TENDER DOCUMENT

FOR

CONSTRUCTION OF GIRL'S HOSTEL, SHRI RAM COLLEGE OF COMMERCE, UNIVERSITY OF DELHI, DELHI

INSTRUCTION TO TENDERERS, GENERAL CONDITIONS OF CONTRACT, SPECIAL TERMS & CONDITIONS &, SPECIFICATIONS SCHEDULE OF QUANTITIES & DRAWINGS.

OWNER
SHRI RAM COLLEGE OF COMMERCE
UNIVERSITY OF DELHI,
DELHI-110007
Phone: 27667905, 27666519

ARCHITECTS
MR.VIJAY GUPTA
ARCHITECTS
603 CHIRANJIV TOWER,
43 NEHRU PLACE, NEW DELHI
Phone: 26414763, 26410790

TENDER DOCUMENT

CONSTRUCTION OF GIRL'S HOSTEL, SHRI RAM COLLEGE OF COMMERCE, UNIVERSITY OF DELHI, DELHI.

ARCHITECTS	MR.VIJAY GUPTA ARCHITECT 603, CHIRANJIV TOWER,43,NEHRU PLACE NEW DELHI
OWNER	SHRI RAM COLLEGE OF COMMERCE, NEW DELHI
PROJECT	CONSTRUCTION OF GIRL'S HOSTEL, SHRI RAM COLLEGE OF COMMERCE, UNIVERSITY OF DELHI, DELHI.

Cost of Tender Document Rs.5000/- (Non Refundable)
(Rs. Five Thousand Only)

Tender issued
to Dated

TENDER DOCUMENT

CONSTRUCTION OF GIRL'S HOSTEL, SHRI RAM COLLEGE OF COMMERCE, UNIVERSITY OF DELHI, DELHI.

1.0 NOTICE INVITING TENDERS

1.1 Sealed Tenders on item rate basis are invited from approved / registered contractors with Government departments / PWD / University of Delhi by **SHRI RAM COLLEGE OF COMMERCE, DELHI UNIVERSITY, DELHI** for the following works to be executed inside the premises of the college.

Name of Project	:	Construction of Girl's Hostel, Shri Ram College of Commerce, University of Delhi, Delhi
Estimated cost	:	Rs. Four Crore twenty five Lakhs
Earnest Money	:	Rs. Eight Lakh Fifty Thousand Only

1.2 The TENDER DOCUMENTS can be had during working days from the **Administrative Officer, Shri Ram College of Commerce, Delhi University, Delhi,** between **10 AM-1PM & 2PM- 4PM from 11.01.2014 TO 31.01.2014** on cash/DD/Banker's Cheque/Pay Order payment of Rs. 5,000/-
(Rs. Five thousand only) per tender.

1.3 This Notice Inviting Tenders and enclosed specifications, General Conditions, Schedule of Quantities along with its Tender Drawings etc shall form the TENDER DOCUMENTS. The specifications, drawings, Schedule of Quantities etc. can also be seen in the Principal Shri Ram College of Commerce's Office during the said working hours.

1.4 Contractor's may contact for any clarification to Architect Office / Owner and may also visit the site in co-ordination with Architect / Owner.

1.5 TENDERS in two parts (A) One commercial bid and (B) One technical pre-qualification bid each Separately Sealed with the requisite Earnest money in the form of crossed Demand Draft (issued by any Nationalized or Scheduled Commercial Bank) and drawn in favour of Shri Ram College of Commerce payable at New Delhi shall be received upto on

03-02-2014 between 10 AM-1 PM & 2PM-4PM in the office of **Administrative Officer, Shri Ram College of Commerce, Delhi.** (On the last day of submission i.e., on 03-02-2014 the bids will be accepted upto 12 Noon only); and **the Technical Bid** shall be opened at **3.00 PM** on **03-02-2014.**

The tenderer should also submit the Rates of tender items in Softcopy along with the hard copy for easy evaluation. The items/ Item description should be recorded in the same sequence as given in the BOQ attached with the tender documents.

1.6 At first only the Technical Pre-qualification bid would be opened for evaluation and suitable parties/ contractors would be short listed. In the next stage only the commercial bids of such Short listed parties would be opened, under intimation to them to enable their presence while Tender (Commercial bid) opening. Commercial bids of all others, not pre-qualified would be Returned unopened.

1.7 TENDERER is to quote on item rate basis and to assist him, item wise quantities are stated in Schedule of Quantities. Although all precaution have been taken while working out the quantities but Owner/ Architect does not take any guarantee for correctness of the same. The payment will be made for the actually executed and measured quantities at agreed rates.

1.8 The rates should be quoted in figures as well as in words and the respective amounts or total shall be given by each Tenderer. In case of any difference in rates in figures / word, those given in words shall hold good as quoted rate.

1.9 The tenderer shall remain valid for acceptance for 90 days from the last date of submission.

1.10 The successful TENDERER shall be intimated about the award of work and the Earnest Money Deposits of other Tenderers shall be returned without any interest on the amount deposited. The Earnest Money of the successful party shall be adjusted towards Security Deposit.

1.11 The site is available and is free from any encumbrances and each Tenderer shall be deemed to have visited the site and seen the site conditions before quoting his Tender. No claim on ground for want of such knowledge / site inspection shall be entertained at any stage.

1.12 The Owner reserves the right to reject any / all TENDERS without assigning any reason and shall not be bound to accept the lowest or any other Tender.

The owner also reserves the right to accept the tender in full or in parts and in the latter case the tenderer is bound to execute the work at his quoted rates.

1.13 TENDER not accompanied by the requisite EARNEST DEPOSIT MONEY in The specified form, shall be summarily rejected.

1.14 Incomplete and late Tenders shall be rejected without any further reference.

1.15 The Time for Completion of work is **(01) One Year from date** of letter of award.

1.16 The Steel used in the construction shall be TMT steel.(From main manufacturers)

1.17 Corrigendum or any other related notices, if any, will only be put up in the college website www.srcc.edu from time to time.

Dated: 11.01.2014

SHRI RAM COLLEGE OF COMMERCE

2.0 INSTRUCTIONS TO TENDERERS

1 Tenders not properly filled or mutilated or with calculation mistakes or generally not complying with the stipulated conditions may be rejected. Conditional tenders shall be summarily rejected.

2 TENDERERS should quote their rates both in figures and in words.

3 The schedule of quantities as mentioned must be fully priced and the total of each page along with carried over figures of the previous page shall be given in ink and Signed by the Tenderer.

4 If the tender is submitted by or on behalf of a company incorporated under the Companies Act. (1959) it shall be signed by the Company Secretary or by one of the Directors, duly authorised on their behalf. If it is, submitted by a partnership firm, it shall be signed under the Co-partnership firms name by a member of the firm who shall sign his own name & give the name & address of each partner of the firm and attach a copy of Power of attorney with the tender authorizing him to sign on behalf of the partners. A certified copy of the registered partnership deed shall also be submitted along with the tender. The tenders should be submitted in a sealed cover.

5 A schedule of approximate quantities for various items accompanies the tender. It shall be definitely understood that the owner/ Architect does not accept any responsibility for the correctness or completeness of the schedule in respect of items and quantities. This Schedule is liable to alteration by omission, deductions or additions at the discretion of The OWNER without affecting the terms of contract and without any extra claim on account of any reason or reasons.

6 All quoted rates shall include the cost of all materials & labour & transportation of materials to the site, all taxes such as Sales Tax, Turnover Tax, Sales Tax , Work Contract Tax, Royalties , Toll Tax , Income Tax , Excise Duty Octroi etc. CONTRACTORS profit & overheads etc. and the fixing or placing in position for which the items of work is intended to be operated as per specifications excluding Service tax. Service Tax as applicable shall be paid on actual basis.

7 No alteration shall be made by the tenderer in the Instructions to the TENDERERS or N.I.T, Contract Form, Conditions of the Contract, Drawings and specifications and if any such alterations are made or any special condition attached, the tender shall be rejected.

8 The acceptance of the tender rests with the OWNER, who reserves the right of rejecting any or all the tenders including the lowest tender without assigning any reasons what so ever.

9 The OWNER reserves the rights of accepting the whole or any part of a tender received and the tenderer shall be bound to perform the same at the quoted rates.

10 Every tenderer shall furnish along with the tender, Latest Income Tax clearance certificate & the Registration No. / Certificate from Sales Tax Deptt. for work Contract Tax etc. failing which his tender is liable to be rejected.

11 From the date of actual handing over of the works to the Owner, which date shall be mutually agreed upon in writing the contractor
Shall be responsible to make good any defects which may occur within a period of 12 months & this period is treated as "Defect Liability period"

12 The CONTRACTOR shall not be entitled to any compensation for any loss suffered by hindrance on account of delays in commencing or executing the work, whatever the cause for such delays may be including delays in procuring Government controlled or other materials.

13 The rates of different items are for all heights, depths, curvatures, and width unless otherwise specified in the item of work.

14 The detailed schedule of programme in the form of a BAR CHART of activities for the whole work shall be drawn and submitted by the contractor within 10 days of the award of work. The work shall be progressed from day to day and completed in the logical order and according to the schedule, after approval of the same by the Project-in-Charge. There shall be provision to report periodic progress in the bar chart, which shall be made on 1st week of every month for the progress made in the previous month against planned schedule.

15 If the OWNER wants to occupy areas in part, the contractor shall have to complete the work of these areas in consultation with the OWNER and hand over the same without affecting any of the clauses of contract agreement.

16 After acceptance of the tender by the owner, the tenderers shall sign the necessary contract papers within 10 days from the receipt of the above intimation. In case of delay the "Earnest Money" may be forfeited and the tender cancelled or the contract enforced as per the terms of the tender and the tenderer shall thus be bound to execute the work even though the formal agreement has not been executed and signed.

17 **Electricity:** The contractor will make his own arrangement for electricity. The electric connection if required will be arranged by the Contractor himself.

Necessary cabling etc. will be done by him at his cost and he will also pay for consumption at the prevailing rates of charges as per bills. The Contractor will purchase or hire generator to meet the requirement of electricity for the works and its cost for running / maintenance will be borne by contractor himself. The OWNER will have no responsibility in this connection.

18. **Water**: Contractor will make his own arrangement for water & further storage and piping etc. No. responsibility lies with the OWNER. The water used should be suitable for construction purpose and should be got tested from approved laboratory by Contractor at his own cost before start of the work. The running and maintenance shall be done by the contractor at his own cost**.**

19 **Weathe**r: No extension of time will be allowed to the Contractor due to weather conditions prevalent in the area. The contractor is expected to take all the precautions at his own risk and cost so that the workmanship, the materials and progress of work are not affected in the inclement weather.

20 **Cleaning up & handing over**: Upon completion of the work all the site area should be cleaned. All works shall be cleaned in a manner which will render the work acceptable to the OWNER. All rubbish shall be removed from the site and shall not be dumped in the surrounding area.

21 The work as described in the drawings and schedule of quantities shall be completed on or before the stipulated date of completion.

22 The CONTRACTOR shall be allowed to make a store rooms inside the premises.(Temporary)

23 The CONTRACTORS should quote their offer keeping in view the basic minimum rates of labour wages with upto date corrections as on the day of submission of the tender as per notification by Local Authorities.

24 The Contractor shall include in his rate all taxes viz Octroi royalties, Sales Tax, Work Contract Tax, VAT & all duties and no claim on this account will be entertained. Except service tax. if applicable

25 The Income Tax and Work Contract Tax as specified will be deducted as per Govt. notification/regulation from the bills for paying to the Government & by the Employer.

26 The rate quoted by the Contractor shall remain firm till the work is completed.

27 The following specified works shall be got carried out by the contractor through specialized firms or manufactures with the approval of ARCHITECT.

a) Water proofing: 10 years guarantee shall be obtained on stamp paper.

28 Proper record for all the materials required for the above works shall be kept at site by the CONTRACTOR.

29 Owner shall have the right to withdraw any item / items mentioned in the Tender from the Scope of the contractor at any time.

30 A "Contractor's All Risk Policy" for the entire value of contract shall be arranged by the Contractor and a copy thereof deposited with the owner. The premium for the same shall be paid by the Contractor.

31 Contractor will have to take & deposit copy of "Workmen Compensation Policy" in respect of manpower deployed by it at the project site. Policy should be in the joint name of Owner & Contractor.

32 The Contractor shall use Ready mix concrete for all bulk concrete work, Ordinary Portland Cement 43 or 53 grade of approved make as specified for all other works except for Plain Cement Concrete, Full Brick Masonry and fine sand plastering where Portland Pozallana Cement of acceptable brand should be used. In case of any problem for non-availability, the matter shall be referred to the Engineer-in-Charge for his final decision.

33 The Contractor shall use burnt clay bricks of uniform size & dimensions (particularly thickness), plain surfaces, uniform colour and with sharp edges in particular for the exposed brick work.

34 The Contractor shall ensure that perfect water levels are maintained in the horizontal layers of brick work as well as uniform plain face in the exposed face of brick work.

35 The Contractor shall use Teakwood for the woodwork which should be fully mature, free from knots or discolouration and of visible attractive grains.

36 The Contractor shall always use fresh plywood shuttering for column faces, beam faces and slab / Chajja edges which are likely to be exposed, to render sharp edges and plain uniform honey-comb free surface finish, without repairing.

37 The contractor to barricade the Project area on the ground up to 6.00m height by using fresh Coloured corrugated GI / Galvolume sheeting supported on firm temporary steel structure. Proposed project area outlined in attached in sketch. (As shown in drawing) Nothing extra will be paid on this account.

Dated: _____2013

SHRI RAM COLLEGE OF COMMERCE

3.00 FORWARDING LETTER

From:

To

_____

_____

SUB: _____

Dear Sir,

With reference to the Tenders invited by you for the above work , I/ We do hereby offer to perform, provide, execute & complete the above work in conformity with the drawings, terms & conditions and specifications stipulated and accordingly submit the tender in two parts separately as under-
Part A- Technical Pre-qualification Bid
Part B- Commercial Bid showing amounts in the schedule of quantities attached.

I/We have satisfied ourselves to the location and conditions of the site and have read the articles of agreement, conditions of contract & specifications etc. and we understand that the works is to be completed within the specified period & fully understand that the time will be the essence of this contract. I/We enclose herewith earnest money vide demand
draft / pay order no……dt…….. for Rs. ……/- (Rupees ……. only) on the _____ _____of _____ in the name of …… (This amount shall not bear any interest and should this tender be accepted) I/ We, hereby agree that this amount will be forfeited if I / We, fail to start the execution within the stipulated time)

Name of the partners / Directors

Yours faithfully

1._____

Signatures

2._____ Date

3_____ Address

4.0 Articles of Agreement (Proforma)

ARTICLES OF AGREEMENT made on day of 2013 between _____ (hereinafter called "the OWNER") of the one part and M/s. _____ whose registered office situated at _____ (hereinafter "the CONTRACTOR") of the other part.

WHEREAS the OWNER is desirous of construction of _____ AND has caused Drawings and bills of quantities showing and describing the work to be done to be prepared by or under the direction of ARCHITECT MR. VIJAY GUPTA , 601, CHIRANJIV TOWER, 43, NEHRU PLACE, NEW DELHI.

AND WHEREAS the CONTRACTOR has supplied the OWNER with a fully priced copy of the said bills of Quantities (which copy is hereinafter referred to as "the contract bills "and whereas the said drawing (herein after referred to as "the Contract drawings") and the Contract bills have been signed by or on behalf of the parties hereto.
AND WHEREAS the CONTRACTOR has deposited the sum of Rs..... (Rupees ..... only) with the OWNER for the due performance of this agreement.

