cadmium) and Flame Retardants- Poly brominated Biphenyls – PBB 1000ppm & Poly brominated Diphenyls Esters- PBDE 1000ppm.

		environmentally sound recovery and disposal of waste EEE.	• *Max. conc. value - 0.1%* by weight in homogeneous material for *Pb, Hg, Cr6+, PBB/ PBDE* • *Max. conc. value - 0.01%* weight in homogenous material for *Cd.*
94/62/EC 2004/12/EC (amendment)	20Dec94 2Nov04	Amending directive 94/62/EC, on **Packaging** and Packaging Waste is to prevent packaging waste by encouraging packaging re-use and recycling while at the same time avoid distortions in the internal market.	The targets defined are the following: • *Recovery of minimum 60%* by weight of the packaging waste • *Recycling of at least 55%* and a maximum 80% by weight of the totally of packaging materials, with a material-specific minimum recycling rate for plastic of 22.5% • Max. sum of concentration levels of *Pb, Cd, Hg and Cr6+>100 ppm* by weight
91/338/EEC	18Jun91	Restriction on the use of Cadmium pigment (amending for the 10th time Directive 76/769/EEC)	The cadmium content (expressed as Cd metal) exceeds 0,01 % by mass is prohibited in the finished products or components of products manufactured from polymers or copolymers of vinyl chloride and stabilized by substances.

b) Cables

The design, manufacture, testing and supply of the cable under this specification shall comply with latest edition of following standards:

IS: 8130 Conductors for insulated electric cables and flexible cords.

IS: 7098 XLPE insulation and sheath of electric cables.

IS: 3975 Mild steel wires, strips and tapes for armouring cables.

IS: 7098 Current rating of cables.

IS: 7098 XLPE insulated (heavy duty) electric cables for working voltage upto and including 1100 volts.

IS: 424-1475(F-3) Power cable-flammability test.

Specification for cross-linked polyethylene insulated XLPE sheathed cable for working voltage upto 1.1 KV.

Specification for XLPE insulated (heavy duty) electric cables for working voltages upto and including 1100 volts.

ASTM-D: 2863 Standard method for measuring the minimum oxygen concentration to support candle-like combustion of plastics (Oxygen Index).

ASTM-D: 2843 Standard test method for measuring the density of smoke from the burning or decomposition.

IEEE : 383Standard for type of test Class-IE, Electric cables, feild splicers and connections for power generation station.

ASTME:662IEC:754(x) Standard test method for specific optical density of smoke generated by solid materials.

IS : 10418 Cable drums.

f) Technical Requirements:

i. The cables shall be suitable for laying in racks, ducts, trenches conduits and under-ground buried installation with uncontrolled back fill and chances of flooding by water.

ii. They shall be designed to withstand all mechanical, electrical and thermal stresses under steady state and transient operating condition.

iii. The aluminum/copper wires used for manufacturing the cables shall be true circular/sector in shape before stranding and shall be of uniformally good quality, free from defects. The conductor used in manufacture of the cable shall be of H2 grade.

iv. The cable should withstand 25 KA for 0.5 sec with insulation armour insulated at one end. Bidder shall furnish calculation in support of capability to withstand the earth fault currents. The current carrying capacity of armour and screen (as applicable) shall not be less than the earth fault current values and duration.

v. The fillers and inner sheath shall be of non-hygroscopic fire retardant materials and shall be suitable for the operating temperature of the cable. Filler and inner sheath shall not stick to insulation and outer sheath.

vi. Progressive automatic in line indelible, legible and sequential marking of the length of the cable in metres at every one metres shall be provided on the outer sheath of all cables and at every 5 metre ‘FRLS’ marking in case of ‘FRLS’ cables.

vii. Strip/Wire armouring following method (b) mentioned in IS: 3975 shall only be acceptable. For single core cable aluminium wire armouring shall be used.

viii. Allowable tolerance on the overall diameter of the cables shall be + 2mm.

ix. The normal current rating of all XLPE insulated cables shall be as per IS: 7098.

x. A distinct inner sheath shall be provided by pressure extrusion process for all multicore armoured and unarmoured cables as per IS: 5831.

xi. Outer sheath shall be provided by extrusion process as per IS: 5831

xii. The breaking load of armour joint shall not be less than 95% of that armour wire. Zinc rich paint shall be applied on armoured joint surface.

xiii. In plant repairs to the cables shall not be accepted.

xiv. All the cables shall be supplied in non-returnable drums as per IS: 10418.

d) In Case of FRLS Cables

i) The outer sheath of cables shall have an oxygen index of not less than 29 as per ASIMD: 2863.

ii) The maximum acid gas generation by weight as per IEC: 754 (i) shall not be more than 20% for outer sheath material of all cables. Bidder shall also guarantee the maximum theoretical acid gas generation with 20% by weight of outer sheath.

iii) The cables outer sheath shall meet the requirement of light transmission of 40% (minimum and shall be tested as per ISTMD: 2843). In case the test for light transmission is conducted as per ASTME: 662. The bidder shall furnish smoke density values as per this standard and shall co-relate the anticipated light transmission when tested as per ASTMD: 2843.

iv) The cable shall pass the fire resistance test as per SS: 42, 41, 475 (I) and flammability test as per EEE: 383.

e) Inspection:

All cables shall be inspected on receipt of the same at site and checked for any damage during transit.

f) Joint in Cables

The contractor shall take care that the cables received at site are distributed to various locations in such a manner as to ensure maximum utilization and avoidance of cable jointing. Cable shall be rechecked before cutting in lengths, where the joints are unavoidable, and the location of such joints shall be got approved from the MoHFW/ Engineer-In-Charge. The joints shall be done by qualified jointer strictly in accordance with manufacturer's instruction/drawings.

g) Joint Boxes for Cables

The cable joint boxes shall be of appropriate size suitable for type of cable of particular voltage rating.

h) Jointing of Cables

All straight through joints shall be done in epoxy mould boxes with epoxy resins. Straight through joints shall not be permitted unless the length of run is in excess of cable drum.

End terminations of cables more than 1.1 KV grade shall be done with epoxy mould boxed and epoxy resin. Cable glands shall be 1.1KV grade double compression type and made to tin plated heavy-duty brass casting and machine finished. Glands shall be of robust construction capable of clamping cable and cable armour, firmly without injury of cable.

All washers and hardwares shall be made of brass tinned. Rubber components used in the glands shall be made of neoprene of tested quality.

Cable lugs shall be tinned copper/aluminium solderless crimping type conforming to IS: 8309 suitable for aluminium or copper conductor.