NOW IT IS HEREBY AGREED AS FOLLOWS: -

For the consideration hereinafter mentioned the CONTRACTOR will upon and subject to the conditions annexed carry out and complete with work shown upon the Contract Drawings and described by or referred to in the Contract Bills and in the said conditions.
The OWNER will pay the CONTRACTOR the sum of Rs. (Rupees ……only) or such other sum as shall become payable hereunder at the time and in the manner specified in the said CONTRACT.

The term "The ARCHITECT in the said conditions shall mean the said Mr. VIJAY GUPTA, ARCHITECTS, 601 Chiranjiv Tower, 43, Nehru Place, New Delhi or in the event of his death or ceasing to be the ARCHITECT for the purpose of this Contract, such other person as the OWNER shall nominate for that purpose.

The said condition and appendix thereto shall be read and construed as forming part of this Agreement, and the parties hereto shall respectively abide by and submit themselves to the conditions and perform the agreements on their parts respectively in such conditions contained.

Not withstanding anything contained in this agreement, THE OWNER shall have power to review the decisions / recommendations made or proposed to be made about any matter connected with the work to be executed under this contract, before / after these are implemented, call for additional information from the ARCHITECT / CONTRACTOR or any other source, hold discussions if necessary and arrive at his decision. This decision would be applicable for the work. If the CONTRACTOR feels aggrieved by this decision, he would be free to raise this matter as a dispute for arbitration, under the agreement but would not stop the work on any pretext and proceed with the work in accordance with this decision.

As witness the hands of the said parties.
Signed by the said in the presence of OWNER

Witness
Name
Address:

Signed by the said in the presence of
Witness
Name CONTRACTOR
Address:

5.00 APPENDIX TO GENERAL CONDITIONS OF CONTRACT SCHEDULE OF FISCAL ASPECTS

NAME OF WORK	:	Construction of GIRL'S HOSTEL, SHRI RAM COLLEGE OF COMMERCE, UNIVERSITY OF DELHI, Delhi.
DEFECT LIABILITY PERIOD	:	12 months after completion of entire work. During. Defect Liability Period of 12 months the contractor will depute his staff for attending to all types of construction defects included under his scope of contract and rectify the defects free of cost.
PERIOD OF FINAL MEASUREMENTS AND VALUATION	:	Within 2 (two) months from date of handing over the work.
DATE OF COMMENCEMENT	:	After 10 days of issue of the award letter from the Owner.
TIME FOR COMPLETION	:	The whole works will be completed within One (01) Year
AGREED LIQUIDATED DAMAGES	:	The quantum of liquidated damages shall be 0.1% of the contract sum of the works per day of delay subject to maximum of 5% of the Contract value.
MINIMUM VALUE OF WORK FOR INTERIM CERTIFICATE	:	RS. 50,00,000/- (RS.FIFTY LAKHS)
SECURITY DEPOSIT PERCENTAGE	:	10 % from Gross amount of each bill as per conditions of contract. Earnest Money will be adjusted towards Security Deposit.
LIMIT OF SECURITY DEPOSIT	:	5% of the Gross amount of work.
REFUND OF SECURITY DEPOSIT AFTER VIRTUAL COMPLETION	:	100% after virtual completion of the works subject to finalization of bill
PERIOD OF HONOURING CERTIFICATE	:	75% within 10 days of submission of Bill, duly certified by the Site Engineer and Architect balance within 20 days of submission of bill duly measurement checked and verified by the Site Engineer and Verified and certified by the Architect.
PERFORMANCE GUARANTEE		5% of the total cost should be provided by the bidder which will be retained by the college until the defect liability period of 12 months.
MOBILISATION ADVANCE	:	No Mobilisation Advance will be paid

TECHNICAL PRE-QUALIFICATION REQUIREMENT

The technical pre-qualification bid includes:-

1. PAN NO., (Self attested copy enclosed with date)
2. TIN NO., (Self attested copy enclosed with date)
3. Sales Tax No., (Self attested copy enclosed with date)
4. Service Tax Registration details
5. Earnest Money Deposit (EMD) in a separately sealed envelope.
6. Company Profile, brochure showing turnover of the company for the last three years.
7. Last Three Year's Income Tax Clearance Certificate
8. List of the Technical Personal with brief Bio-data - Qualifications & Experience
9. List of Tools, Plant and Machinery
10. Performance Certificate issued by Client of running Projects.
11. Completion Certificate issued by Client of Completed Projects.
12. Disputes pending with any client for work done in preceding five (5) years. If none, an affidavit to that effect.
13. Delay, if any, in execution of earlier projects completed in last three years. The delay period alongwith reasons.

14. **QUALIFICATION CRITERIA**

The party should have satisfactorily executed at least three jobs of similar nature in the last three years, each of value not less than 40% of the Estimated Cost of this tender of 1st Class construction work.

OR

Should have satisfactorily executed two jobs of similar nature in the last three years, each of value not less than 60% of the Estimated Cost of this tender of 1st Class construction work.

OR

Should have satisfactorily executed at least one job of similar nature in the last three years, of value not less than 80% of the Estimated Cost of this tender of 1st Class construction work.

[Should submit attested copies of Completion & Performance Certificates]

15. All the above papers along with Qualification Criteria enumerated but excluding the EMD, should be submitted in a sealed envelope marked "TECHNICAL PRE-QUALIFICATION BID". The EMD should be in a separately sealed envelope which will be considered along with the Technical Pre-qualification bid.

16. After evaluation, including if necessary actual visit by evaluating committee to the completed works cited by the intending parties, the college would put up the list of all the pre-qualified parties and the date of opening of Commercial Bid in the college website. The tentative date of Opening of Commercial Bids would be 18-02-2014. In case of all other parties not pre-qualified, the EMD & their respective unopened Commercial Bids would be returned back.

17. The college reserves the right to reject any or all the applications without assigning any reason whatsoever.

1 **6.0 GENERAL CONDITIONS OF CONTRACT**

6.0 GENERAL CONDITIONS OF CONTRACT

1. DEFINITIONS

1.1 The contract document consists of the Agreement, the General Conditions of the Contract, Special Terms & Conditions, Specifications and Schedule of Quantities and Rates contained therein including all modifications thereof incorporated in the document before execution and the Contract Drawings prepared by the ARCHITECT from time to time.

The OWNER The
ARCHITECT
The CONTRACTOR
The ENGINEER-IN-CHARGE

Are those mentioned as such in the Agreement and shall include their legal representatives, assigns or successors. They are treated throughout the Contract Document as if each were of the singular number and masculine gender.

1.2 "The Site" shall mean the site of the contract work including any building and erections thereon and any other land allotted by the OWNER for Contractor's use.

1.3 The term "Sub-contractor", as employed herein, includes those having a direct contract with the Contractor. and it includes one who furnishes material worked to a special design according to the plans or specifications of this work but does not include one who merely furnishes material not so worked

Anyone doing work on a piece rate basis shall be deemed to be a Sub-contractor.

1.4 "Written notice" shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm or to an office of the corporation for whom it is intended, or if delivered at or sent by registered mail to the last business address known to him who gives the notice.

1.5 The term " Work " of the Contractor or Sub-contractor includes labour or material or both

1.6 All time limits stated in the Contract Document are the essence of the Contract.

1.7 The law of the place of work shall govern the construction under the contract.

1.8 The date of virtual completion of a work or specified area of a work is the date when construction is sufficiently completed, in accordance with the Contract Documents as modified by any change or variation orders agreed to by the parties, so that the OWNER can occupy the works for the use it was intended.

2 CONTRACT DOCUMENT

The following documents shall constitute the contract document:

i) Notice inviting Tender
ii) Instruction to Tenderers
iii) Articles of Agreement
iv) General Conditions of Cont
v) Special Conditions of Contract
vi) Specifications
vii) Schedule of Quantities
viii) Drawings

All parts of the Contract document are complementary, what is called for in any one shall be binding, as if called for by all

The Contract Document shall remain in the custody of the OWNER so as to be available at all reasonable times for the inspection of the ARCHITECT or of the Contractor. Immediately after the execution of the contract one copy of the Contract Document and two copies of the Contract Drawings shall without charge be supplied by the ARCHITECT to the Contractor and one copy of the Contract Document retained with

him. Original contract documents and two sets of contract drawings will be sent to the OWNER.

After the execution of the contract two copies of the Specifications, descriptive schedule or other like document necessary for use in carrying the work shall without charge be supplied by the ARCHITECT to the Contractor

Provided that nothing contained in the said Specification, Descriptive schedules or other document shall impose any obligation beyond those imposed by the Contract Document namely by the Contract Drawings, the Contract Bills, the Articles of Agreement and these conditions

After the award of the Contract, the Contractor shall without charge be supplied with all such further drawings and details as may be prepared by the ARCHITECT and his CONSULTANT, from time to time as the work proceeds as are reasonably necessary either to explain or amplify the Contract Drawings or to enable the Contractor to carry out and complete the work in accordance with these Conditions. Provided all such drawings shall be a reasonable development of the work described in the Contract Document.

The Contractor shall keep one copy of the Specifications, Descriptive schedule or other like documents referred to in this clause and one copy of the contract Drawings and such other drawings and details supplied to him from time to time and referred to in this clause and written instructions referred to in clause and sub-clauses 9,16.1 ,16.2 and 29 upon the site so as to be available to the OWNER / ARCHITECT or his representative at all reasonable times.

None of the documents herein before mentioned shall be used by the CONTRACTOR for any purpose other than this contract and neither the OWNER nor the ARCHITECT shall divulge or use except for the purpose of this contract any of the prices in the contract bills.

Upon final payment under clause 30.6 of these conditions the Contractor shall if so requested by the ARCHITECT forthwith return to the ARCHITECT all Drawings, Details, Specifications, Descriptive Schedule and other Documents of like nature which bears his name or that of the CONSULTANT.

3 TYPE OF CONTRACT

The Contract shall be an item rate contract. The contractor shall be paid for the actual quantity of work done, as measured at site, at the rates quoted by him in the "Schedule of Quantities and accepted by OWNER.

4 SCHEDULE OF QUANTITIES

Variation of schedule quantities on upside shall be 10% for normal items and 20% for specific items with prior to the approval of the Principal / Owner. However, on downside the quantities can be reduced upto 100%.

5 CONTRACT DRAWINGS

5.1 In general the drawings shall indicate dimensions, position and type of construction, the Specifications shall indicate the qualities and the methods; and the Schedule of Quantities shall indicate the quantum and the rate for each item of work. Any work indicated on the Drawings and not mentioned in the Specification or vice versa shall be furnished as though fully set forth in both. Work not specifically detailed called for, marked or specified shall be the same as similar parts that are detailed, marked or specified

5.2 The Contractor's work shall not deviate from the Drawings and Specification. The ARCHITECT Interpretation of these documents shall be final and without appeal.

5.3 Errors or inconsistencies discovered in the Drawings and Specification shall be promptly brought to the attention of the OWNER / ARCHITECT, through the ENGINEER-IN-CHARGE, for interpretation or correction. Local conditions which may affect the work shall likewise be brought to the OWNER / ARCHITECT attention. If at any time it is discovered that the work is being done which is not in accordance with the Contract Drawings and specifications, the Contractor shall correct the work immediately. Corrections of defective work shall not be a basis for any claim for extension of time or for any additional sum (s). The Contractor shall not carry on work except with the knowledge of the ENGINEER-IN-CHARGE.

5.4 Figured dimensions on the Scale Drawings and large size details shall govern. Large size details shall take precedence over small scale drawings. Any work done before receipt of such details, if not in accordance with the same, shall be removed and replaced or adjusted, by the Contractor without expense to the OWNER. The general conditions apply with equal force to all the work including authorized extra works.

5.5 All drawings, Schedule of Quantities and Specifications and copies thereof furnished by the ARCHITECT are his property. They shall not be used on any other work and shall be returned to the ARCHITECT at his request on completion or termination of the Contract.

5.6 Reinforcing steel bar bending schedules shall be submitted to the Engineer- in- charge at least Fifteen days prior to the fabrication of the reinforcement.

6.0 CONTRACT SUM

The "Contract Sum" shall not be adjusted or altered in any way whatsoever otherwise than in accordance with the express provisions of these conditions, and subject to clause 5.2 of these conditions. Any error whether of Arithmetic or in the computation of the Contract Sum shall be deemed to have been accepted by the parties hereto

7.0 CONTRACT BILLS

Monthly payments: Based on measurements recorded in a Measurement Book (MB) by Contractor's own representative, the Contractor will submit his bill in quadruplicate in approved proforma along with the MB monthly for payment. The MB and the submitted bills would be verified and certified for payment by the Architect and independently cross checked by the Engineer-in-Charge. All such payments shall however be considered as advance payment against Final bill. The bill shall be deemed to have been prepared in accordance with the principles of the standard method of measurement of Building works.

Any error in description or in , quantity or omission of items from the contract bills shall not Vitiate this contract.

8. SCOPE AND INTENT

8.1 **Scope**: The general character and the scope of the work is illustrated and defined by the Specifications and the Schedule of Quantities herewith attached and by the signed Drawings. If the Contractor finds any discrepancy in or divergence between the "Contract Drawing" and or the "Schedule of Quantities " he shall immediately give to the OWNER / ARCHITECT a written notice specifying the discrepancy or divergence and the OWNER / ARCHITECT shall issue instruction in regard thereto. .

Extent: The Contractor shall carry out and complete the work in every respect in accordance with the contract and with the directions of and to the reasonable satisfaction of the OWNER / ARCHITECT The OWNER / ARCHITECT may in his absolute discretion and from time to time issue further drawings, details and/or written instructions, written directions and written explanations all of which collectively referred to as OWNER / ARCHITECT instructions All such Drawings and instructions shall be consistent with the Contract Document, true development thereof and reasonably inferable therefrom.

8.3 **Intent:** The intention of the documents is to include all labour and materials equipment and transportation necessary for the proper execution of the work. Materials of work described in words which so applied have a well known technical or trade meaning shall be held to refer to such recognized standard.

9.0 ARCHITECT'S INSTRUCTIONS

9.1 The Contractor shall forthwith comply with and duly execute any work comprised in such instructions

issued to him by the ARCHITECT in regard to any matter in respect of which the OWNER / ARCHITECT is expressly empowered by these conditions to issue instructions, provided always that verbal instructions, directions and explanations given to the Contractor or his work representative by the ARCHITECT shall, if involving a variation, be confirmed in writing.

If within seven days after receipt of a written notice from the ARCHITECT, requiring compliance with an instruction the Contractor does not comply herewith, then the OWNER may employ and pay other persons to execute any work whatsoever which may be necessary to give effect to such instructions and all cost incurred with such employment shall be recoverable from the Contractor by the OWNER as a debt or may be deducted by him from any monies due or to become due to the Contractor under this Contract.

9.2 All instructions issued by the ARCHITECT shall be in writing. It should be given to the EIC and then passed on to the contractor Any instruction issued orally shall be of immediate effect but shall be confirmed in writing by the Contractor to the ARCHITECT within seven days and if not dissented in writing by the ARCHITECT to the Contractor within seven days from receipt of the Contractor's confirmation it shall be taken as from the expiration of the latter said seven days.

9.3

Provided Always

9.3 A That if the OWNER / ARCHITECT within seven days of giving such an oral instruction himself confirms the same in writing,

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10. FACILITIES AND CO-OPERATION

In the case of works indicated on the Drawings but not included in the contract, the Contractor shall provide necessary facilities and co-operation for any Sub-contractor or supplier who may be approved by the OWNER. The Contractor shall do all cutting, filling or patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of other CONTRACTORS shown upon or reasonably implied by the Drawings and Specifications for the completed structure and he shall make good after them as the OWNER / ARCHITECT may direct. Any cost caused by the defective or ill-timed work shall be borne by party responsible therefore. The Contractor shall not endanger any work by cutting; excavating or otherwise altering the Work and shall nor cut or alter the work of any other Contractor save with the consent of the OWNER / ARCHITECT.

11 **SETTING OUT**

The Architect shall determine any lines, levels which may be required for the execution of the work and shall furnish to the Contractor by way of accurately dimensioned drawings such information as shall enable the Contractor to set out the work at ground level.

The Contractor shall set out and level the work and shall be responsible for the accuracy of the same. He shall provide all the instruments and attendance required by the OWNER / ARCHITECT for checking the work. He shall entirely at his own cost amend to the satisfaction of the OWNER / ARCHITECT any error found at any stage which may arise through inaccurate setting.

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12 **SITE**

12.1 **Visit:** Before tendering, the Contractor shall have visited and examined the site and satisfied himself as to the nature of the existing roads or other means of communication and the character of the soil and of the excavations, the correct dimensions of the work and the facilities for obtaining any special articles called for in the Contract Document and shall have obtained generally his own information on all matters affecting the continuation and progress of the works.

No extra charge made in consequence of any misunderstanding or incorrect information on any of these points, or on the grounds of insufficient description, will be allowed. Should the Contractor

after visiting the site, find any discrepancies, omissions, ambiguities or conflicts in or among the Contract Documents, or to be in doubt as to their meaning he shall bring the questions to the OWNER / ARCHITECT's attention, not later than three days before the last date for submission of the tender.

12.2 **Possession:** The Contractor shall be allowed admittance to the site on the Date of Commencement stated in the appendix and he shall thereupon and forthwith begin the work and shall regularly proceed with and complete the same on or before the Date of Completion stated in the appendix subject nevertheless to the provision for extension of time hereinafter contained.

12.3 **Treasures:** Any Treasures, Coins or objects of Antiquity, which may be found at site, shall be handed over to the OWNER.

12.4 All dismantled materials and excavated stone shall be the property of the OWNER. All useful stone / materials shall be stacked/ stored properly and handed over to the ENGINEER-IN-CHARGE against proper receipt. No extra cost will be paid to the Contractor for such operation.

13 SAMPLES AND SHOP DRAWINGS

13.1 After the award of the Contract, the Contractor shall furnish for the approval of the ARCHITECT, with such promptness as to cause no delay in his work or in that of any other Sub-contractor, samples and shop drawings required by the specifications or by the ARCHITECT. Samples shall be delivered as directed by the ARCHITECT.

13.2 A schedule giving dates for the submission of samples shall be included in the schedule described under clause 14. Unless specifically authorised, all samples must be submitted for approval within Ten days of signing the Contract and not less than twenty days before the date the particular work involved, is scheduled to begin.

13.3 The OWNER / ARCHITECT shall check and approve such samples, with reasonable promptness only for conformity with the design concept of the works and for compliance with the information in the Contract Documents. The work shall be executed in accordance with the approved samples.

14. PROGRESS CHART

The Contractor shall prepare programme, progress and PERT charts and submit the of the OWNER/ ARCHITECT and for his record within 10 days of the award of the Contract. The charts shall indicate the expected date of commencement and completion of each of the items of work and shall be in a form approved by the OWNER / ARCHITECT. The Chart shall also indicate the scheduling of samples, Submission of Shop Drawings and approvals.

15 ACCESS FOR OWNER / ARCHITECT TO THE WORKS

The OWNER / ARCHITECT and their representatives shall at all reasonable time have access to Works and to the workshop or other places of the contractor where work is being prepared for the Contract and when work is to be so prepared in workshop so other places of a Sub-contractor (whether or not a nominated Sub-contractor as defined in clause 26 of these conditions) the contractor shall have a term in the Sub- contract so as to secure a similar right of access to those workshop or places for the OWNER/ ARCHITECT and his representatives and shall do all things reasonably necessary to make such right effective.

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16 ARCHITECTS' STATUS AND DECISIONS

16.1 The ARCHITECT shall be the OWNER's representative. The ARCHITECT shall periodically visit the site for designs, supervision with the progress and the quality of the work and to determine in general if the work is proceeding in accordance with the Contract Document. During such visits and on the basis of the observations while at the site he shall keep the OWNER informed of the progress of the work, shall endeavor to guard the OWNER against defects and deficiencies in the work of the Contractor and he shall reject work which fails to conform to the Contract Document. He shall have authority to stop the work whenever such stoppage may be necessary in his reasonable opinion to ensure the proper execution of the Contract. The architect will immediately inform the owner of such stoppages.

The ARCHITECT shall be in the first instance the interpreter of the Conditions of the Contract and the judge of its performance. He shall side neither with the owner nor with the contractor but shall use his powers under the contract to enforce its faithful performance by both. In case of termination of the appointment of the ARCHITECT, the OWNER shall appoint a capable and reputable ARCHITECT against whom the Contractor shall have no objection and whose status under Contract shall be that of the former ARCHITECT.

16.2 **Decision:** The OWNER shall within a reasonable time take decisions on all claims of the Contractor and all other matters relating to the execution and progress of the work or the interpretation of the Contract Document.

The ARCHITECT may in his absolute discretion and from time to time issue further Drawings, Details and/ or written instructions, written directions and written explanations in regards to the followings and inform the owner of the same.

a) Variation or modification of the design
b) The quality or quantity of works or the additions or omission or substitution of any work
c) Any discrepancy in or divergence between the Drawings and / or specifications
d) The removal and / or re-execution of any works executed by the Contractor.
e) The dismissal from the works of any persons employed thereon.
f) The opening up for inspection of any work covered up.
g) The amending. and making good of any defects under Defects Liability Period.
h) The removal from the site of any materials brought thereon by the Contractor and the substitution of any other material therefor .
i) Assignment and sub-letting.
j) Delay and extension of time
k) The postponement of any work to be executed under the provision of this Contract.

16.3 **Dismissal:** The Contractor shall on the instructions of the ARCHITECT immediately dismiss from the works any person employed thereon by him who may in the opinion of the ARCHITECT be incompetent or misconducts himself and such person shall not be again employed on the work without the permission of the ARCHITECT.

17 SECURITY DEPOSIT

The person/persons whose tender(s) may be accepted (hereinafter called the Contractor) shall permit OWNER to deduct such sum at the rate of 10 % of the Gross value of the work done from each Running Bill at the time of making any payment to him for work done under the contract, Such total deduction shall be made by the OWNER by way of Security Deposit subject to a Maximum of 5% of the contract sum, out of which 50% shall be released after virtual completion subject to finalization of bills and rest 50% after defect liability period of 12 months subject to all defects being rectified by the Contractor. All compensation of other sums of money payable by the Contractor under the terms of this contract may be deducted from or paid out of his security deposit from or may become due to the Contractor by the OWNER on any account whatsoever and in the event of Security Deposit being reduced by reasons of any such deductions the contractor make good the same in cash within 10 days. The Security Deposit shall be collected from the running bills of the Contractor at the rate mentioned above and the earnest money deposited at the time of tenders will be treated as part of the Security Deposit and to be adjusted.

18 ENGINEER-IN-CHARGE

The term "ENGINEER-IN-CHARGE" shall mean the person nominated by the OWNER and appointed and paid by the OWNER. and acting under the instructions of the ARCHITECT /OWNER to inspect the works in the absence of the ARCHITECT/OWNER. The Contractor shall afford the ENGINEER-IN-CHARGE every facility and assistance for inspecting the works and materials and for checking and measuring the work and the materials. Neither the ENGINEER-IN- CHARGE nor any representative of the ARCHITECT/OWNER shall have power to set out works or to revoke, alter, enlarge or relax any requirements of the Contract or to sanction any day work, additions, alterations,deviations oromissions, of any extra work whatever except in so far as such authority may be specially conferred by a written order of the

ARCHITECT.

The ENGINEER-IN-CHARGE or any representative of the 'ARCHITECT/OWNER, shall have power to give notice to the Contractor or to his representative of non-approval of any work or materials and such work shall be suspended or the use of such materials shall be discontinued until the decision of the ARCHITECT , is obtained. The work will from time to time be examined by the ARCHITECT, the ENGINEER-IN-CHARGE or the ARCHITECT'/OWNER representative 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 limitation of this clause, the Contractor shall take instructions from the ARCHITECT/OWNER/ENGINEER INCHARGE.

19 CONTRACTOR'S FIELD ORGANISATION AND EQUIPMENT

19.1 **Site Engineer:** The Contractor shall constantly keep on his work during its progress qualified and competent Site Engineer who will be responsible for the carrying out of the works to the true meaning of the Drawings, Specifications and Schedule of the Quantities, ARCHITECT's instructions and directions to the satisfaction of the ARCHITECT. Any directions or instructions given to him by the ARCHITECT shall be deemed to have been issued to the Contractor. Attention is called to the importance of requesting instructions from the ARCHITECT before undertaking any work where ARCHITECT's directions or instructions are required. Any such work done in advance of such instructions will be liable to be removed. In case CONTRACTOR does not appoint such Engineer Rs. 50000.00 p.m. person shall be deducted from his bill for the period he has not employed.

19.2 **Equipment:** The Contractor shall provide and install all necessary hoists, ladders, scaffolding, tools, tackles, plants, all transport for labour materials and plant necessary for the proper carrying on execution and completion of the work to the satisfaction of the ARCHITECT.

19.3 **Office Accommodation:** The Contractor shall provide / erect and maintain where directed simple water proof office accommodation for the supervisors and the Engineer-in Charge. This accommodation shall be well lighted and ventilated and provided with windows, doors with a lock. The Engineer –in charge's office shall be a minimum of 100 sqft and shall have a table, chair and drawers for keeping drawings and tack board for displaying drawings. The accommodation to be demolished when directed by OWNER.

19.4 **Watchmen:** The Contractor shall make his own security arrangements to guard the Site and premises at all times, at his own expense. The security arrangement shall be adequate to maintain strict control on the movement of material and labour. The Contractor shall extend the security arrangement to guard the material stored and /or fixed on the premises by the Sub-contractors.

19.5 **Storage of Materials:** The Contractor shall provide, erect and maintain proper sheds for the storage and protection of the materials etc. against fire, theft, Rains etc. and also for the execution of work which may be required on the site.

19.6 **Sanitary Conveniences:** The Contractor shall provide and erect all necessary sanitary convenience for the Engineer -in –Charge, Site staff and the workmen, maintain in a clean orderly condition and clean and deodorize the ground after removal.

19.7 **Scaffolding, Staging, Guardrails:** The Contractor shall provide scaffolding, staging, guardrails, temporary stairs which shall be required during construction. The support for the scaffolding, staging, guardrails and temporary stairs shall be strong, adequate for the particular situation. The temporary access to the various parts of the works under construction shall be rigid and strong enough to avoid any chance of mishaps. The arrangement proposed shall be subject to the approval of the ARCHITECT

19.8 Barricading project area on the ground upto 6.0 M height by using fresh coloured corrugated GI / Galvolume sheeting supported on firm temporary steel structure (Refer Item 37 Page 8).

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20 **TAXES**

The Contractor shall include in his rates the various taxes such as octroi, excise duty, sales tax turnover / works contract tax, VAT and any other tax payable and it shall be assumed that his rates cover for all taxes Royalties, Excise duties, Toll Tax, and duties and no claim on this account will be entertained. Except service tax. If applicable.

21 **STATUTORY OBLIGATIONS, NOTICES, FEES AND CHARGES**

The Contractor shall comply with and give all notices required by any government authority, and instrument, rule or order made under any Act of Parliament or any regulation or Bye-law of any local authority relating to the work or with whose system the same is or will be connected. The Contractor before making any variation from the Contract Drawings or Contract Bills necessitated by such compliance shall give to the ARCHITECT a written notice specifying and giving reasons for such variations and the ARCHITECT may issue instructions in regard thereto. If within 10 days of having given the said written notice the Contractor does not receive any instruction in regard to the matters therein specified, he shall proceed with the work confirming to the Act of parliament instrument,' rule-order, regulations or Bye-law in question and any variation thereby necessitated shall be deemed to be a variation required by the ARCHITECT.

21.2 The Contractor shall pay and indemnify the OWNER against liability in respect of any fees or charges (including any rates and taxes) legally demandable under any Act of Parliament rule or order or any regulation or Bye-law or any local authority in respect of the Work.

22 **ROYALTIES AND PATENT RIGHTS**

All royalties or other sums payable in respect of supply and use in carrying out the work as desired by or referred to in the Contract Bills of any patented articles, process or inventions shall be deemed to have been included in the Contract Sum, and the Contractor shall indemnify the OWNER from and against all claims, proceedings, damages, costs and expenses which may be brought or made against the OWNER or to which he may be put by reason of the Contractor infringing or being held to have infringed any patent rights in relation to any such articles , processes and inventions.

23 **LICENSES & PERMITS FOR MATERIALS UNDER GOVERNMENT CONTROL**

Licenses and permit for all materials under Government control shall be obtained by the Contractor through the collaboration and help of OWNER, the Contractor shall include in his tender all transport charges and other expenses likely to be incurred to bring materials to the Site.

24 **ASSIGNMENT OR SUB-LETTING**

The Contractor shall not without the written consent of the ARCHITECT assign or sub-let any portion of the work.

25 **SUB-CONTRACTOR**

As soon as practicable and before awarding any sub-contract, the Contractor shall notify the ARCHITECT in writing the names of the Sub-contractor proposed for the principal parts of the work and for such other parts as the ARCHITECT may direct, and shall not employ any agency to

whom the Architect or the OWNER may have any objection.

The ARCHITECT however, shall have power to obtain estimate and select other Agencies to carry-out any of the work as described in this Contract Document..

26 **ARTISTS AND TRADESMEN**

The CONTRACTOR shall permit the execution of work not forming part of this contract by artists, tradesmen, or others engaged by the OWNER. Every such person shall for the purposes of clause 43 of these conditions be deemed to be a person for whom the OWNER is responsible and not be Sub-contractor

27 **SEPARATE CONTRACT**

The OWNER reserves the right to let other CONTRACTORS work at site in connection with this work. The Contractor shall afford other Contractor reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly co-ordinate his work with theirs. If any part of Contractor's or Sub-Contractor' s work depends for proper execution or results upon the work of any other Contractor, or Sub-Contractor, the Contractor shall inspect and promptly report to the ARCHITEC any Defects in such work that render it unsuitable for such proper execution and results. Failure of the CONTRACTOR to so inspect and report shall constitute an acceptance of the other Contractor's work as fit and proper except as to defects which may develop in the other Contractor's or Sub-contractor's work after the execution of the work, to ensure the proper execution of his subsequent work the Contractor shall measure work already in place and shall at once report to the ARCHITECT any discrepancy between the executed work and the drawings

28 **VARIATIONS**

The ARCHITECT shall have power to make any alterations or omissions, additions, substitution for the original specifications, drawings, design and instructions, in consultation with the owner that may appear to him to be necessary during the progress of the work. The Contractor shall carry out the work in accordance with any instruction which may be given to him in writing signed by the ARCHITECT and such alterations, omissions, additions or substitution shall not invalidate the contract and orders etc. Any altered, additions or substituted work which the Contractor may be directed to do in the manner above specified as part of the work shall be carried out by the Contractor on the same conditions in all respect on which he agreed to do the main work.

i) If the rates for the additions, altered or substituted work are specified in the contract for the work the Contractor is bound to carry out the additional, altered or substituted work at the same rates as are specified in the contract for the work.

ii) If the rates for additional, altered or substituted work are not specifically provided in the contract for the work the rates shall be derived from the rates for a similar class of work as are specified in the contract for the work. .

iii) If the altered, additional or substituted work includes any work for which no rates is specified in the contract for the work and cannot be derived from the similar class of work in the contract, then such work shall be carried out at the rates entered in Schedule of Rates DSR 2012 with up to date correction slips minus / plus percentage.

iv) If the rates for the altered, additional or substituted work cannot be determined in the manner specified in sub-clauses (i) to (iii) above, then the contractor shall within 7 days of the date of receipt of order to carry out the work inform the ARCHITECT the rates which he intends to charge for such class of work supported by analysis of the rate or rates claimed and the ARCHITECT shall determine the rate or rates on the basis of prevailing market rates through the ENGINEER-IN- CHARGE if required and pay the Contractor accordingly. However, the ARCHITECT, by notice in writing will be at liberty to cancel his order to carry out such class of work and arrange to carry it out in such manner as he may consider advisable. <u>But under no circumstances shall the Contractor suspend the works on the plea of non-settlement of rates of extra or such item during currency of the works till virtual completion certificate issued by the ARCHITECT. The rate for extra and substituted items shall be determined on the basis of actual cost of materials & labour etc. (for this contractor shall produce the sufficient proof) plus 15% to cover Contractor's all over-heads and profits, and works contract tax. etc.</u>

29.2 The rates of material/ labour in the extra items as forwarded by the Contractor shall be checked/verified by the ENGINEER-IN-CHARGE before forwarding to the ARCHITECT

29.3 The rates for all above items will be finally approved by the OWNER. However the Engineer- in-Charge may allow the provisional rates for such items claimed by the Contractor pending approval of final rates by the OWNER.