Crimping of terminals shall be done by using Corrosion inhabitory compound, with crimping tool.

Fire resistant paint has to be applied 1 Metre on either side of cable joint.

The contractor shall liaise fully with all other contractors to achieve an efficient and properly coordinated installation where equipment has to be re-positioned due to lack of site liaison; no extra cost shall be incurred by the Engineer-In-Charge.

i) Testing of Cables

Cables shall be tested at factory as per requirement of IS: 7098 Part-I. The tests shall incorporate routine tests, type tests and acceptance tests. Prior to laying of cables, following tests shall be carried out:

i) Insulation test between phases and phase to earth for each length of cable before and after jointing.

   On completion of cable laying work, the following test shall be conducted in the presence of Engineer-in-charge.

ii) Insulation resistance test (Sectional and overall) 1000/5000V depending upon the voltage grade of cable.

iii) Continuity resistance test.

iv) Sheathing continuity test.

v) Earth test.

j) Laying of Cable

The cable drum shall be placed on jacks before unwinding the cable. Great care shall be exercised in laying cables to avoid forming links. At all changes in directions in horizontal & vertical places, the cable shall be bent with a radius of bend not less than 8 times the diameter of cable.

The cable of 1.1KV grade shall be laid not less than 750mm below ground level in a 375mm wide trench (throughout), where more than one cable is to be laid in the same trench, the width of the trench shall be increased such that the interaxial spacing between the cables except where otherwise specified shall at least be 150mm minimum or as per site requirements or as approved by the Engineer-in-charge. Where single core cables are used in multiphase systems, the cables shall be installed in trefoil where possible.

In case the cables are laid in vertical formation due to unavoidable circumstance the depth per tier shall be increased by 200mm (minimum). Cable shall be laid in reasonably straight line, where a change in direction takes place a suitable curvature shall be i.e. either 12 times the dia meter of the cable or the radius of the bend shall not be less than twice the diameter of the cable drum or whichever is less. Minimum 3-meter long loop shall be provided at both sides of every straight through joint & 3 meters at each end of cable or as directed at site.

Greater care shall be exercised in handling the cable in order to avoid forming ‘Kinks’. The cable drum shall in-verbally convey on wheels and the cable unrolled in right direction as indicated on the drum by the manufacturer. The cable shall be pulled over rollers in the trench steadily and uniformly without jerks and strains.

Cables laid in trenches in single tier formation, 10 cms. All around sand cushioning is provided below and above the cable before a protective cover is laid. For every additional vertical tier. The 30cm of

sand cushion are provided over the initial tier. The cable shall be protected by 2nd class bricks of size not less than 230x115x75mm, stone tiles/RCC curved channel be placed on top of the sand breadth wise for the full length of the cable and where more than one cable is to be laid in the same trench the brick shall cover all cables and project at least 8 cms. Over the outer sides of the end cables.

Filling of trenches shall be done after the sand cushioning and laying of tiles or bricks are carried out to the satisfaction of the Engineer-in-charge (Refer drawing). Back fill for trenches shall be filled in layer not exceeding 150 mm. Each layer shall be properly rammed & consolidate before laying the next layer.

PVC pipe shall be provided for all road crossing. The size of the pipe shall be according to the cable and a minimum 100mm dia. pipe shall be provided. The pipe shall be laid in ground with special arrangement and shall be cement jointed and concreting with 1:5:10 shall be made as per relevant IS with latest amendment. Location of cables laid directly underground shall be indicated by cable marker at an interval of 30 meters & with change of direction. Aluminium strip cable tag of 20mm wide with engraved tag no. shall be provided at both ends of cable.

Where the cables are to be laid in ducts (pucca trenches) in side the building, they will have to be laid on MS rack/ on MS cable trays grouted in walls trenches. Cables sizing through floors shall be protected from mechanical damage by a steel channel to a height of one meter above the floor where cable pass through wall they shall be sleeved with PVC/steel conduit.

Where the cables are laid in open (in building) along walls, ceiling or above false ceiling, cable rack (ladder type) or cable tray shall be provided. The size of the cable tray or rack shall depend on the number of cables to pass over that rack. Cable tray/rack shall be properly supported through wall/ceiling according to the site conditions. Cable laid on tray & riser shall be neatly dressed &clamped at an interval of 1000 mm & 750mm for horizontal & vertical cable run respectively either side at each bend of cable. All power cables shall be clamped individually & control cables shall be clamped in groups of three or four cables. Clamps for multicore cables shall be fabricated of 25x3 GI flats. Single core power cable shall be laid in trefoil formation & clamped with trefoil clamps made of PVC/fibre glass.

Cable openings in wall/floor shall be sealed by the contractor suitably by hession tape & bitumen compound or by any other proven to prevent ingress of water.

After the cables are laid, these shall be tested as per IS and the results submitted to Engineer-in-charges/Engineer and in case the results found unsatisfactory, all the repairing/ replacing of cables will be done by the contractor free of charge.

k) Fire Seal System

i) All the floor/wall opening provided for cable crossing shall be sealed by fire seal system.

ii) The fire proof sealing system shall fully comply with the requirements of relevant IS/BS: 476 Part-B. The fireproof seal system shall have minimum one hour fire resistance rating.

iii) The fire proof seal system shall be physically, chemically, thermally stable and shall be mechanically secured to the masonary concrete members. The system shall be completely gas and smoke tight, **anti rodent** and anti-termite.

iv) The material used in fireproof seal system shall be non-toxic and harmless to the working personnel.

v) Type of fireproof seal system shall be foaming type or **flame mastic** type compound or approved

equivalent.

After laying and jointing work is completed, high voltage test should be applied to all cables to ensure that they have not been damaged during or after the laying operation and that there is not fault in the jointing.

Cables for use on low and medium voltage system (1.1KV grade cables) should withstand for 15 minutes a pressure of 3000V DC applied between conductors and also between each conductor and sheaths. In the absence of pressure testing facilities it is sufficient to test for one minute with a 1000V insulation tester In case the test results are unsatisfactory the cost of repairs and replacements and extra work of removal & laying will be made good by the contractor.

Cable shall be installed so that separation shown in the table below are observed.

HV Cable (11 KV/ 33 KV)	-	HV Cable (11 KV/ 33 KV)	50 mm
ELV & LV 230 V/433 V	-	ELV & LV cable 230 V/433 V	Equal to the diameter of the bigger cable.
HV cables (11 KV/33 KV)	-	ELV & LV cables 230 V/433 V	300 mm
LV cables 433 V	-	Telephone/Instrument cable	350 mm
All cables	-	All hot pipe work	200 mm

l) Quality Assurance

Quality Assurance shall follow the requirements of MoHFW/ Engineer-In-Charge as applicable. Quality Assurance involvement will commence at enquiry and follow through to completion and acceptance thus ensuring total conformity to Purchaser's requirements.

m) Deviations

Deviation from specification must be stated in writing at the quotation stage.