30 CERTIFICATES AND PAYMENTS

30.1 At the period of Interim Certificate named in the appendix to these conditions the ARCHITECT shall issue a certificate stating the amount due to the Contractor from the OWNER, and the Contractor shall be entitled to payment thereof within the period for honouring certificate named in the appendix to these conditions and interim valuation shall be made whenever the ARCHITECT considers them to be necessary for the purpose of ascertaining the amount to be stated as due in an interim certificate

30.2 The amount stated as due in an Interim Certificate shall subject to any agreement between the parties as to stage payments, be the total value of work properly executed and of the materials and goods delivered to or adjacent to the work for use thereon up to and including a date not more than seven days before the date of the said Certificate less any amount which may be retained by the OWNER (as provided in Sub-Clause (3) of this condition) and less any installments previously paid under this condition, provided that such certificate shall only include the value of the said materials and goods as and from such time as they are reasonably, properly and not prematurely brought to or placed adjacent to the work and then only if adequately protected against weather or other casualties.

30.3 The OWNER may retain the percentage of the total value of the work, materials and goods referred to in Sub-Clause (2) of this condition which is named in the appendix to these conditions as Security Deposit. Provided always that when the sum of the amounts so retained equals the amount named in the said appendix as limit of Security Deposit ,no further amount shall be retained by virtue of this Sub-Clause.

30.4 The amounts retained by virtue of Sub-Clause (3) of this Condition shall be subject to the following rules:-

30.4 The OWNER's interest in any amounts so retained shall be fiduciary as trustee for the Contractor

(a) (but without obligation to invest), and the Contractor's beneficial interest therein shall be subject only to the right of the OWNER to have recourse thereto from time to time for payment of any amount which he is entitled under the provision of this Contract to deduct from any sum due or to become due to the Contractor.

30.5 The measurements and valuation of the work shall be completed within the period of final measurements and valuation as stated in the appendix to these Conditions, and the Contractor shall be supplied with a copy of the priced bills of variation not later than the end of the said period and before the issue of the Final Certificate under sub-clause (6) of this Condition. Either before or within a reasonable time after Virtual Completion of the work the Contractor shall send to the ARCHITECT all documents necessary for the purpose of the computations required by these Conditions including all documents relating to the accounts of nominated sub- contractors and nominated suppliers.

30.6 As soon as is practicable but before the expiration of the period the length of which is stated in the appendix to these Conditions or from the end of the "Defects Liabilities Period" also stated in the said appendix or from completion of making good defects under Clause 39 of these conditions or from receipt by the ARCHITECT of the Document referred to Sub-Clause (5) of this condition, whichever is the latest, the ARCHITECT shall issue the Final Certificate. The Final Certificate shall state :-

30.6 (a) The sum of the amount paid to the Contractor under Interim Certificate and the amount named in the said appendix as limit of Security Deposit, and

30.6 (b) The Contract sum adjusted as necessary in accordance with the terms of these conditions, and the difference (if any) between the two sums shall be expressed in the said certificate as a balance due to the CONTRACTOR from the OWNER or to the OWNER from the CONTRACTOR as the case may be, and subject to any deductions authorized by these conditions, the said balance shall as from fourteenth day from the issue of the said certificate be a debt payable as the case may be by the OWNER to the CONTRACTOR or by the CONTRACTOR to the OWNER.

30.7 Save as afore said, certificate of the ARCHITECT shall of itself be conclusive evidence that any works materials or goods to which it relates are in accordance with this Contract Documents.

31 CLAIM FOR EXTRA

31.1 When any instruction or decisions given at site involve an extra or whereby the Contractor may plan to claim an extra, it shall be the responsibility of the Contractor to inform the ARCHITECT the extra amount and get written authorization from the ARCHITECT before proceeding with the work involved.

31.2 Any modification carried out for expanding or simplifying work at the request of the Contractor or his representatives shall not be taken as the basis for claiming an extra. However, if such modification shall also involve an extra the rate for such modification shall be settled in advance and written authorisation obtained by the CONTRACTOR from the ARCHITECT or EIC before with the work involved. If no such information is given by the Contractor in writing to the ARCHITECT such modification shall not be accepted as the basis for extra charge

32 DEDUCTION FOR UNCORRECTED WORK.

If the ARCHITECT deems it inexpedient to correct work damaged or not done in accordance with the Contract, an equitable deduction from the contract price shall be made therefore.

33 FLUCTUATION

The rates quoted by the CONTRACTOR shall remain firm for entire period of construction including authorized extension of time. No. escalation shall be payable for this period including authorized extension of time.

34 UNFIXED GOODS AND MATERIALS

Unfixed materials and goods intended for, delivered and placed on or adjacent to the work shall not be removed except for use upon the work unless the ARCHITECT has consented in writing to such removal which consent shall not be unreasonably with held. Where the value of any such materials or goods has in accordance with clause 30 of these conditions been included in any Interim Certificate under the Contract for which the Contractor has received payment, such materials and goods shall become the property of the OWNER, but the CONTRACTOR shall remain responsible for loss or damage to the same

35 MATERIALS AND WORKMANSHIP

All materials and workmanship shall be as per the relevant I.S .Code and of approved quality and make and the Contractor shall immediately remove from the works any material and/or workmanship which in the opinion of the ARCHITECT are defective or unsuitable and shall substitute proper material and or workmanship at his own cost. The term approval used in connection with this contract shall mean the approval of the ARCHITECT .

35.1 The Contractor shall if required submit satisfactory evidence as to the kind and quality of material.

35.3 All material shall be delivered so as to ensure a speedy and uninterrupted progress of the work.

Such material shall be stored so as to cause no obstruction and so as to prevent overloading of any portion of the structure, and the CONTRACTOR shall be entirely responsible for damage or loss by weather or other cause.

35.4 Within 15 days after signing the Contract, the CONTRACTOR shall submit for approval of the ARCHITECT a complete list of all materials which he and his Sub- contractors propose to use in the work of the particular brand of any article where more than one is specified as a standard. He shall also list out items not specifically mentioned in the specifications but which are reasonably inferred necessary for the completion of the work.

35.5 **Inspection** : Allmaterials and workmanship shall be subject to inspection, examination and test by the ARCHITECT at any and all times during manufacture and / or construction. TheARCHITECT shall .have the right to reject defective material and workmanship or require its correction. Rejected workmanship shall be satisfactorily replaced with proper material without additional charge therefore and CONTRACTOR shall promptly segregate and remove the rejected material from the Works. If the CONTRACTOR fails to proceed at once with the replacement of rejected materials and/or the correction of defective workmanship, the ARCHITECT may by contract or otherwise replace such materials and/or corrects such workmanship and charge the cost thereof to the Contractor, or may terminate the right of the CONTRACTOR to proceed further with the work.

The Contractor shall furnish promptly without additional charge all reasonable facilities, labour and materials necessary for the safe and convenient inspection and the test that may be required by the ARCHITECT.

35.6 **ACCOUNTING OF CEMENT & STEEL**

a) **Variation in the consumption of Cement:** After the completion of the work and also at any intermediate stage, the theoretical quantity of cement consumed in the work shall be calculated on the basis of cement consumption co-efficient given in the CPWD Schedule of rates 2012. For the item of work not provided in this statement, the consumption shall be worked out on actual observation basis and the ARCHITECT's decision in this regard shall be final. Over this theoretical quantity of cement, a variation of 2% plus or minus shall be allowed. If it is discovered that the quantity of cement used is less than the theoretical consumption (allowing variation on minus side), the cost of quantity of cement not so used shall be recovered from the Contractor at twice the market rate. However if the quantity of cement used is more than the theoretical consumption (allowing variation on plus side),no recovery shall be made from the contractor But if the cement is issued by the Owner, this recovery shall be done at twice the issue rate in both cases.

b) Variation in consumption of Steel: After the completion of work, and also at any intermediate stage the theoretical quantity of steel used in the work shall be calculated on the basis of the measurements recorded with cross sectional weights as per CPWD Specifications. 3% wastage shall be allowed. Over this theoretical quantity, a variation of 2% plus or minus shall be allowed as variation due to wastage being more or less. The difference between quantity of steel actually issued and the theoretical required shall be worked out If it is discovered that the quantity of steel used is less than the theoretical consumption, such quantity shall be recovered "from the CONTRACTOR at twice market rate. The steel reinforcement shall be paid as per cross sectional weights mentioned in the CPWD specifications. The Contractor shall procure and submit vouchers in support of total quantum of steel brought by him at site and will also get the total weight of steel verified from Engineer –in-Charge at his cost. Engineer –in-charge will maintain a record of steel received at site diameter wise. If the quantity of steel used is more than theoretical consumption, no recovery shall be made from the contractor. If the steel is issued by the owner, recovery shall be made from the contractor at twice the issue rate in both cases.

35.7 **Secured Advance on Materials:** The ARCHITECT in consultation of OWNER may allow in the running bills payment against non-perishable materials brought to the site of work for incorporation in the works to a maximum of 75 % of the value of materials. The Contractor on signing an indenture on proper stamp paper in the form to be specified by the ARCHITECT may be entitled to be paid during progress of the execution of the work a secured advance up to 75% of the estimated value of any materials which are in the opinion of the ARCHITECT non-perishable and are in accordance with the contract and which have been brought on the site for bonafide incorporation in the work and are protected against damage by weather or other causes, but which have not at the time of advance been incorporated in the works. When materials on account of which an advance has been made under this sub-clause are incorporated in the work, the amount of such advance shall be deducted from the next payment made under any of the clauses of the contract.

36. DEFECTS

36.1 The Contractor shall make good at his own cost and to the satisfaction of the ARCHITECT, all defects, shrinkages or small faults, arising in the opinion of the ARCHITECT from work or materials not being in accordance with the drawings or Specifications or Schedule of Quantities or the instructions of the ARCHITECT which may appear within "Defect Liability Period" referred to in the appendix. The ARCHITECT shall visit the site during defect Liability Period to check the defects when required by the OWNER.

36.2 Such defects, shrinkage's shall upon directions in writing of the ARCHITECT and within such reasonable time as shall be specified therein be amended and made good by the Contractor, at his own cost and in case of default the OWNER may employ and pay other Contractor to amend and make good such defects, shrinkage, settlements or other faults and all damages, loss and expense consequent thereon or incidental thereto shall be made good and borne by the Contractor and such damage, loss or expense shall be recoverable from him by the OWNER or may become due to. the Contractor or the OWNER may, in lieu of such amending and making good by the contractor, deduct from any money's due to the contractor a sum to be determined by the ARCHITECT as equivalent to the cost of amending such work and in the event of the Security Deposit being insufficient recover the balance from the Contractor, together with any expenses the OWNER may have incurred in connection therewith.

37 POSSESSION, COMPLETION AND POSTPONEMENT

37.1 On the date for commencement stated in the appendix to these conditions possession of the site shall be given to the Contractor who shall there upon begin the works and regularly and diligently proceed with the same, and who will complete the same on or before the date for

Completion stated in the said, appendix subject nevertheless to the provisions for extension of time contained in clause 39 of these conditions.

37.2 The ARCHITECT may issue instructions in regard to the postponement of any work to be executed under provisions of this Contract.

38 POSSESSION BEFORE VIRTUAL COMPLETION

If at any time or times before Virtual Completion of the work the OWNER with the consent of the Contractor shall take possession of any part or parts of same for handing over to the Finishing Contractor or other agency, then not withstanding anything expressed or implied elsewhere in this Contract:

38.1 Such part or parts shall not be deemed to be Virtually'Complete

38.2 Virtual Completion of such part or parts would occur on the completion of the last part of the structure under this Contract

The Contractor shall not claim that such part or parts are complete and request for refund of Security Deposit in lieu thereof.

39 **EXTENSION**

Upon it becoming reasonably apparent that the progress of the work is delayed, the Contractor shall forthwith give written notice of the cause of the delay to the ARCHITECT, and if in the opinion of the OWNER, the completion of the work is likely to be or has been delayed beyond the date for completion stated in the appendix to these conditions or beyond any extended time previously fixed under this clause.

39.1 By Force majeure. Or

39.2 By reason of any exceptionally inclement weather, or

39.3 By reason of civil commotion, local combination of workmen strike or lockout affecting any of the trades employed upon the works or any of the trades engaged in the preparation, manufacture or transportation of any of the goods or materials required for the work, or

39.4 By reason of ARCHITECT's instructions issued under clauses 9,29.1,37.2 of these conditions or

39.5 By reason of the Contractor not having received in due time necessary instructions, drawings details or levels from the ARCHITECT for which he had specifically applied in writing on a date which having regard to the date for completion stated in the appendix to these conditions or to any extension of time then fixed under this clause was neither unreasonably distant from nor unreasonably close to the date on which it was necessary for him to receive the same.

39.6 By delay on the part of artists, tradesman or others-engaged by the OWNER executing work not forming part of this Contract, or

39.7 By reason of the opening up for inspection of any work covered up or of the testing of any of the work, materials or goods in accordance with clause 35. 5 of these conditions (including making good in consequence of such opening up or testing) unless the inspection of test showed that the work, materials or goods were not in accordance with this Contract or

39.8 By reason of the Contractor's inability for reason beyond his control and which he could not reasonably have foreseen at the date of this Contract to secure such labour, goods or materials as are essential to the proper carrying of the works.

Then the ARCHITECT shall as soon as he is able to estimate the length of the delay beyond the date or time aforesaid make in writing a fair reasonable extension of time for completion of the works. Provided always that the Contractor shall use constantly his best endeavors to prevent delay and shall do all that may reasonably be required to the satisfaction of the ARCHITECT to proceed with the work.

40. DAMAGE FOR NON-COMPLETION

If the Contractor fails to complete the works by the date specified in these conditions or within any extended time fixed under clause 39 of these conditions and the ARCHITECT certifies in writing that in his opinion the same ought reasonably to have been completed, the Contractor shall pay or allow to the OWNER a sum calculated at the rate stated in the appendix as agreed Liquidated Damages for the period during which the said work shall so remain or have remained incomplete, the OWNER may deduct such damages from any monies otherwise payable to the Contractor under this Contract.

After a period of two weeks, the Contract will come to an end and the owner shall be at liberty to withdraw the work and get it executed from any other agency at Contractor risk and cost and the site shall be vacated by Contractor immediately.

41. V1IRTUAL COMPLETION AND DEFECTS LIABILITY PERIOD

41.1 When in the opinion of the ARCHITECT the works are practically completed, he shall forthwith issue a certificate to that effect and Virtual Completion of the works shall be deemed for all the purpose of this Contract to have taken place on the day named in such certificate.

41.2 Any defects, shrinkage or other faults which shall appear within the "Defects Liability Period" stated in the appendix to these conditions and which are due to materials and workmanship not in accordance with this Contract shall be specified by the ARCHITECT in a Schedule of Defects which he shall deliver to the Contractor not later than 14 days after the expiration of the said Defects Liability Period and within a reasonable time after receipt of such schedule the Defects, Shrinkage's and other faults therein specified shall be made good by the Contractor and (unless the OWNER shall otherwise instruct in which case the contract sum shall be adjusted accordingly) entirely at his own cost.

41.3 Notwithstanding sub-clause (2) of this condition the ARCHITECT may whenever he considers it necessary to do so, issue instructions requiring any defects, shrinkages or other fault which shall appear within the Defects Liability Period named in the appendix to these conditions and which are due to materials and workmanship not in accordance with this contract to be made good and the Contractor shall within a reasonable time after receipt of such instructions comply with the same entirely at his own cost, provided that no such instruction shall be issued after 14 days from the expiration of the said defects liability period.

41.4 When in the opinion of the ARCHITECT any defects, shrinkages or other defaults which he may have required to be made good under sub-clause (2) and (3) of this condition shall have been made good he shall issue a certificate to that effect and completion of making good defects shall be deemed for all the purposes of this contract to have taken place on the day named in such certificates.

42. PAYMENT WITH HELD

The ARCHITECT may withhold or on account of a subsequently discovered evidence nullify the whole or part of any certificate to such extent as may be necessary in his reasonable opinion to protect the OWNER from loss on account of:

42.1 Defective work not remedied.

42.2 Failure of the Contractor to make payments properly to Sub-Contractor or for materials or labour.

42.3 Damage to another Contractor or Sub-contractor

.

42.4 Claims filed on reasonable evidence indicating probable filing of claims.

When the above grounds are removed, payment shall be made for amounts withheld because of them.

43. INJURY TO PERSONS AND PROPERTY OWNER

43.1 The Contractor shall be liable for and shall indemnify the OWNER against any liability, loss, claim or proceedings whatsoever arising under any statute or at common law in respect

of personal injury to or the death of any person whomsoever arising out of or in the course of or caused by the carrying out of the works, unless due to any act or neglect of the OWNER or of any person for whom the OWNER is responsible.

43.2 Except for such loss or damage as at the risk of the OWNER under clause 45 of these conditions (if applicable) -the Contractor shall be liable for and shall indemnify the OWNER against any expense, liability, loss, claim or proceedings in respect of any injury or damage whatsoever to any property real or personal in so far as such injury or damage arises out of or in the course of or by reason of the carrying out of the works, and provided always that the same is due to any negligence omission or default of the Contractor, his servants or agents or of any Sub-Contractor, his servants or agents.

44. INSURANCE AGAINST INJURY TO PERSONS AND PROPERTY

44.1 Without prejudice to his liability to indemnify the OWNER under clause 43 of these conditions the Contractor shall maintain and shall cause any Sub-Contractor to maintain.

44.1 a. Such insurance as are necessary to cover the liability of the Contractor or as the case may be of Sub-Contractor in respect of personal injuries or deaths arising out of or in the course of or caused by the carrying out of the work and

44.1 b Such insurance as may be specifically required by the Contractor in respect of injury or damage to property real or personal arising out of or in the course of or by reason of the carrying out of the work, and caused by any negligence, omission or default of the' Contractor, his servants or agents or, as the case may be of such sub-contractor, his servants or agents. The Contractor shall produce or cause any Sub-Contractor to produce for inspection the relevant policy or policies of insurance together with the receipts in respect of premiums paid under such policy or policies as and when required to do so by the ARCHITECT provided always that as and when may be reasonably required by the OWNER the production by either the Contractor or any sub-Contractor of a current certificate of insurance from the company or Firm which shall have issued the policy or policies aforesaid shall be a good discharge of the Contractor's obligation to produce or to cause the production of the policy/policies and the receipts in respect of premium paid.

44.2 a The Contractor shall maintain in the joint names of the OWNER and Contractor such insurance as may be required in respect of any expense, liability , loss, claim or proceedings which the OWNER may incur or sustain by reason of injury or damage to property real or personal arising out of or in the course of or by reason of the carrying out the work, and caused otherwise than by the negligence, omission or default of the Contractor, his servants or agents or any sub- Contractor, his servants or agents .

44.2 b. Any such insurance as is referred to in the immediately preceding paragraph shall be placed with insurers to be approved by the ARCHITECT and the CONTRACTOR shall have to deposit with him the policy or policies and the receipt in respect of premiums paid.

44.3 Should the Contractor or any sub-Contractor make default in insuring or in continuing to insure as provided in sub-clause (1) and (2) of this condition the OWNER may himself insure against any risk with respect to which the default shall have occurred and may deduct a sum equivalent to the amount paid in respect of premiums from any monies due to or become due to the Contractor.

45. INSURANCE OF THE WORKS AGAINST FIRE, ETC.

45.1 a. The Contractor shall in the joint names of the OWNER and Contractor insure against loss or damage by fire, storm, tempest, lightning, flood, earthquake, aircraft or anything dropped therefrom, aerial objects, riot and civil commotion for the full value thereof, all work executed and all unfixed materials and goods intended for, delivered to and placed on or adjacent to the work, but excluding temporary building plant, tools and equipment owned or hired by the Contractor or any Sub-Contractor and shall keep such work materials and goods so insured until Virtual Completion of the work. Such insurance shall be approved by the ARCHITECT and the Contractor shall deposit with the ARCHITECT the policy or policies and the receipts in respect of premiums paid and should the Contractor make default in

insuring or continuing to insure as aforesaid the OWNER may himself insure against any risk with respect of which the default shall have occurred and deduct a sum equivalent to the amount paid by him in respect of premium from any monies due to or to become due to the Contractor Provided always that if the Contractor shall independently of his obligations under this contract maintain a policy of insurance which covers (inter alia) the said work, materials and goods against the aforesaid contingencies to the full value thereof, then the maintenance by the Contractor of such policy shall if the Owner's interest is endorsed thereon, be a discharge of the CONTRACTOR'S obligation to insure in the joint names of the OWNER and Contractor and the production by the Contractor as and when may reasonably be required by the ARCHITECT of a current certificate of insurance from the company or firm which shall have issued the said policy shall be a discharge of the Contractor's obligation to deposit with the ARCHITECT a policy or policies and the receipts in respect of premiums paid.

45.1 b. Upon settlement of any claim under the insurance aforesaid, the Contractor with due diligence shall restore work damage, replace or repair unfixed materials or goods which have been destroyed or injured, remove or dispose of any debris and proceed with the carrying out and completion of the work. All monies received from such insurance shall be paid to the Contractor by installment under certificates of the ARCHITECT issued at the period of interim certificates named in the appendix to these conditions. The Contractor shall not be entitled to payment in respect of the restoration of work damaged, the replacement and repair of any unfixed materials or goods and the removal and disposal of debris other than the monies received under the said insurance.

45.2 A all work executed and all unfixed materials and goods intended for, delivered to and placed on or adjacent to the work (except temporary buildings, plant, tools and equipment owned or hired by the Contractor: or any Sub-Contractor) shall be at the sole risk of the Contractor as regards loss or damage by fire, storm, tempest, lightning, flood, earthquake, aircraft or anything dropped therefrom, aerial objects, riot and civil commotion. If any loss or damage affecting the work or any part thereof or such unfixed materials or goods is occasioned by anyone or more of the said contingencies, then:

45.2 (a) The occurrence of such loss or damage shall be disregarded in computing any amounts payable to the Contractor under or by virtue of this contract. .

45.2 (b) The Contractor with due diligence shall restore work damage, replace or repair any unfixed materials or goods which have been destroyed or injured, remove and dispose off any debris and proceed with carrying out and completion of the work. The restoration of work damaged, the replacement and repair of unfixed material and goods and the removal and disposal of debris shall be done by the Contractor at his cost.

45.3 If the Contractor fails to take insurance of the work against fire etc. the OWNER can take such insurance at the cost of the Contractor or recover from the Contractor the premium that he would have paid for such insurance.

45.4 **All insurance polices shall be valid upto the Date of expiry of Defect Liability Period.**

46. DETERMINATION BY OWNER

46.1 Default: If the Contractor makes default in anyone or more of the following respects, that is to say:

46.1 (a) If he without reasonable cause suspends the carrying out of the works before completion thereof, or

46.1 b If he fails to proceed regularly and diligently with the works or

46.1 c If he refuses or persistently neglects to comply with a written notice from the ARCHITECT requiring him to remove defective work or improper materials or goods and by such refusal or neglect the work is materially affected, then the ARCHITECT may give him the notice by registered post or recorded delivery specifying the default, and if the Contractor either continues such a default for 14 days after receipt of such a notice and shall at any time thereafter repeat such a default (whether previously repeated or not) then the OWNER without prejudice to any other rights or remedies may within 10 days after such continuance or repetition of notice by registered post or recorded delivery forthwith determine the employment of the Contractor under this Contract.

46.2 Bankruptcy of Contractor: In the event of the Contractor becoming bankrupt or making a composition or arrangement with his creditors or being a company having a winding up order made or (except for purposes of reconstruction) a resolution for voluntary winding up passed or a receiver or manager of his business or undertaking duly appointed or possession taken by or on behalf of the holders of any debentures secured by a floating charge, of any property comprised in or subject to the floating charge, the employment of the Contractor under this Contract shall be forthwith automatically determined but the said employment may be reinstated and continued if the OWNER and the Contractor, his trustee in bankruptcy liquidate, receiver or manager as the case may be shall so agree.

46.3. The OWNER shall be entitled to determine the employment of the Contractor under this Contract if the Contractor has offered or given or agreed to give to any person any gift or consideration of any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any action in relation to the obtaining or execution of this contract with the OWNER, or for showing or forbearing to show favour or disfavour to any person in relation to this Contract or any other Contract with OWNER, or if the like acts have been done by any person employed by the Contractor or acting on his behalf (whether with or without the knowledge of the Contractor), or if in relation to this Contract or any other Contract with the OWNER, the Contractor or any person employed by him or acting on his behalf has committed any offence under the prevention of corruption act, or has given any fee or reward, the receipt of which is an offence under the Local Government Act.

46.4. In the event of the employment of the Contractor being determined as aforesaid and so long as it has not been reinstated and continued, the following shall be the respective rights and duties of the OWNER and Contractor.

46.4 a. The OWNER may employ and pay other persons to carry out and complete the works and' he or they may enter upon the works and use all temporary buildings, plant, machinery, appliances, goods and materials intended for, delivered to and placed on or adjacent to the works and may purchase all materials and goods necessary for the carrying out and completion of the works.

46.4 b The Contractor shall if so required by the OWNER within 14 days of the date of determination assign to the OWNER without payment the benefit of any Agreement for the supply of materials or goods and or for the execution of any works for the purposes of this Contract but on the terms that a supplier or Sub-Contractor shall not be entitled to make any reasonable objection any further assignment thereof by the OWNER.

46.4 c The Contractor shall as and when required in writing by the ARCHITECT to do so (but not before) remove from the works any temporary buildings, plant, tool, equipment's, goods and materials belonging to or hired by him. If within a reasonable time after any such requirements has been made, the Contractor has not complied therewith, then the OWNER may (but without being responsible for any loss or damage) remove and sell any such property of the Contractor, holding the proceeds less all costs incurred to the credit of the Contractor.

46.4 d The Contractor shall allow or pay to the OWNER in the manner hereinafter appearing the amount of any direct loss and/or damage caused to the OWNER by the determination. Until after completion of the works under paragraph (a) of this Sub-Clause the OWNER shall not be bound by any provisions of this Contract to make any further payment to the Contractor, but upon such completion and the verification within a reasonable time of the accounts

therefore the ARCHITECT shall certify the amount of expense properly incurred by the OWNER and the amount of any direct loss and/or damage caused to the OWNER by the determination and if such amount when added to the monies paid to the Contractor before the date of determination exceed the total amount which would have been payable on due completion in accordance with this Contract, the difference shall be a debt payable to the OWNER by the Contractor, and if the said amounts, when added to the said monies be less than the said total amounts, the difference shall be a debt payable by the OWNER to the Contractor.

47. CO-ORDINATION OF WORK

At the commencement of work, and from time to time, the Contractor shall confirm with the Sub-contractors, persons engaged on separate contracts in connection with the work, and with the ARCHITECT for the purpose of the co-ordination and execution of the various phases of the work. The Contractor shall ascertain the Sub-contractors, persons engaged on separate contracts in connection with the works, the extent of all chasing, cuttings and forming of all openings, holes, grooves, etc. as may be required to accommodate the various services, the Contractor shall ascertain the routes of all services, and the positions of all Light Points, Junctions Boxes etc. in connection with the installation of plant and services and arrange for the Construction of work accordingly. The breaking and cutting of completed work must be avoided.

48. LABOUR

The Contractor shall employ no child labour less than 14 years of age on the work. If female labours engaged, the Contractor shall make necessary provision for safeguarding small children and keeping them clear of the site of operations. No labourer shall reside within the compound except authorised guards.

a) The contractor shall, at all time during the continuance of the contract, comply fully with existing Acts, regulations and byelaws including all statutory amendment and re-enactment of State or Central Government and other local authorities and any other enactments, notification and acts that may be passed in future either by the State or the Central Government or local authority including Indian Workmen's compensation Act. Contract Labour (Regulation and Abolition) Act 1970 and Equal Remuneration Act 1976. Factories Act, Minimum Wages Act, Provident Fund Regulations. Employees Provident Fund Act, Schemes made under the same Act. Health and Sanitary Arrangement for workmen, Insurance and other benefits and shall keep Employer indemnified in case any action is commenced by competent authorities for contravention by the Contractor. If the Owner is caused to pay or reimburse, such amounts as may be necessary to cause or observe ,or for non-observance of the provisions stipulated here forth on the part of the Contractor , the Owner shall have the right to deduct from any moneys due to the Contractor, his amount of Security or recover from the Contractor personally any sum required for estimated to be required for making good the loss or damage suffered by the Owner provided , however , the Owner shall have no other responsibility in connection with the employees of the contractor, who shall, in no case, be treated as the employees of the owner at any point of time.

b) The Contractor shall pay the labourers engaged by him on the work not less than a fair wage, which expression shall mean, whether for time or piecework, the respective rates of wages fixed by Local Government as fair wages for the area payable to the different categories of labourers or those notified under the Minimum Wages Act for corresponding employees of the owner, whichever may be higher.

c) The Contractor shall, notwithstanding the provisions of a contract to the contractory, cause to be paid a fair wage to labourers indirectly engaged on the works, including any labour engaged on the works, including & labour engaged by sub-contractors in connection with the said works as if the labourer had been directly employed by him.

49. PROTECTION OF TREES AND SHRUBS

Trees and Shrubs designated by the ARCHITECT shall be protected from damage during the course of the work and the earth level shall not be changed within three feet of such tree. Where necessary such trees and shrubs shall be protected by means of temporary fencing.

50. GUARANTEE

50.1 Besides guarantees required elsewhere, the Contractor shall guarantee the work in general for one year as noted under clause of the Conditions.

50.2 All required guarantees shall be submitted to the ENGINEER-IN-CHARGE by the Contractor when requesting certification of accounts for payment by the OWNER.

51. ANTIQUES

51.1 All fossils, antiques, and other objects of interest or value which may be found on the site or in excavating the same during the progress of the work shall become the property of the OWNER. The Contractor shall carefully take out and preserve all such objects and shall immediately or as soon as conveniently may be after the discovery of such articles deliver the same into the possession of the ARCHITECT or of the ENGINEER-IN-CHARGE uncleaned and as excavated.