In absence of such a statement, it will be assumed that the requirements of the specifications are met without exception.

o) Spares for Commissioning Including Consumables

The manufacturer/tenderer shall also supply a complete list of commissioning spares and tools and consumables. The same shall be included in the bid price. No extra payment shall be made on account of non-availability of spares during commissioning.

5.0 CABLE TRAYS

a. **Perforated Cable tray** – for Power Cables & Low current service both

The perforated cable trays are fabricated out of 1.6mm thick CRCA sheet steel having minimum 50mm depth or as called for in BOQ, hot dip galvanized or epoxy coated of approved shade. Perforations are maximum 10mm spaced at maximum 20mm distance. The cables shall be tied with the cable tray with nylon strip/ aluminium clamps/M.S. clamps as per requirements.

Suitable provision shall be made where a tray crosses expansion joints. The width of the tray shall allow for a suitable separation between cables the design shall allow for adequate bending radius for the sizes of cables. No sharp bend to be allowed in cable tray. Joints between sections shall be bolted.

The tray shall be suspended from the surface of the concrete slab by means of approved steel hangers spaced at a distance of not more than 125cms. Suitable bushes shall be provided where cables pass through apertures in the tray. Cables must be securely fixed to the tray with clamps or cable ties. In routing necessary barrier and spacing shall be maintained for cables of different voltages in case they lie side by side. Telephone cables shall cross the power cables only at about right angle and these two shall not run in close proximity. Full details of the tray shall be approved by the Engineer-In-Charge /Engineer-in-charge before fabrication. Earth continuity shall be maintained between each section of cable tray and each total run of tray shall be effectively bonded to the nearest earth continuity 0conductor. All nuts and bolts used shall be of galvanized steel.

Depending on the size of cable trays space of 20-33% has to be maintained for future expansion.

Cable tray is manufactured to comply with the specifications of National Electrical Code (NEC) and National Electrical Manufacturer's Association (NEMA).

6.0 INTERNAL ELECTRICAL WORKS

A. Conducting (M.S Conduit)

All conduits shall be of heavy gauge solid drawn ERW welded manufactured out of 16 (1.6mm) gauge MS Sheet up to 32mm dia and of 14 (2 mm) gauge for sizes higher than this. Both inner and outer surfaces shall be smooth without burrs, dents and kinks. Conduits shall be black stove enameled inside and outside. The cross section of conduit shall be uniform throughout. The welding shall be uniform such that welded joints do not yield when subjected to flattening test. Welded joint shall not break when threaded or bent at an angle. Conduit shall conform to specifications of IS: 9537 (Part-II) and the capacity of conduits shall be in accordance with the standards and shall never be exceeded. The minimum size of the conduit shall be 20mm dia. Care shall be taken to ensure that all conduits are adequately protected while stored at site prior to erection and no damaged conduit shall be used.

B. PVC Conduit

All conduits shall be high impact rigid 2mm thickness PVC heavy duty type and shall comply with I.E.E. regulations for non-metallic conduit 2mm thick as per IS-9537/1983 (Part-III). All sections of conduit and relevant boxes shall be properly cleaned and glued by using epoxy resin glue and the proper connecting pieces. Inspection type conduit fittings such as inspection boxes, drawn boxes, fan boxes and outlet boxes shall be M.S. or otherwise mentioned. Conduit shall be terminated with adopter/PVC glands as required.

Accessories

Conduit accessories such as normal bends, unions, circular junction boxes and pull boxes, locknuts etc. shall be heavy gauge type and approved make. Conduit accessories shall conform in all respects to IS: 3837-1966 with latest amendment. Wherever several conduits are running together, adequately sized adoptable boxes common to all runs shall be used to avoid inserting inspection boxes in the individual run. Where it is necessary to segregate wiring metal filler shall be fixed with in the box.

Conduits shall be laid before casting in the upper portion of a slab or otherwise, as may be instructed or in accordance with approved drawings, so as to conceal the entire run of conduits and ceiling outlet boxes. Vertical drops shall be buried in columns or walls. Wherever necessary, chases will be cut by the contractor with the help of chase cutting m/c or by hand. Nothing extra shall be paid to the contractor on this account. In case of exposed brick/ rubble masonry work special care shall be taken to fix the conduit and accessories in position along with the building work. Sufficient depth of the chases will be made to accommodate the required number of conduits. The chase will be filled with cement, coarse sand mortar (1:3) and properly cured by watering for one week.

If a chase is cut in an already finished surface the contractor shall fill the chase and finish it to match the existing finish. Contractor must not cut any iron bars to fix conduits. Conduits shall be kept at a minimum distance of 100mm from the pipes of other non-electrical services. Where the conduit is to be embedded in a concrete member it shall be adequately tied to the reinforcement to prevent displacement during casting, conduits in chases shall be held by steel hooks of approved design at maximum of 100 cm centres. The embedding of conduits in walls shall be so arranged as to allow at least 12mm plaster cover the same. All threaded joints of conduit pipes shall be treated with some approved ‘preservative compound’ to secure protection against rust.

Suitable expansion joints fittings of approved make and design shall be provided at all the points where the conduit crosses the expansion joint in the building. (Preferably with Pilca metallic watertight conduits). Conduits shall cross at right angles of the joints only.

Separate conduit shall be used for:

1) Normal light, fan call bell
2) 16 A power outlets
3) Telephone system
4) TV Network
5) Or any other services not mentioned here.

Wiring for short extensions to outlets in hung ceiling or to vibrating equipment’s, motors etc. shall be installed in flexible conduits. Flexible conduits shall be formed from a continuous length of spirally wound interlocked wire steel with a fused zinc coating on both sides. The conduit shall be provided with approved type adopter. A separate and accessible earth connection shall bond across the flexible conduit.

Conduit runs on surfaces shall be supported with metal 1.2 mm thick saddles, which in turn are properly secured on to GI spacer to the wall or ceiling. 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 and shall be painted in color matching the adjoining area. Unseemly conduit bends and offsets shall be avoided by using better appearance. Cross cover of conduits shall be

minimum and entire conduit installation shall be clean and with good appearance. For surface work, the boxes shall be raised back pattern type, designed for use with distance saddles to give clearance of 6mm between the back of conduit and the fixing surface.