51 If in the opinion of the ARCHITECT compliance with the provisions of the preceding Sub-Clause has involved the Contractor in direct loss and/or expense for which he would not be reimbursed by a payment made under any other provision in this Contract, then the ARCHITECT shall ascertain the amount of such loss and/or expense, any amount from time to time so ascertained shall be added to the Contract sum, and if an Interim Certificate is issued after the date of ascertainment any such amounts shall be added to the amount which would otherwise be stated as due in such certificates.

52. **EXCEPTIONAL MATTERS**

The decision, opinion, direction, certificate (except for payment) with respect to all or any of the matters under clauses 5,9,19,25,26,35,43 & 46 hereof (which matters are herein referred to as the excepted matters) shall be final and conclusive and binding on the parties hereto and shall be without appeal. Any other decision, opinion, direction, certificate or valuation of the Architect or, any refusal of the Architect to give any of the same shall be subject toany right of Arbitration and review in the same way in all respect (including the provision as to opening the reference) as if it were a decision of the Architect under the following clause.

53. ARB ITRATION

All dispute and differences of any kind whatever arising out of or in connection with the Contract or the carrying out of the works (whether during the progress of the works or after their completion and whether before or after the determination, abandonment or breach of the Contract) shall be referred to and settled by the Architect who shall state his decision in writing. Such decision may be in the form of a Final Certificate or otherwise. The decision of the Architect with respect of any of the excepted matters shall be final and without appeal. But if either the Owner or the Contractor be dissatisfied with the decision of the Architect on any matter, question or dispute of any kind(except any of the excepted matters) or as to the with holding by title Architect of any certificate to which the Contractor may claim to be entitled then and in any such case either party (the Owner or the Contractor) may with 28 days after receiving notice of such decision give a written notice to the other party through the architect requiring that such matters in dispute be" Arbitraced upon. Such written note shall specify the matters which are in dispute together with the amount or amount claimed in respect of such dispute or difference of which such written notice has been given and no other shall be and is hereby referred to the Arbitration and final decision of a single Arbitrator being a Qualified Engineer/ Architect to be agreed upon and appointed by both the parties or in case of disagreement as to the appointment of a single Arbitrators to the Arbitration then the Arbitrations of two Arbitrators both being a Qualified Engineer/ Architect one to be appointed by each party,which Arbitrators shall before taking upon themselves the burden of reference appoint an Umpire.

The Arbitrator, the Arbitrators or the Umpire as the case may be shall have power to open up review and revise any certificate, opinion, decision, requisition or notice save in regard to the excepted matters referred to in clause 52 determine all matters in dispute which shall be submitted to him or them and of which notice shall have been given as aforesaid.

Except where otherwise provided in the contract all questions and disputes relating to the meaning of the specifications designs, drawings and instructions herein before mentioned and as to the quality or workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works, or the execution or failure to execute the same whether arising during the progress of the work or after the completion of, abandonment thereof shall be referred to the sole arbitration of the person appointed by the OWNER.

The Arbitrator to whom the matter is originally referred being transferred or vacating his office or being unable to act for any reason then The Owner at the time of such transfer, vacation of office or inability to act, shall appoint another person to act as Arbitrator in accordance with the terms of the contract. Such person shall be entitled to proceed with the reference from the stage at which his predecessor left it.

Subject as aforesaid the provisions of the latest Arbitration and conciliation Act or any statutory modification or re- enactment thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceeding under this clause. It is also a term of the contract that the party invoking arbitration shall specify the dispute or disputes to be referred to arbitration under this clause together with the amount or amounts claimed in respect of each such dispute.

It is also a term of the contract that if the Contractor(s) do/does not make any demand for arbitration in respect of any claim (s) in writing within 90 days of receiving the intimation from the OWNER that the final bill is ready for payment the claim of the Contractor (s) will be deemed to have been waived and absolutely barred and The Owner shall be discharged and released of all liabilities under the contract in respect of these claims. The Arbitrator shall give a reasoned award if the amount of award is more than Rs. 50,000/-

54. PROTECTION AND CLEANING

54.1 The Contractor shall protect and preserve the work from all damages or accidents by providing necessary protections/temporary works etc. or other constructions as required by the ARCHITECT This protection shall be provided for all property adjacent to the site as well as on the site.

54.2 The Contractor shall properly clean the work as it progresses and shall remove all rubbish and debris from the site from time to time as is necessary and as directed. On completion the Contractor shall ensure that the premises and/or site are cleaned of surplus materials debris, shed etc. areas under floors cleared of rubbish, gutters and drains cleaned, doors and

windows and sashes eased, locks and fastenings oiled, keys clearly labeled and handed over to the ENGINEER-IN-CHARGE so that the whole work is left fit for immediate occupation or use and to the satisfaction of the ARCHITECT

55. TOLERANCE

The Contractor shall exercise every care to ensure that all structural members are sufficiently plumb and true to dimensions called for on the drawings to receive finishing elements such as concrete copings, railings, gates, claddings, washed grit finishes etc. Any variations may require rectification in the structural members or may involve remaking or replacing the finishing elements, fabricated to fit into the openings or spaces, as called for on the Drawings.

In case of separate Contract, the Contractor whose work does not conform to dimensions called for, shall be liable for all the expenses which may have to be incurred for rectification or replacement as may be required by the ARCHITECT for the proper installation of the finishing elements. The ARCHITECT decision in this respect shall be final and binding on the
parties concerned.

7.0 SPECIAL CONDITIONS OF CONTRACT

1. The entire work shall be carried out as per CPWD Specifications 2009 (with upto date correction slips)

However, in case of any discrepancy in the description of any items as given in the Schedule of Quantities appended with the tender and the specification relating to the relevant item as per CPWD specifications 2009, the former shall prevail. If the specifications for any items are not available in the CPWD specifications referred above, relevant I.S.I. specifications shall be followed. In case I.S.I. specifications are also not available the decision of the OWNER / ARCHITECT shall be final.

Wherever any reference to any Indian standard Specifications occurs in the document referring to this contract, the same shall be inclusive of all the amendments issued thereto or revisions thereof, if any, upto the date of receipt of tenders.

2 Samples of all materials required for execution of the work shall be got approved from the ARCHITECT. Articles manufactured by firms of repute and approved by the ARCHITECT shall only be used. Articles classified as first quality by the manufacturer shall be used unless otherwise specified.

Preference shall be given to those articles which bear ISI certification mark. In case articles bearing 1S1 certification mark are not available the quality of samples brought by the Contractor shall be judged by the standards laid down in the relevant ISI specifications. All materials and articles brought by the Contractor to the site for use shall conform to the sample approved which shall be preserved till the completion of the work.

3 The work shall be carried out in the manner complying in all respects with requirements of relevant bye laws of the local body under the jurisdiction of which the work is to be executed as directed by the ARCHITECT and nothing extra shall be paid on this account.

4. The work will be carried out in accordance with the ARCHITECT drawings and structural drawings. The structural and Architectural drawings shall at all times have to be properly co-related before executing the work. ARCHITECT's requirement shall have to be fully satisfied. For finishing items samples shall be prepared for prior approval of the ARCHITECT before starting the particular items of work.

5 The Contractor shall carry out performance tests for the entire installations as per standard specifications before the work is finally accepted and nothing whatsoever shall be payable to the Contractor without such tests.

6. The Contractor shall carry out all tests required and pay all charges in connection therewith including fee for testing as may be specified to be conducted by an approved testing authority by the ARCHITECT. Unless otherwise specified. In all such cases cost of samples and to and for carriage shall be borne by the Contractor. Nothing extra shall be payable to the Contractor on account of above testing charges. .

7 The ENGINEER-IN-CHARGE/Contractor should maintain the Register for cement, steel, paints etc. and other Registers required by the ARCHITECT and these should be signed by the Contractor or his authorised agent and the ENGINEER-IN-CHARGE of the work

8. The rates of all items of work shall be considered as inclusive of pumping out or bailing out water if required for which no extra payment will be made. This will include water available from any source such as rains, floods, sub-soil water table being high or due to any other cause whatsoever .

9 The CONTRACTOR shall be responsible to arrange at his own cost all necessary tools and plants required for the execution of work.

10. The CONTRACTOR shall provide suitable weighing, measuring and leveling arrangement at site

for checking the weight, dimensions, and levels as may be necessary for execution of work.

11. The CONTRACTOR shall have such openings etc. as may be required for the electric and sanitary works and nothing extra shall be paid on this account.

12 The work of electrification, horticulture and other internal and external services may be carried out simultaneously by other agencies. The CONTRACTOR shall afford necessary facilities for the same. No claim in the matter shall be entertained and nothing extra over the agreement rates shall be paid for fixing, laying/burying in the work pipes, cables, conduits, clamps, Junction boxes, etc.

13. The rates for items of work included in the Schedule of Quantities shall be applicable for all floors except for items where specified otherwise.

14 Contractor will submit running bills on the basis of clear measurements recorded in a "Measurement Book" (hereafter referred to as MB and enclosed with the running bill), in quadruplicate with one copy to the OWNER, two copies to Engineer-in-Charge and one copy to Architect. The Architect would assess the quality of workmanship for which measurements have been recorded, adherence to specifications / instructions, verify the measurements as recorded in the MB and certify the amount payable. The Engineer-in-Charge may also cross verify the measurements preferably jointly with the Architect if feasible or otherwise independently, but in no circumstances would overturn Architect's decision on quality and/ or non-compliance of specifications; and in case of any difference observed would refer the same to the Architect for review.

Under special circumstances, the EIC / Architect may recommend payment on Account of upto 75% of the submitted bill payable before measurement verification, subject to approval of the OWNER.

15 The Contractor shall furnish the code number allotted by EPFO (Employee Provident Fund Organization) authority to the college and maintain proper documents of the man power engaged permanently and submit to the institute quarterly for verification.

16 Contractor shall follow all the relevant laws including labour / provident fund / ESI / local authorities as applicable in the state or notified from time to time and will be responsible for any liability accrued on this account and keep the Owner indemnified of any liability, whatsoever in connection with the execution of this work.

17 Work Contract Tax and T.D.S shall be deducted from Contractors bill .

18 Necessary insurance of labour under Workman Compensation Act and the building including any injuries to labour or damage to building on any account shall be got done by Contractor and the copy of the same sent to OWNER

19 Contractor shall make his own arrangement for storage of water and electricity for the construction at his own cost and the generator of suitable capacity to finish the job in time.

20 Quantities of items are approximate and liable to change to any extent on either side . Any variation in quantities shall not vitiate the contract.

21 Contractor shall not sub let the work to any other Contractor or Agency without written approval of the architect.

22 The owner has right to withdraw any item of work from the contract or add / delete or change the same. Contractor shall make no extra claim for the same.

23 The work shall be completed within the time as per appendix to General Condition of Contract Timely completion is essence of this order and Contractor shall pay liquidated damages @ as per appendix to General Condition of Contract.

After a period of two weeks, the contract will come to end and the owner shall be at liberty to withdraw the work and get it executed from any other agency at Contractor risk and cost and the site shall be vacated by Contractor immediately.

24 No escalation in prices shall be allowed as this is a short term contract.

25 **No Mobilisation Advance will be paid.**

26 Ready mix concrete used for RCC work should be of approved manufacturers on the approval of ENGINEER-IN-CHARGE / ARCHITECT

27 Minimum amount of Running bill would be as per appendix to General Condition of Contract.

28 Tender should be unconditioned as conditional tenders are liable to be rejected.

29 In addition to mandatory tests as specified the Contractor will get tests conducted on other materials as per instructions of the Owner / Architect. The cost of all these tests shall be borne by the Contractor.

30 Engineer – in – Charge will work under the instructions of ARCHTIECT/OWNER

The contractor shall be responsible to obtain all connections i.e. Water connection, Electric connection etc. from the Concerned Authorities. The Contractor shall get all approval from concerned authorities, to obtain Completion Certificate and supply 3 sets of as built – up drawings of all modifications carried out at site.

All Govt charges shall however to be reimbursed to Contractor on production of original deposit receipts

LIST OF APPROVED MAKE FOR CIVIL WORK

S.No.	MATERIAL	MAKE
1	Wall putty	Birla, JK
2	Ordinary Portland Cement	ACC/ Shriram / Ultratech (43grade or 53 grade only ISI marked) Ambuja.
3	White Cement	JK, Birla, Nihon
4	Cold twisted steel bar Thermo mechanically Treated bar	Sail , Tata, Rathi Conforming to is 455-1978, IS: 2062
5	Block Boards & Plywood	Phenol bonded Duro , Merino, Greenply, Century (water proof)
6	Water proofing compound	ROFF, CICO in liquid form, Dr. Fixit.
7	Pre-cast Mosaic & PCC Tiles	Nitco
8	Glazed Tiles / Ceramic	Bell, Kajaria, Orient, nitco, Somani
9	Paints	Asian Paints/ Nerolac/ Shalimar/ ICI(Duco)
10	Glass Panes & Sheet	Modifloat, St.Gobain
11	Aluminium Sections	Hindalco /Jindal
12	Bitumen	Hindustan Petroleum, Indian Oil
13	Door fittings (Brass)	Dorset , Golden, godrej or as approved by client
14	Flush door shutter	Greenply / Merino/ Duro
15	Vitrified Tiles	Marbonite , Kajaria, Johnson
16	Locks	Godrej, Golden Locks / Dorset
17	Door closers/ Floor spring	Dorma / Ozone
18	Ready Mix Concrete	Ultratech, ACC or as approved by client
19	Texture Paints	Asian Paints, Unitile,
20	Adhesive for fixing of tiles	Roff, Pidilite, Bal Endura, Laticrete
21	Grout	Bal endura, Roff, Laticrete
22	Inter locking cement concrete Paving Blocks	NITCO, NIMCO or as per Approval
23	Waterproof Cement Paint	ACC, Super Anowcem, Snowcem India.
24	Metal Sheet (ACP)	Alucobond, Dura Build or As per approvel
25	Laminate	Duro, Merino, Greenply, Century

26	False Ceiling	Armstrong

All first quality material manufactured by Company will be used.

All the samples to be got approved from EIC/ARCHITECT/OWNER in writing before placing order to purchase out of the brand/makes available in the list above.

The EIC/ARCHITECT/OWNER may select the particular brand from the list of approved makes.

TECHNICAL SPECIFICATIONS

1.0 GENERAL

1.1 The work shall be executed at per CPWD specifications 2009 as amended upto date for various items of work. In case specifications for particular items of work are not available in CPWD specifications, then the relevant I.S specifications will be applicable.

1.2 In case no specifications are available then the decision of the Architect based on acceptable engineering practices and local usage shall be final and binding.

2.0 The contractor shall provide and maintain at site through out the contract period, the following at his own cost and the cost deemed to be included in the contract rates.

i) All Equipments instruments and labour required by the Engineer –in- charge for measurement of the works.

ii) A testing room of suitable size for carrying out test there in.

iii) Sieves Set of standard sieves for testing grading of sand with sieve shaker.

iv) Sieves set of standard sieves for testing grading of aggregates with sieve shaker.

v) Oven for drying of earth, sand and aggregate etc.

vi) Glass measuring flasks of ½ and 1 litre capacity

vii) Flask for determining moisture content of sand

viii) Slump cone for slump text

xi) Minimum 24 steel moulds for 150mm x 150 mm x 150mm size. It may be necessary to provide more steel cube mould depending upon concreting programme.

x) Work benches shelves desks,sinks and any other furniture and lights as required by the Engineer –in-charge.

xi) Cube testing machine with calibration certificate.

xii) Any other equipment not specifically mentioned above which can reasonably be necessary for conducting laboratory test, the completion and maintenance of the work to the satisfaction of the Engineer –in-charge and the Architect.