Where conduits are run on steel work, they will be fixed by means of purpose made GI Caddy clips in manner meeting with the approval of the Engineer prior to the installation being carried out. Other methods of fixing may be agreed in special circumstances, but approval must first be obtained from the site engineer.

The spacing of saddles shall be not more than 600mm centers for up to 32mm diameter conduits and at 750mm for conduit sizes of 40mm diameter and above in case of MS conduit and not more than 600 mm for PVC conduit. In addition, saddles shall be fixed at each side of any bend/Tee, or set at a distance of 200mm from the bend/Tee. The holes in the brickwork or concrete for fixing plugs shall be neatly drilled by means of a masonry drill of the appropriate size.

All the GI sheet steel /passivated boxes used for housing switches, plugs, fan regulator etc. shall be five sided conforming to IS: 5133 Part I-1969. Suitable size of boxes shall be provided a minimum of 2 adjustable fixing lugs on vertical sides. Suitable earth terminal inside each box shall be provided. All fixing lugs shall be threaded to receive standard machined chromium plated brass screws. Sufficient number of knockouts shall be provided for conduit entry. Conduits carrying wires of different circuit can terminate in common J.B having metal compartments. Necessary GI pull wires shall be inserted into the conduit for drawings wires. In case conduit pipe is required to cross any RCC beam special adopter boxes shall be provided for crossing & nothing shall be paid extra.

Where conduits are used for non-air-conditioned space to air-conditioned space or into a fan chamber or duct, a junction box shall be installed to break the continuity of such conduit at the point of entry or just outside and conduit shall be sealed around the conductors.

Particular care shall be taken during the progress of the work to prevent the ingress of dirt and rubbish such as plaster droppings into erected conduits. Conduit which has become so clogged shall be entirely freed from these accumulations or will be replaced. Screwed plastic or metal caps or turned wooden plugs shall be employed to protect all open ends. Plugs of waste wood, paper, cotton or other fibrous matter shall not be used. All unused conduit entries shall be blanked off in an approved manner and where conduits terminate in adaptable boxes, all removable box covers shall be firmly secured to provide complete enclosure. If considered necessary by the Engineer-in-charge, the conduits shall be swabbed out by drawing swabs of rag through the conduit to remove moisture prior to any cables being drawn in.

All conduit installations must be completed and erected in their totality before they are wired and must be fully rewireable from outlets to distribution boards or trunking systems etc. to which they connect. No wiring of any part of the installation shall be commenced until instructions are received to do so by the Engineer-in-charge at such time as he is satisfied that the wiring will not be damaged due to building operations.

Conduits shall be installed so that they are self-draining in the event of ingress of moisture due to condensation or any other reason. A suitable drainage hole shall be drilled at the bottom of the lowest conduit box in every 9-meter of horizontal run.

PVC bush of good quality shall be used in each conduit termination in a switch box, draw box, lighting fixtures and circular junction boxes.

Exposed conduits running above false ceilings shall be suitably clamped independently along with the dropped ceiling. Perforated straphangers or twisted attachment shall not be acceptable. In no case shall

raceways be supported or fastened to other pipe for repair and maintenance. They shall be arranged symmetrically and in the cost compact design, in no way unduly criss-crossing each other. Proper spacing shall be maintained when two or more conduits run side by side. The layout of the pipes shall be co-ordinated with other services if any. The junction boxes and conduits used in hazardous areas shall be flameproof type with cast iron construction complete with threaded covers. The conduit of each circuit or section shall be completed before conductors are drawn in. The entire system of conduit after erection shall be tested for mechanical and electrical continuity throughout and permanently connected to earth conforming to the requirements by means of special approved type of earthing clamp efficiently fastened to conduit pipe in a workman like manner for a perfect continuity between the earth and conduit.

The conduit system shall be so laid out that it will obviate the use of tees, elbows and sharp bends. No length of conduit shall have more than the equivalent of two-quarter bends from inlet to outlet. The conduit itself being given required smooth bend with radius of bends suiting to the site conditions but not less than 6 times overall diameter.

Outlet boxes shall be of heavy-duty sheet steel installed as to maintain continuity throughout. These shall be so protected at the time of laying that no mortar finds its way inside during concrete filling or plastering. For fluorescent fittings, the outlet boxes heavy duty shall be provided 300mm off centre for a 1200mm fitting and 150mm off centrefor a 600mm fittings or as per B.O.Q.

Draw boxes of ample dimensions shall be provided at convenient points to facilitate pulling of long runs of cables. They shall be completely concealed with MS covers flush with plasterwork painted to match the wall. These boxes will be as few as possible and located where found suitable by the Engineer-In-Charge.

Switch Boxes

The switch boxes shall be zinc passivated& shall not be less than **18 SWG** thick or shall be as called for in BOQ. It will be so designed that accessories could be mounted on integral pedestals or on adjustable flat iron mounting straps with tapped holes by brass machine screw. 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 either side of their walls. These shall be completely concealed leaving edges flush with wall surfaces. Earthing terminal inside box shall be provided.

Moulded plate switches screw less as specified in item of work shall be provided. No timber shall be used for any supports. Boxes, which come within concrete, shall be installed at the time of casting. Care shall be taken to fix the box rigidly so that its position is not shifted while concreting.

Wiring

All the wiring installation shall be as per IS: 732 with latest amendment. PVC insulated copper conductor cables as specified in bills of quantity shall be used for sub-circuit runs from the distribution boards to the points and shall be pulled into conduits. They shall be twisted copper conductors with thermoplastic insulations of 660/1100 volts grade. Colour Code for wiring shall be followed.

Looping system of wiring shall be used, wires shall not be jointed. Where joints are unavoidable, they shall be made through approved mechanical connectors with prior permission of the Engineer-In-Charge. No reduction of strands is permitted at terminations. No wire smaller than 1.5 sq.mm shall be used and shall be as per B.O.Q. Wherever wiring is run through trunkings or raceways, the wires

emerging from individual distributions shall be bunched together with cable straps at required regular intervals. Identification ferrules indicating the circuit and DB number shall be used for submains sub-circuit wiring. The ferrules shall be provided at both end of each submain and sub-circuit.

Where single-phase circuits are supplied from a three phase and a neutral distribution board, no conduit shall contain the wiring fed from more than one phase. In any one room in the premises where all or part of the electrical load consists of lights, fans and/or other single phase current consuming devices, all shall be connected to the same phase of the supply. Circuits fed from distinct sources of supply or from different distribution boards or through switches or MCBs shall not be bunched in one conduit. In large areas and other situations where the load is divided between two or three phase, no two single-phase switches connected to different phase shall be mounted within one box.

All splicing shall be done by means of terminal blocks or connectors and no twisting connection between conductors shall be allowed.

Industrial sockets shall be of moulded plastic BoQ and deeply recessed contact tubes. Visible scraping type earth terminal shall be provided. Socket shall have self-adjustable spring loaded protective cap. Socket shall have MCB/ELCB/RCCB as specified in the schedule of work.

Maximum number of PVC insulated 650/1100 V grade/copper conductor cable conforming to IS: 694-1990.

Conduit size	**20mm**		**25mm**		**32mm**		**40mm**		**50mm**		**60mm**	
Wire size in sq.mm.	**S**	**B**	**S**	**B**	**S**	**B**	**S**	**B**	**S**	**B**	**S**	**B**
1.50	7	5	12	10	20	14	-	-	-	-	-	-
2.50	6	5	10	8	18	12	-	-	-	-	-	-
4	4	3	7	6	12	10	-	-	-	-	-	-
6	3	2	6	5	10	8	-	-	-	-	-	-
10	2	-	4	3	6	5	8	6	-	-	-	-
16	-	-	2	-	4	3	7	6	-	-	-	-
25	-	-	-	-	3	2	5	4	8	6	9	7

Notes:

1) The above table shows the maximum capacity of conduits for a simultaneous drawing in of cables.
2) The columns heads ‘S’ apply to runs of conduits which have distance not exceeding 4.25 m between draw in boxes and which do not deflect from the straight by an angle of more than 15 degrees. The columns heads ‘B’ apply to runs of conduit which deflect from the straight by an angle of more than 15 degrees.
3) Conduit sizes are the nominal external diametres.

7.0 TELEPHONE SYSTEM AND LAN WIRING

Enhanced Category 5 UTP specifications

a) The UTP shall be 4-pair, with 24 SWG solid or standard copper conductors.

b) The UTP-based cabling system shall have a 160 MHz channel channel bandwidth over a maximum distance of 100m (328 ft)and a channel power sum attenuation-to-crosstalk ratio (PSACR) of 9.6 dB@ 100 MHz using an interconnect or BIX cross connect configuration.

c) The UTP-based cabling system shall use matched components from a single manufacturer, certified to deliver system performance over the lifetime of the application that the cabling system was originally designed to support.

d) All component used in the UTP-based cabling system shall be warranted for a period of 25 years from date of installation against defects in materials and workmanship.

e) The UTP-based cabling system shall comply with the following standards:

Enhanced Category 5 – TIA/EIA Addendum

Category 5 – ANSI/TIA/EIA-568, TIA/EIA TSB67

Class D – CENELEC EN50173

Class D – ISO/IEC 11801

UTP Outlets

a) The outlet UTP connection module and its optional cover shall be available in the following colors: grey, almond, white, black, orange, red, yellow, green, blue, purple and brown.

b) The outlet UTP connection module shall be Power Sum rated, with a power Sum NEXT performance equal to or better than ANSI/TIA/EIA-568 Category 5 pair-to-pair NEXT performance specifications, and shall have a PS5 marking to indicate compliance.

c) The eight-position outlet UTP connection module shall accommodation six-position modular plug cords without damage to either the cord or the module.

d) It shall be possible to inspect and/or re-terminate the UTP cable at the outlet through front access at the face plate.

e) The faceplate housing the outlet UTP connection modules shall have aperture plugs to cover any unused openings in the faceplate.

f) The faceplate housing the outlet UTP connection module in wall mounted single and dual-gang electrical boxes, utility poles and modular furniture (cubical) access points using manufacturer – supplied faceplates and/or adapters, equipped with front, side or angled-entry options for modular cords.

UTP System Testing

a) There are two primary field test parameters for an UTP-based end-to-end cabling system. These are continuity/wire mapping and a visual inspection, both to be performed by the vendor.

b) Continuity/wire mapping is used to verify consistency pair-to-pin terminations at each end of a given cable. It also checks for faulty connections in the run. For each of the eight conductors in the cable, continuity/wire mapping indicates:

Continuity of the channel to the remote end.

Shorts between any two or more conductors.

Crossed pairs.

Reversed pairs.

Split pairs.

Any other mis-wiring.

TELEPHONE TAG BLOCK (TTB / IDF)

CAT-5e (enhanced) unshielded twisted pair cable in MS conduit shall be used to have modern structured cabling network for telephone system, to have latest facilities for Internet and also data cabling. All the telephone Jack must terminated on RJ-11 jacks and installed onto a dual Jack faceplate. Telephone RJ-11 Jacks must be terminated with a **BLACK** Connector/Jack.

For LAN CAT 6 UTP cables shall be used for interconnecting the RJ 45 outlets to Intermediate Switch (Hub) or directly to IT room, if the running length limit permits. These Intermediate switch shall be installed in a rack/cabinet and located in electrical room of the respective floors. Fibre Optic cable or CAT-6 UTP cable shall be used for backbone to interconnect the Intermediate switch to IT room's Server rack, as per the design requirement of the specialised Vendor. All the Data Jack must terminated on an 8 wire, 8-position Jack. Each RJ-45 Data Connection will be terminated with a **BLUE** Data Jack.

Only conduit routing & wiring shall be provided by the Electrical contractor and the configuration & wiring shall be done by the Vendor for the IT Networking.

EPABX system, with latest technology will be provided by a separate Vendor to provide Voice Mail &Call Accounting by costing of all calls made by telephones.

A small cabinet for Low current services shall be provided at the false ceiling level at entrance of guest room, to locate all the terminal points like Tel.Tag block, tap-off box for MATV etc., for interconnecting all the low current outlets (jacks) provided in the guest room. Each tel. outlet in guest room shall be provided a separate wire from the room tag block.

Similarly one CAT-5e wire from the floor TTB/IDF shall be provided for each Tel. Outlet proposed.

A Multi pair box as per BOQ Tel. Cable shall be laid from the Service gate to the Telephone switch room MDF for Direct lines from the Service provider. Some of the lines shall be bypassed to EPABX and shall be directly provided to Top management's office & Telephone operators for direct communication to outside. Rest of the lines shall be routed through EPABX for the use of patrons & staff through extensions. The following area/desk shall have direct access to outside Tel. lines:

a) Telephone Operator's room

b) Telephone Switch room

c) Security room

d) Fire officer room

8.0 DISTRIBUTION BOARDS & MCBs

General

Distribution boards shall be of standard make with MCBs as per approved make given. Distribution boards shall be constructed out of steel sheet all weld enclosure with double door IP42 protection and shall be powder coated. Ample clearance between the conductors of opposite pole, between conductors and sheet steel body shall be maintained in order to obviate any chance of short circuit. Removable conduits entry or knockouts plates shall be provided at top and bottom to facilitate drilling holes at site to suit individual requirements. Also on additional/separate adopter box of suitable length and size shall be provided to accommodate wires and cables. No. of conduits etc. and nothing shall be payable on this account. The MCBs shall be mounted on high-grade rigid insulating support and connected by electrolytic copper bus bars. Each incoming MCB isolator shall be provided with solderless cable sockets for crimping. Phase separation barriers made out of arc resistant materials shall be provided between the phases. Bus bars shall be colour coded for phase identification.