2.0 DRAWINGS / SAMPLES

2.1 The work shall be carried out in accordance with architectural / structural/ electrical drawings to be issued by the Engineer –in –charge / Architect. The structural and architectural drawing shall have to be properly co-related before executing the work. In case of any difference noticed between the structural and architectural drawings, final decision, in writing of the Engineer –in –charge / Architect shall be obtained by the contractor. For items where so required, sample shall be prepared before starting the particular item of work for prior approval of the Engineer –in –charge / Architect and nothing extra shall be payable on this account.

3.0 MATERIAL

3.1 All materials to be used shall conform to the specifications.

SPECIFICATIONS OF CIVIL WORKS

1 EARTH WORK

1.1 All excavation operations shall include excavation and 'getting out' the excavated materials. In case of excavation for trenches, basements, water tanks etc. 'getting out' shall include throwing the excavated materials at a distance of at least one metre or half the depth of excavation, whichever is more, clear off the edge of excavation. In all other cases getting out shall include depositing the excavated material as specified.

1.2 The excavation shall be done true to levels, slope, shape and pattern indicated by the Engineer-in-charge. Only the excavation shown on the drawings or as required by the Engineer –in-charge shall be measured and recorded for payment.

2 R.C.C. WORK

2.1 In respect of projected balconies and projected verandahs, the payment for the RCC work shall be made under the items of RCC work (RCC slabs). The payment for centering shuttering shall similarly be made under the items of centering and shuttering for RCC works. Nothing extra shall be paid for the side shuttering at the edges of slabs, projected balconies and projected verandahs. All the exposed edges shall however be finished as per specifications and nothing extra shall be paid.

2.2 In the item of RCC walls the Railings as per ARCHITECT's design of any thickness,holes, slits, etc. shall be paid for these provisions. The finished railing should be perfectly straight and in one plane.

2.3 The centering and shuttering for all the RCC and R.B. work shall be of steel or ply of approved quality and thickness.

2.4 PRECAST RCC

For the work of providing and fixing RCC lintels shelves etc. the form work shall be of wooden planking with steel sheet lining or of steel plates stiffened by steel angles as per clause 5.2.1 and5.2.3.3 of CPWD specification 2009.

The compaction of the concrete shall be done by mechanical vibrating tables or external vibrators as approved by the Engineer-in- charge and as per clause 5.4.3.2 of CPWD specification 2009. The rates quoted for the item shall include for both the form work and mechanical vibration.

3 BRICK WORK

3.1 Where fractions of half bricks occur due to Architectural or other reason the work shall be measured as follow:

a) If as per drawing, the use of fraction of half bricks, is required, the measurements shall be made for half brick.

b) If the thickness of the walls is required to be increased up to 2 cm (3/4")

beyond the structural thickness of half brick multiples, the same shall be made up in mortar and paid for the specified thickness.

c) Brick work in steps /treads of stairs, pillars (square of rectangular) shall be payable under respective item no. 4.01 or 4.02 of the schedule of quantities (Volume –II) and nothing extra shall be payable on any account whatsoever ,it may be.

All sunken floors of toilet shall be provided with water proofing treatment after giving proper slope. All C.I. Pipes shall be covered with cement concrete 1:2:4 all round . In the sunken (Specified Area) shall be filled with light weight material. One spout of 1.5" dia pipe provided over the water proofing treatment for draining.

4.0 WOOD WORK

4.1 Joinery**:** The Contractor shall take in hand joinery work immediately after the award of work. The frames and shutters shall not be painted or otherwise treated and fixed in position before these are approved by the ARCHITECT / ENGINEER - IN-CHARGE in writing.

4.2 Timber required for all wood work shall be kiln seasoned to the satisfaction of the ENGINEER –IN –CHARGE / ARCHITECT and moisture content shall be as per Para 9:6 of CPWD Specifications 2009

4.3 The timber shall be brought well in advance after getting it seasoned in kilns and stacked at site in such a way that air circulates well in the stacks . A certificate of kiln seasoning shall be produced with each lot of timber brought at site .

4.4 Secured advance shall be given on timber brought at site @ 65 % of market value of timber after the timber is got insured against fire and theft.

4.5 The quality of the timber to be used in the work shall be got tested in the laboratory as per the Instructions of ARCHITECT. The entire cost of testing including the cost of shutters and oar samples of the materials shall be borne by the Contractor.

5 SPECIFICATIONS FOR ANODIZED / POWDER COATED ALUMINIUM WORK.

5.1 GENERAL : The work shall be carried out a per approved ARCHITECTURAL drawings as per instructions of ENGINEER-IN-CHARGE .Special dimensions or directions in these specifications / nomenclature of the items shall supersede all else.

5.2 MATERIAL

5.2.1 Inspection of Material and works: All materials brought to the site by the Contractor, for use in the work as well as fabricated work shall be subjected to inspection and approval by ENGINEER-IN-CHARGE, get necessary tests, carried out on materials and own at his own cost of the Contractor.

5.2.2 Removal of Rejected Material / Works : In case any material / works are rejected by the ENGINEER –IN – CHARGE the same shall be removed from the site within 48 hours failing which the same may be removed by the ENGINEER – IN-

CHARGE at the risk and the cost of the Contractor.

5.2.3 **Manufacturer's Test Certificate :** The Contractor shall , if required by the ENGINEER-IN-CHARGE ,produce manufacturer's test certificate for any material or particular batch of material supplied by him . The test(s) carried out shall be as per relevant specifications / Indian Standard Code.

Approval of Samples : The Contractor shall submit to the ENGINEER –IN – CHARGE shop drawing of all doors / windows / ventilators / glazing etc. alongwith samples of all the materials for approval and no work shall commence before such samples are approved. Samples of unanodised as well as anodized sections ,PVC/ Neoprene / EPDM gaskets ,hardware fittings and fixtures, glass screws etc. any other material / work shall be supplied and samples will be retained as standards of materials and workmanship . The cost of the shop drawings and samples shall be borne by the CONTRACTOR.

5.4 ALUMINIUM SECTIONS :

5.4.1 The aluminium sections shall confirm to I.S.Designation HE 9 WP / HV 9 WP alloy with chemical composition and technical properties as per I.S.733 and I.S.1285 . The aluminium section section shall confirm to the following parameters also.

a) The minimum tensile strength shall be 19 kg f/mm

b) The maximum allowable deviation in length from a straight line shall be 0.5 mm / metre

c) The maximum allowable deviation from straight shall be one degree.

d) The maximum permissible twist shall be 0.5 mm / metre.

e) The maximum variation in flatness shall be not more than 0.125 x 25 width.

5.4.2 Aluminium sections manufactures by reputed companies like HINDALCO / Jindal shall be used but the unit weight of the section should be not less than the unit weight of various components as specified in the drawings or in the nomenclature of item of works. For any excess weight of section used nothing extra shall be paid. However weights of finished anodized sections shall be considered for payment.

5.5 FABRICATION :

5.5.1 All joints shall be accurately fabricated and good in appearance. The finished surface shall be free from visible defects.

5.5.2 All hardware used shall conform to the relevant I.S.I a specifications and sampled shall be got approved from the Engineer – in – Charge before actual use. Each openable window and ventilators shall have an anodized shall have an Anodized Aluminium handle and a stay door shall have handles, tower bolts, six lever brass mortise lock 70 mm size (Godrej) or equivalent with one side key arrangement and to be fixed with counter sunk machine

screws . Handles, tower bolts etc. to be fixed with necessary nickel plated self tapping hardened steel screws.

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5.5.3 All aluminium works shall be deemed to include in various items complete works including making arrangements for all fittings, fixtures etc. as directed and approved by Engineer- in-charge.

5.5.4 All doors, glazings etc. shall be made completely leak proof against water and air and for which no extra payment shall be made.

5.5.6 All aluminium works should provided for replacing damaged / broken glass pane without having to remove or damage any member of interior finishing materials.

5.6 ANODIZING :

5.6.1 All aluminium sections shall be anodized as per I.S. 7085. Anodizing to conform to I. S.1868 and shall be AC 15 grade with minimum thickness of 15 microns when measured as per I.S.6012.

5.6.2 The Contractor should satisfy himself by 100% checking in the factory that the thickness of the anodic coating is found to be minimum 15 microns. Testing shall be done for thickness at Contractor's cost. If any material is found sub-standard this shall be rejected by the Engineer –in-charge.

5.6.3 The anodized aluminium works shall conform to relevant I.S.Codes relating to materials, workmanship, fabrication,finishing,erection,installation etc. In this connection relevant I.S. Codes including no. 1868 I.S.733 ,I.S.1948 ,I.S.7085, I.S 6012,1285,I.S.740 are considered applicable by the ENGINEER –IN-CHARGE and shall be followed.

The thickness of the finished polyester powder coating measured by micron meter shall not be less than 50 micron nor more than 120 micron at any point.

5.6.4 Protective paper tape shall be applied on the anodized/powder coated sections before they are brought on site. Then protective paper tape shall be removed after installation is complete.

5.7 GLAZING

5.7.1 All glass panes shall be retained within aluminium framing by use of exterior grade PVC/Neoprene/EPDM Gaskets. No water leakage shall occur on the interior even if water penetrates exterior neoprene gaskets. Gas edges shall be clean cut into exact size glass with chipped or damaged edge shall be rejected.

5.7.2 For doors, glass of 5.5mm thickness conforming to classification 'A 'quality or selected quality of I.S. 2835, shall be used.

5.8 FIXING

The screws used for fixing aluminium member shall be of nickel plated hardened steel (Nettle fold or equivalent) threads of machine screws used shall conform to requirements of I.S 4218.

5.9 PROTECTION AND CLEANING

After the work is completed aluminium works including glass panes shall be washed with a suitable thinner and water to remove all marks and blemishes etc. in order to give a uniform clear appearance.

6.0 ROOFING

providing & laying brick bat coba 125 mm thick (average) consisting of:

Ist layer: Applying a slurry coat of neat cement using 2.75 kg/sqm. of cement admixed with water proofing compound conforming to IS. 2645 and approved by Engineer-in-charge over the RCC slab including adjoining walls upto 300mm height including cleaning the surface before treatment..

2nd layer: Laying brick bats with mortar using broken bricks/brick bats 25 mm to 115mm size with 50% of cement mortar 1:5 (1 cement : 5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge over 20 mm thick layer of cement mortar of mix 1:5 (1 cement :5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge to required slope and treating similarly the adjoining walls upto 300 mm height including rounding of junctions of walls and slabs.

3rd layer : After two days of proper curing applying a second coat of cement slurry using 2.75kg/ sqm of cement admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge .

4th layer :- Finishing the surface with 20 mm thick jointless cement mortar of mix 1:4 (1 cement :4 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge including laying glass fibre cloth of approved quality in top layer of plaster and finally finishing the surface with trowel with neat cement slurry and making pattern of 300x300 mm square 3mm deep.

The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test.

All above operations to be done in order and as directed and specified by the Engineer- in – charge.

7.0 WATERPROOFING TREATMENT FOR VERTICAL & HORIZONTAL SURFACE OF DEPRESSED PORTIONS

(for, Internal surface & External walls)

a) Cleaning the sunken roof surface and walls from dust, dirt, cement slurry etc. by means of wire brush,dust removing brush and scraper etc. and plastering the entire surface with 12mm thick cement plaster in mix 1:4 (1 cement : 4 coarse sand)

b) Wetting the surface prior to application of Tapecrete without free water standing.

c) Application of 1st coat of Tapecrete acrylic polymer modified cementitious slurry coating over the surface and to be taken to vertical surface and turned down

d) Laying fibre glass cloth over the Tapecrete applied surface and vertical surface of walls when the first coating is still green and allowed to air cure for at least 4 (four) hours.

e) Application of one coat of Tapecrete brush topping coat over the treated surface and allowed for air cure for at least 4 (four) hours and water cure for next two days

f) Laying 12mm thick cement plaster 1:4 (1 cement : 4 coarse sand) mixed with Cico No. 1 @ 1.5 kg per bag of cement, normal curing of the roof shall be done prior to allowing traffic.

8 MAINTENANCE

The contractor shall maintain in good condition at work executed till the completion of entire work allotted to the Contractor.

9 SAFETY

The CONTRACTOR must take all safety measure and precautions to avoid accidents by Exhibiting day and night necessary caution boards, speed limits boards, red flags and red lights and by providing attended barriers, railing etc. The CONTRACTOR shall be responsible for all damages and accidents caused due to negligence of his part or his labour or his Sub-Contractor. No. hindrance shall be caused to traffic during execution of work.

10 DAMAGES

Any damage done by the CONTRACTOR to the building work etc. or ground surface, drains, sewerage, existing available drainage system, pipe line etc. will be made good by the CONTRACTOR at his own cost. No. compensation shall be paid to the CONTRACTOR for any damage caused by rain, wind, storm or floods to the work or the material collected for the execution of the work. He will make good all such damage at his cost and no claim on this account will be entertained.

The CONTRACTOR will indemnify the OWNER against all structural damages caused by his negligence, non-conforming use of partially completed structures, non-compliance of specification, like removing the shuttering prior to due date or use of faulty material or work. under such circumstances the CONTRACTOR under written order of ARCHITECT / ENGINEER –IN – CHARGE shall rectify and break all the damaged work at his own cost and rectify the same for which no extra payment will be made. The ARCHITECT may deduct reasonable amount due to the CONTRACTOR till it is rectified or get rectified after 7 days notice through other agency and recover the cost there of from the bills of the CONTRACTOR.

11 FACILITIES

The CONTRACTOR will give all facilities at his own cost to the ARCHITECT and OWNER, their Engineers and representative for proper execution of the contract including access to the site works, inspection of all materials and works and measurements of quantities etc. and shall work to their entire satisfaction and shall provide, sign board, proper site office with necessary lighting, toilets, furniture (table & chair & drawings racks etc.) at site at work at own cost.

12 INCOME TAX / WORKS CONTRACT TAX

The Income Tax / W.C.T as applicable shall be deducted by the OWNER as per Govt. notification /regulation from the bills for payments to the Government.

13 OCCUPANCY

The OWNER shall have the right to occupy the works in parts as and when such parts are completed and declared fit for occupation by the ARCHITECT. Completion certificate for the work shall be given by the ARCHITECT as per conditions of contracts before such occupation.

14 QUOTED RATES / UNITS

Units of rates as shown in the schedule of quantities should be carefully seen. Rates once given by the CONTRACTOR shall remain unchanged and no excuse on any account will be entertained, after the tenders are opened.

15 SITE ORDER BOOK

A site order book will be kept at the site of the work in which instruction shall be recorded by OWNER / ARCHITECT / ENGINEER – IN- CHARGE and their representative.

The CONTRACTOR or his authorized agent shall sign the site order book to acknowledge the instruction in all events and their compliance.

16 SPECIFICATIONS APPLICABLE

The CONTRACTORS are expected to have read the relevant CPWD specification and I.S. Code which will be applicable to the work and with up to date correction slips & the conditions which are mentioned in these contract documents.

17 SAMPLES

Samples of items of work to be executed should be prepared and got approved from the ARCHITECT and OWNER before execution of such item of work is taken up. If the materials of approved make are not used, the item of work of such materials shall be out rightly rejected and not paid for at all. Sample of each finishing items and others as desired shall also be prepared for approval of the ARCHITECT before the execution and no extra cost shall be paid towards preparation of sample.

18 DEPUTING REPRESENTATIVE

On acceptance of the tender, the name of the accredited representative of the CONTRACTOR, who would be responsible for taking instruction from the ARCHITECT / OWNER shall be communicated in writing to the Owner.

19 THE DEVIATION LIMITS:

The quantities of any item henceforth mentioned in schedule of quantities are liable to vary (increase or decrease) upto any extent and can even be deleted or substituted as per scope of work or as per ARCHITECT'S instructions. The CONTRACTOR shall not have any claim whatsoever on these varied quantities. This condition shall supersede all other clauses regarding the deviation limit.