Distribution boards shall be recessed in wall nitch or if required mounted on the surface of the wall with necessary clamp bolts etc. The mounting height shall not exceed 1200mm from finished floor level. Distribution board shall be provided with proper circuit identification nameplate and danger sticker/plate as per requirements.

All the distribution boards shall be provided with engraved nameplates with 'lighting', 'power' or 'UPS' with DB Nos., as the case may be. Each DB shall be provided with a circuit list giving details of each circuit. All the outgoing circuit wiring shall be provided with identification ferrules giving the circuit number & phase.

Each distribution board shall have a separate neutral connection bar and a separate earth connection bar mounted within the DB each having the same number of terminals as the total number of outgoing individual circuits from the distribution board. Conduit & cable armouring shall be bonded together & connected to the distribution board earth bar.

Where oversized cables are specified due to voltage drop problems, it shall be contractors responsibility to ensure that satisfactory terminal arrangements are provided without an extra cost.

Residual Current Circuit Breaker

RCCB shall be 4 pole 415 volts 50Hz, 30-300mA sensitivity. These shall be of approved make. The rating of the RCCB shall be as specified in BOQ. These shall be suitable for manual closing and opening and automatic tripping under earth fault circuit of 30-300mA as specified in item of work. The enclosure of the RCCB shall be moulded from high quality insulating material. The material shall be fire retardent, anti-tracking, non-hygroscopic, impact resistant and shall with stand high temperature. All parts of switching mechanism shall be non-greasing, self-lubricating material so as to provide consistent and trouble free operation. Operation of RCCB shall be independent of mounting position and shall be trip free type. The RCCB shall be protected against nuisance tripping by protective device.

Miniature Circuit Breaker

1. The MCB shall be current limiting type and suitable for manual closing and opening and automatic tripping under overcurrent and short circuit. The MCB shall also be trip free type.
2. Single pole/three pole versions shall be furnished as required.
3. The MCB shall be rated for 10 KA/15 KA fault level.
4. The MCB shall be suitable for its housing in the distribution boards and shall be suitable for connection at the outgoing side by tinned cable lugs and for bus-bars connection on the incoming side.
5. The terminal of the MCBs and the open and close conditions shall be clearly and indelibly marked.
6. The MCB shall generally conform to IS: 8828. -1996
7. The MCB shall have 20,000 electrical operation upto 63A.
8. The MCB shall have minimum power loss (Watts) as per I.S./ IEC.

LIST OF NOMINATED MATERIALS & SUPPLIERS:

List of nominated Materials and Suppliers:

List of Makes for Civil Works		
The following brand makes/ manufacturer‘s makes listed below may be used with prior approval of the Architect. In case it is established that any material as listed below is not available in the market, approved equivalent materials and finishes of any other specialized brand names/ manufacture‘s makes may be used as per approval of the architect or EIC.		
S.NO.	ITEM DESCRIPTION	MAKE/BRAND
1	CEMENT(OPC)	ACC/L&T/ JK CEMENT/ BIRLA/ULTRA TECH /GUJARAT AMBUJA/JP/VIKRAM/AMBUJA
2	WHITE CEMENT & PUTTY	JK WHITE / BIRLA
3	STEEL, TOR STEEL (REINFORCEMENT FE 500D) & STRUCTURAL	SAIL/TATA STEEL/JINDAL STEEL/JSW/RINL
5		
7	WHITE CEMENT PUTTY	BIRLA WHITE/ ASIAN/ WALPLAST
8	BITUMEN	IOCL/TIKI TAR INDUSTRIES/ JUNO BITUMIX PVT. LTD
9	CEMENT ADMIXTURE/PLASTICIZER	FOSROC/SIKA/PIDILITE/CICO/BASF
10	ANTI-TERMITE TREATMENT CHEMICAL	BAYER/GIBRALTOR/BASF/GIBRALTOR
FLOOR/WALL FINISHING		
11	1ST QUALITY ACRYLIC DISTEMPER, ACRYLIC/ PLASTIC EMULSION , SYNTHETIC ENAMEL PAINT, ACRYLIC EXTERIOR PAINT, EPOXY PAINT	ASIAN PAINTS/ DULUX / NEROLAC
12	TEXTURED PAINTS - EXTERIOR	ACRO PAINTS/ UNISTONE/ SPECTRUM/HERITAGE
13	STEEL PRIMER (RED OXIDE ZINC CHROMATE PRIMER)	ASIAN PAINTS, NEROLAC, BERGER, ICI

14	RECTIFIED CERAMIC TILES, CERAMIC TILES, VITRIFIED TILES, HEAT RESISTANCE TILE (VITRIFIED TILES TO BE DOUBLE CHARGED MANUFACTURED FROM MOTHER PLANT)	FIRST QUALITY NITCO/ KAJARIA/ SOMANY/ JOHNSON/RAK OF APPROVED DESIGN, COLOR AND SHADE
15	BRICK PAVERS	JAY JALARAM BRICKS/PIONEER BRICKS/JINDAL MECHANO BRICKS
16	P.O.P	SRIRAM NIRMAN/ BIRLA WALL PUTTY/ JK
17	CEMENT PRIMER	NEROLAC/BP WHITE (BERGER)/DECOPRIME-WT (ASIAN)/WHITE PRIMER (ICI)
18	FIRE RETARDANT PAINT	NIPPON PAINT/BERGER/ASIAN PAINTS/SHALIMAR PAINTS
CEILING AND PANELLING		
19	FALSE CEILINGS	
A	GYPSUM CEILING	USG BORAL/SHERA/GYPROC
B	METAL CEILING (CLIP-IN AND LAY-IN)	ARMSTRONG/ ECOTONE/USG BORAL
C	OPEN CELL CEILING	ARMSTRONG/USG BORAL/HUNTER DOUGLAS
D	CALCIUM SILICATE BOARDS/TILES	HILUX (RAMCO INDUSTRIES LTD.)/AEROLITE/GYPROC
E	ACOUSTIC FALSE CEILING	ARMSTRONG/ EARCONS/ ECOTONE/ECOPHON
F	ACOUSTIC WALL PANEL	ARMSTRONG/ EARCONS/ ANUTONE/ECOTONE/ECOPHON
WOOD WORK		
20	FLUSH DOOR, BLOCK BOARD, PLYWOOD	DUROPLY INDUSTRIES LTD., GREEN PLY, CENTURY,NATIONAL, KITPLY PRODUCTS
21	DECORATIVE LAMINATE	FORMICA/ GREENLAM/ MERINOLAM/DURO
DOORS AND WINDOWS		
22	FIRE DOORS	NAVAIR INTERNATIONAL PVT. LTD./ HORMANN/SUKRI/ENVIROTECH SYSTEM PVT.LTD.
23	UPVC DOORS & WINDOWS	FENESTA/ ALUPLAST
24	ALUMINIUM EXTRUDED PROFILES	HINDALCO/ JINDAL/INDAL
25	ALUMINIUM LOUVRED DOOR	DOMAL/ ETERNIA/ AGV AFLAB/ADITYA BIRLA
26	WINDOW TURN HANDLES, FRICTION HINGES	IPSA, DORMA, EBCO, DORMA, HETTICH, GEZE

27	HERMETICALLY-SEALED DOUBLE INSULATED GLASS	SAINT GOBAIN/AIS ASAHI INDIA GLASS LTD./GSC TRUTUF
28	FLOAT GLASS, MIRRORS	SAINTGOBAIN /TRUTUF/AIS ASAHI INDIA GLASS LTD/ MODIGUARD
29	FLOOR SPRING, FRAMELESS	DORMA/HETTICH/OZONE/DOORSET
30	STRUCTURAL GLAZING/ SPIDER GLAZING	KALCO/CONSOLIDATED GROUP/ALUMAX INDIA/ DOMAL/ ASTHA ALUMINA PVT. LTD.
31	STAINLESS STEEL FIRE RATED HARDWARE	DORMA,GEZE,HAFELE
32	SS HANDLES, TOWER BOLTS, HINGES, ALDROP, FLOOR STOPPER, CASEMENT STAY, SAFETY CHAIN, MAGNETIC DOOR CATCHER, MAGIC EYE, DRAWER GLIDES, FLOOR STOPPER, PANIC BAR/ PUSH BAR	HAFELE/ DORMA/ GEZE/ HETTICH/ OZONE/KICH
33	PATCH FITTINGS	HETTICH/DORMA/GEZE/HAFELE/OZONE/KICH
MISC ITEMS		
34	AAC BLOCK ADHESIVE	PIDILITE/FERROUSCRETE/LATICRETE
35	GLUE	FEVICOL/DUNLOP/VEMICOL/ ARALDITE
36	BLINDS	VISTA/DECOREX/ELEGANT DÉCOR
37	SILICON SEALANT	GE BAYER SILICONE/ SIKA/BECKER/DOW CORNING
38	TILE ADHESIVES/EPOXY GROUT/SILICONE SPRAY/POLYSULPHIDE SEALANT	LATICRETE/ROFFE/PIDILITE
39	WATER PROOFING	SOPREMA/FOSROC/BASF
40	ANTITERMITE PAINT	NOCIL/PYRAMID/TRISUL/MONTARI INDUSTRIES
41	FASTENERS/CRAMPS	FISCHER/HILTI/BOSCH/CANON
42	THERMAL INSULATION/ROCKWOOL/GLAS S WOOL/MINERAL WOOL/PUF	TWIGA/POLYGLASS/OWENS CORNING
43	HPL	FUNDERMAX

44	TILE ADHESIVES, EPOXY GROUT, SILICONE SPRAY, POLYSULPHIDESEALANT	LATICRETE, ROFFE, PIDILITE

LIST OF APPROVED MAKES FOR ELECTRICAL WORKS		
A.	ELECTRICAL SYSTEM/ PANELS	
1	FUSES & SWITCH FUSE UNIT	L&T/ ABB/ SCHNEIDER/ LEGRAND
2	ACB / MCCB / CONTACTOR	L&T/ ABB/ SCHNEIDER/ LEGRAND/SIEMENS
3	METAL CLAD SOCKET	SIEMENS/ MDS/ LEGRAND
4	RISING MAINS / BUS DUCT	SPC ELECTROTECH / HAVELLS / C&S/ ABB / LS POWER/IIGM PVT LTD/L&T/SIEMENS

5	LED'S LIGHT	PHILIPS/ WIPRO/TRILUX /BAJAJ/SYSKA LED
6	ISOLATORS FOR MOTORS	MDS/ SIEMENS/ SCHNEIDER/ ABB/ INDO ASIAN
7	CHANGE OVER SWITCH	HH-ELCON/ HPL/ SOCOMAC / GE
8	CONTACTOR, TIMER, SINGLE PHASEPREVENTOR & OVER LOAD RELAY	L&T/ ABB/ SCHNEIDER/ GE
9	METERS - DIGITAL TYPE	L&T/ SOCOMEC/ ABB/LEGRAND/RISHABH/CONZERV
10	PROTECTIVE RELAYS	ALSTOM/ ASHIDA/ L&T/EPCOS/NEPTUNE/DUCATI
11	CT'S / PT'S- DRY TYPE-EPOXY	AE/ KAPPA
12	INDICATING LAMP / PUSH BUTTON ACTUATERS - LED CLUSTER TYPE	L&T/ SIEMENS/ BCH
13	ROTARY SWITCHES	L&T/ KAYCEE/ BCH
14	TERMINAL BLOCK	ELEMEX/ WAGO
15	LT PANELS/CAPACITOR PANEL/SYNCPANEL /SUB PANEL /FEEDARPILLAR/HVAC PANNEL	SHIVALIC / RISHA CONTROL/SUDHIR / NEPTUNE/LS POWER
16	LIGHTNING ARRESTER	ERICO/ KAPE / JMV / LPI/APS/ S. N. EARTHING
B.	CABLES/TERMINATIONS/ACCESSORIES	
1	LUGS	DOWELLS/ COMET
2	BRASS CABLE GLANDS	COMMET/ POWER / GRIPWELL / DOWEL / COMMEX
3	LT POWER CABLE (ALUMINIUM/ COPPER)	POLYCAB /HAVELLS / KEI / RR KABEL/FINOLEX/SKYTONE
4	CONTROL CABLE (COPPER)	POLYCAB /HAVELLS / KEI / RR KABEL/FINOLEX/SKYTONE
7	FIRE SURVIVAL CABLE	AFW /SKYTONE / PRYSMIAN
C.	CONDUITING & WIRING ACCESSORIES	
1	MS CONDUIT WITH ACCESSORIES / GI CONDUIT (ISI MARKED)	BEC /RM CON /AKG/ STEEL CRAFT
2	PVC CONDUIT WITH ACCESSORIES(ISI MARKED)	BEC/RMG STEEL/POLYPACK/PRECISION/ATUL/POLYCAB
3	PVC INSULATED COPPER CONDUCTOR FRLS WIRE	BATRA HENLAY / POLYCAB /HAVELLS/KEI/RR KABEL

4	PLATE TYPE - SWITCHES / SOCKETS/ TV & TELEPHONE SOCKETS AND ALL OTHER WIRING ACCESSORIES	LEGRAND/ SCHNEIDER/NORISYS/HONEYWELL/ORIENT
5	RACEWAYS & CABLE TRAY	MEM /LS POWER/RM CON/CTM ENGINEERING/SRGINTERNATIONAL PVT LTD/INDIANA GRATING
6	PVC INSULATION TAPE	STEEL GRIP/ ANCHOR
7	PHENOL LAMINATED SHEET	HYLUM/ FORMICA
D.	LIGHTING DBS & MCBS	
1	MCB/ ELCB/ ELMCB / RCCB	ABB/ C&S/ HAGER/ INDO/ ASIAN/SIEMENS/LEGRAND/SCHNEIDER/L&T/EATON
2	DISTRIBUTION BOARD	M.K (HONEY WELL)/ LEGRAND/ HAGER/C&S/INDOASIAN/LEGRAND/L&T/SCHNEIDER/SIEMENSABB/EAT ON
E.	LIGHTING FIXTURES & FANS	
1	BULK HEAD FITTINGS	BAJAJ/WIPRO/SYSKA LED/PHILIPS/TRILUX
2	EXHAUST FANS / CEILING FAN / WALL MOUNTED FAN	CROMPTON/ORIENT/USHA/HAVELLS/KHAITAN/ RALL ISON
3	LIGHTING FIXTURES	BAJAJ/WIPRO/SYSKA LED/PHILIPS/TRILUX
4	LIGHTING CONTROL SYSTEM	SCHNIDER/ PHILIPS/ WIPRO/TRILUX
5	LIGHTING POLES	WIPRO/ KESELEC SCHREDER/LUSTURE
F.	ELV- TELEPHONE & MISC. SYSTEMS	
19	TELEPHONE TAG BLOCK	MK / SYSTIMAX / SCHNEIDER / KRONE TYPE
20	TELEPHONE CABLES	BATRA HENLAY / POLYCAB /HAVELLS
21	CO-AXIAL CABLES	BATRA HENLAY / POLYCAB /HAVELLS
22	EPABX	CISCO/TADIRAN/POLYCOM/JUNIPER
23	IT & TELECOM SYSTEM	BELDEN / SYSTIMAX / PANDUIT /MOLEX/IMPULSE/EXTREME
G.	MISCELLANEOUS SYSTEMS	
1	BATTERIES	EXIDE/ STANDARD/AMARON/LUMINOUS/OKAYA
2	BATTERY CHARGER	KELTRON/ NELCO/ EXIDE/ HBL NIFE
3	EARTHING (ALL TYPE)	ERICO/ TERCEL/MEM/JMV/S. N. EARTHING

LIST OF APPROVED MAKES FOR PLUMBING WORKS		
1	VITEROUS CHINA SANITARY FIXTURES	PARRYWARE / JAQUAR / CERA
2	CHROME PLATED SANITARY FIXTURES & CP FITTINGS	PARRYWARE / JAQUAR / CERA
3	GEYSERS	VENUS / BAJAJ / JAQUAR
4	UPVC PIPES & FITTINGS	SUPREME / PRINCE / ASTRAL
5	CPVC PIPES & FITTINGS	SUPREME / ASHIRVAD / ASTRAL
6	GI FITTINGS	KS / UNIK / ZOLOTO
7	GI PIPES & FITTINGS	JINDAL HISSAR / PRAKASH SURYA
8	BALL VALVE	SANT / ZOLOTO / AUDCO
9	BUTTERFLY VALVE	SANT / ZOLOTO / AUDCO
10	NON RETURN VALVE	SANT / ZOLOTO / AUDCO
11	MOTORIZED BUTTERFLY VALVE	ZOLOTO / SANT / AUDCO / BELIMO / AIP
12	INSULATION	CAREFLEX /SUPREME

13	RUBBER EXPANSION JOINT	KANWAL / RESISTOFLEX
14	SUCTION STRAINER	ZOLOTO / SANT / AUDCO / BELIMO
15	PRESSURE GAUGE	FIEBIG / H GURU
16	SW PIPE & FITTINGS	LAL CHAND ANAND & SONS
17	RCC PIPE	PRAGATI CONCRETE UDYOG
18	SFRC MH COVER	ACCURATE BUILDCON
19	CI MH COVER	NECO / HEPCO / RIF / SRIF
20	PVC TANK	SINTEX / SHEETAL
21	SOLAR SYSTEM	INTERSOLAR / CHOUDHARY ENTERPRIZES

SCHEDULE OF FISCALS	
ESTIMATED COST OF WORKS	**Rs. ----------**
Mobilization Period	**7 days from the date of Work Order**
Date of Commencement of work on site	**7 days after the date of Work order**
Completion Period	**One Year from date of commencement.**
Date of virtual completion	**One year from date of commencement.**
Retention Money	**5% of each R.A. payment**
Liquidated Damages for Delay	**2.5 % per month up to max. of 10% of Contract value**
Period of Final Measurement	**1 month from date of official notification by the contractor for completion of work.**
Frequency of Interim Bills	**Once in every two month.**
Value of Interim Certificate	**Rs----------**
RA bills payment	**75 % payment shall be released after certification of the project manager.100 % payment of the RA bill shall be released after certification of Technical committee and The architect.**
Period of honoring Interim Certificate	**15 working days from receipt of verified bill.**
Earnest Money	**Rs. 50,000/- in the form of Demand Draft / Bank Guarantee**
Mobilization Advance	**NIL**
Material Advance	**75% of the value of material brought to the site For the purpose of the construction as per contract. Recovery shall be done in next 2 RA bills.**
Performance Bond	**2.5% (Two & half) of the awarded cost.**
Tax Deduction at Source	**As per applicable**
Defects Liability Period	**12 Months from the date of issuance of virtual completion certificate**
Escalation	**No escalation shall be payable**