20 REINFORCEMENT CUTTING & BENDING SCHEDULE

The CONTRACTOR will have to prepare bar bending schedule of reinforcement in triplicate and the same forwarded to ENGINEER – IN-CHARGE AND ARCHITECT for approval. Reinforcement will have to be placed strictly in accordance with approved schedule only.

21 REQUEST FOR DRAWINGS

The drawing will be supplied by the ARCHITECT to the CONTRACTOR. At any stage he will have no excuse to delay the work on this account & would ask well in advance within 15 days, in writing to ARCHITECT with copy to OWNER.

22 WORKING LATE HOURS

No work shall be done at night (6 PM to 8 AM) and on National Holidays without the instructions in writing of the ARCHITECT / ENGINEER –IN-CHARGE

23 MIXING OF CEMENT CONCRETE OR CEMENT MORTARS.

The mixing of cement concrete, cement mortars shall be done in mechanical mixer operated by Diesel or by power. Mixer and vibrators would be kept at site all the time.

24 TESTS

All mandatory tests shall be carried out as per CPWD specifications 2009 Vol.I to II . The CONTRACTOR shall establish a laboratory at site. He shall have all sieves, weighing balance measuring glass cylinders etc. Whenever desired by Owner.

25 FINAL BILL

Final bill as based on joint measurement (Contractor, Architect and Engineer-in-Charge) of the work executed and duly accepted by the CONTRACTOR shall be submitted by him within 60 days of the completion of work. The final bill shall then be certified by the Architect and returned to the OWNER for payment. Should the CONTRACTOR fail to take appropriate action as above, within the period prescribed, the ENGINEER-IN-CHARGE shall take the measurements jointly with ARCHITECT'S representative and prepare final bill which will be final and binding on the CONTRACTOR and the CONTRACTOR shall have no right to dispute the same.

26 CLAIM FOR INTEREST

No claim for interest will be entertained by the OWNER with respect to any earnest money, Security Deposit or balance payments etc. owning to a dispute between OWNER and the CONTRACTOR or with respect to any delay on the part of the OWNER in making interim or final payment or otherwise.

27 REJECTION OF BAD –WORK

The ARCHITECT shall have full power to accept or reject any work due to bad quality, poor workmanship or poor quality of materials used. No. payment will be made for the rejected work.

Pre-fixed weekly meeting will be held which should be attended by the CONTRACTOR or his authorized representative . In case no desired results achieved ARCHITECT / OWNER will terminate the contract.

28 SAFE STORAGE

28.1 The CONTRACTOR shall make all arrangements for storage and safe custody of material

issued by OWNER or arranged by himself . The CONTRACTOR shall construct suitable godown at the site of work for storing material safe against damage due to sun, rain, dampness, fire, theft etc. He should also employ necessary watch & ward establishment for purpose.

28.2 Cement bags shall be stored in godown with weather proof roofs and walls. Each godown shall be provided with single door with two locks. The key zone lock shall remain with Engineer –in charge and that of other lock with authorized agent of the CONTRACTOR at the site of work so that cement is removed from the godown according the daily requirement with the knowledge of both the parties. The cement bags shall be stacked on proper floors consisting of two layers of dry bricks laid on well-consolidated earth at a level at least one foot above ground level. These stacks shall be in rows of 2 and 10 high with a minimum of 2 feet space clear alround.

28.3 All materials shall be used by the CONTRACTOR from his own stocks.

28.4 All material supplied by the OWNER to the CONTRACTOR shall remain the absolute property of the OWNER and shall not be removed by the CONTRACTOR from the site of the work on any account. The CONTRACTOR shall not be entitled to sell, mortgage, loan or dispose off the material in any other way except to use the same in the construction of work. Any material remaining unused and in perfectly good condition at the time of the completion of the contract shall have to be returned to the Owner in good condition.

29.0 VIOLATION OF CONDITIONS

In case the CONTRACTOR breaks any of the above stipulated conditions, he shall, in addition to throw away himself open to action for contravention of the terms of the Contract and criminal breach of trust he will be liable to pay to the OWNER the cost of such material at double the market rate.

Dated: _____2013 Signature of Tenderer

SPECIAL CONDITIONS (PLUMBING)

1. **DRAWINGS**

The contractor shall submit completion drawings to the Engineer-in-charge after execution of work. Completion certificate will not be issued to the contractor unless completion drawings are submitted to the Engineer-in-charge. These drawings should give following informations :

a. Position of all sanitary fittings.

b. Runs of all pipes including drainage, water supply, soil & vent pipes.

c. Position of all manholes, with invert level, traps etc.

d. Complete schematic diagram of entire installations.

2. Position of Sanitary Fixtures, Runs, Pipes etc.

a. The recommended position of the sanitary fixtures, runs of all piping etc. as shown in the layout drawings will be adhered to as far as possible or as far as practicable.

b. Should there be any discrepancy of incomplete description ambiguity or omission in the drawings and other documents, whether original or supplementary, forming the contract completion or maintenance of the installation, the Contractor shall immediately on discovering the same draw the attention of the Engineer-in-charge to this.

c. Prior to the installation of all fixtures' fittings, traps etc. final position shall be ascertained from the Engineer-in-charge.

3. **COMPLETION TEST**

After completion of the work, Contractor shall notify the Engineer-in-charge (in writing) about the completion of the work, within 15 days from the date of this notification the Engineer-in-charge shall send his representative to remain present at the time of carrying out the tests by the Contractor. These tests shall comply with the existing local and central regulations.

4. **MAINTENANCE**

For a period of twelve months commencing immediately after issue of completion certificate of the work by Employer, the Contractor's liability shall be to replace the defective parts, rectify / reconstruct the defective work that may develop.

If it is necessary for the Contractor to rectify / reconstruct any defective portions of the work under the contract, the provision of this contract shall apply to the portions of work so replaced or renewed until the expirations of work so replaced or date of such replacement or renewal or until the end of the above mentioned period of 12 months, whichever may be later. If any defects be not remedied within a reasonable time the Employer through the Consultants may proceed to do the work at Contractor's risk and expenses, but without prejudice to any other rights which the Employer may have against the contractor in respect of such defects.

The Contractor shall bear the cost of such repairs/rectifications carried out on his behalf at site. Immediately upon expiry of the maintenance period the Architect shall

issue a final certificate indicating that the Contractor has completed his obligation under the contract.

5. **ELIGIBILITY**

On contractors licensed by the concerned local authorities are eligible to execute the sanitary and water supply installation work.

6. All items of work given in this Schedule of Quantities shall be executed in strict accordance with the relevant drawing and specifications read in conjunction with appropriate I.S.I. Codes.

7. The quantities given in this schedule are provisional, the contractor will be paid for the actual quantity of work executed as measured at site and priced at the rates/quoted in the schedule. The owners reserves the right to increase or decrease any of the quantities without any limit or to totally omit any item or work. Any claim by the contractor on these account will not be entertained.

8. It will be responsibility of the contractor to get all approval from local authority, C & D forms, getting the drainage lines approved from the concerned authorities and submit these certificates to the engineer-in-charge. For such approval the fee deposited by the contractor will be payable by the owner on production of a receipt.

9. The work will be carried out strictly according to I.S.I. codes, 1996 C.P.W.D. specifications with amendments upto date and the requirements of the local authorities concerned.

10. The contractor will co-operate with other agencies working at site.

11. All G.I. water pipes will be tested to a hydraulic test pressure of 7 kg/cm^2 before covering.

12. All soil, waste and rain water pipes will be tested with smoke (machine should be available at site) and in addition with water filled upto 4.5 meter height.

13. All measurements will be taken in accordance with IS: 1200 unless otherwise specified.

14. The rates for all items of the work shall also include all costs towards necessary testing as called for in the specifications.

15. This schedule shall be fully priced and the extension and the totals duly checked. The rates for each item should be entered both in words and figures and in the case of any discrepancy between two, rates entered in words will be taken as correct.

16. The rates for all items of the work shall also include the following :

a. Supplying, storing and handling of all fixtures and fittings.

b. Providing all necessary approved fittings and accessories. Accessories to be supplied to match the fixtures.

c. Cutting and making good walls and floors necessary and restoring the disturbed to their original finish.

d. Effecting proper inlet, outlet, joints and slopes as required.

17. All fixtures, fittings and pipes where mentioned as C.P. shall mean C.P. brass.

18. The rates for HCI pipe work shall include cost towards all lead caulk jointing including cost of the lead, cutting of pipe and clamps etc. complete in all respects.

19. All pipes will be measured inclusive of all pipe fittings.

20. The specialized work like Water treatment etc. will be done by agency approved by the Engineer-in-charge/Consultant.

21. Rates for each item should be properly worked out, Employer has right to delete any item and may ask any particular item to be executed and nothing extra will be paid on this account.

22. Rates for each item shall be quoted as given in Schedule of Quantities, otherwise tender will be treated as incomplete tender and can be rejected by the Employer/Consultant.

23. All vitreous chinaware shall be of first quality and of colour as specified in Schedule of Quantities.

GENERAL TECHNICAL CONDITIONS PLUMBING

1. SCOPE OF WORK

1.1 Work under this contract shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely furnish all the plumbing and other specialized services as described hereinafter and as specified in the Schedule of Quantities or shown on the plumbing drawings.

1.1.1 Without restricting to the generality of the foregoing Sanitary installations shall include the following :

a. Sanitary fixtures.

b. Soil, Waste, Rainwater and Vent pipes.

c. Water Supply (Internal & External) including hot water supply.

d. External Sewerage System.

e. Storm Water Drainage System.

f. Miscellaneous Items.

1.1.2 Services rendered under sub-section 1.1.3 shall be done without any extra charge.

1.1.3 The contractor must be get acquainted with the proposed site for the works and study the Specifications and Conditions carefully before tendering. The work shall be executed as per programme approved by the Engineer-in-charge. If part of site is not available for any reason or there is some unavailable delay in supply of materials stipulated by the employer, the programme of construction shall be modified accordingly and the contractor shall have no claim for any extras or compensation on this account.

1.2 *SPECIFICATIONS*

1.2.1 Work under this contract shall be carried our strictly in accordance with specifications attached with the tender.

1.2.2 Items not covered under these specifications 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 latest amendments as applicable in the contract.

1.2.3 Works not covered under para 1.2.1 and 1.2.2 shall be carried out as per relevant Indian standards specifications or codes of practice and, if not available, as per British Standards specifications.

1.3 *EXECUTION OF WORK*

1.3.1 The work shall be carried out in conformity with the plumbing drawings and within the requirements of Consultantural, HVAC, electrical, structural and other specialized services drawings.

1.3.2 The contractor shall co-operate 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 programme.

1.3.3 On award of the work, contractor shall submit a programme of construction in the form of a pert chart or bar chart for approval of the Engineer-in-charge. All dates and time schedule agreed upon shall be strictly adhered to, within the stipulated time of completion/commissioning alongwith the specified phasing, if any.

1.4 *INSPECTION & APPROVAL FROM THE LOCAL AUTHORITIES*

The Contractor shall arrange all necessary inspections, tests, approvals for the entire installation from the local authorities concerned and submit these to Engineer-in-charge / Consultant. The Contractor shall pay all statutory fee etc. required for the inspection and commissioning of the entire installation and furnish documents to the Engineer-in-charge / Consultant. The fee paid by the Contractor will be reimbursed to him on production of the receipt.

1.5 *CUTTING & MAKING GOOD*

No structural member shall be chased or cut without the written permission of the Engineer-in-charge.

1.6 *DRAWINGS*

1.6.1 The drawings enclosed with the tender are for general guidance of the contractor. The Contractor on award of work will furnish detailed stage-wise working drawings within 10 days of award of the work for the approval of Engineer-in-charge / consultant and work will start after the approval.

1.7 *MATERIAL*

1.7.1 All materials used in the works shall conform to the tender specifications.

1.7.2 As far as possible materials bearing I.S. certification marks shall be used with the approval of the Engineer-in-charge.

1.7.3 Unless otherwise specified and expressly approved in writing by the Engineer-in-charge, materials of makes and specifications mentioned with tender shall be used.

1.8 *MOCK-UP*

The contractor shall install all pipes, fixtures, clamps and accessories and fixing devices in mock-up shaft and room so constructed as directed by Engineer-in-charge without any cost. The materials used in the mock-up may be reused in the works if found undamaged.

Any tiles or finished surfaces or floors damaged by the contractor while doing his work shall be made good with new tiles or other finishing material. No payment shall be admissible for such repairs. The Engineer-in-charge may, at his discretion get the damaged and debit the cost of such repairs to the contractor.

1.9 *SANITARY FIXTURES*

1.9.1 **Scope of work**

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

1.9.1.2 Without restricting to the generally of the foregoing the sanitary fixtures shall include all sanitary fixtures, C.P. fittings and accessories etc. necessary and required for the building.

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

1.9.2 **General requirements**

1.9.2.1 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 or not.

1.9.2.2 All fixtures and accessories shall be fixed in accordance with a set pattern matching the tiles or interior finish as per architectural / interior designers requirements. Wherever necessary the fittings shall be centered to dimensions and pattern desired.

1.9.2.3 Fixing screws shall be half round head chromium plated brass with C.P. washers wherever required as per directions of Engineer-in-charge.

1.9.2.4 All fittings and fixtures shall be fixed in a neat workmanlike manner true to levels and heights shown on the drawings and in accordance with the manufacturers 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.

1.9.2.5 When directed, contractor shall install fixtures and accessories in a mock-up room for the approval of the Engineer-in-charge. Sample room fixtures may be reused on the works if undamaged, but no additional payment for fixing or dismantling shall be admissible.

1.10 ***SOIL, WASTE, RAINWATER AND VENT PIPES***

1.10.1 **Scope of work**

1.10.1.1 Work under this section consists of furnishing all labour, materials equipment and appliances necessary and required completely install the soil, waste, rain water and vent pipes as required by the drawings, specified hereinafter and given in the bill of quantities.

1.10.1.2 Without restricting to the generality of the foregoing, the soil, waste, rain water and vent pipes system shall include the following.

a. Vertical and horizontal soil, waste, rain water and vent pipes and fittings, lead joints, clamps, connections to fixtures, painting and cement concrete alround the pipes as per Schedule of Quantities.

b. Connection of pipes to gully trap and manholes etc.

c. Floor and urinal traps, Clean out plugs, inlet fittings and rain water heads as specified.

d. Waste pipes connections from all fixtures e.g. wash basin, sinks, urinals, kitchen equipments etc.

e. Testing of all pipes and fittings.

1.10.2 **General requirements**

1.10.2.1 All materials shall be new of the best quality conforming to specifications. All works executed shall be to the satisfaction of the Engineer-in-charge.

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

1.10.2.3 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.

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

1.10.2.5 Access doors for fittings and clean outs shall be so located that they are easily accessible for repair and maintenance.

1.10.2.6 All works shall be executed as directed by Engineer-in-charge.

1.11 ***WATER SUPPLY***

1.11.1 **Scope of work**

1.11.1.1 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 bill of quantities.

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

a. All water lines to different parts of building and making connection from source etc.

b. Pipe protection and painting.

c. Providing hot water geysers / system and insulations of hot water pipe lines, wherever required.

d. Control valves, masonry chambers and other appurtenances.

e. Connections to all plumbing fixtures, kitchen equipment, tanks and appliances.

f. Excavation and refilling of pipe trenches, wherever necessary.

1.11.2 **General requirements**

1.11.2.1 All materials shall be new of the best quality conforming to specifications. All works executed shall be to the satisfaction of the Engineer-in-charge.

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

1.11.2.3 Short or long bends shall be formed by means of a hydraulic pipe bending machine for pipes upto 65 mm dia.

1.11.2.4 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.

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

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

1.12 *SEWERAGE / DRAINAGE SYSTEM*

1.12.1 **Scope of work**

1.12.1.1 Work under this section shall consist of furnishing all labour, materials, equipments and appliances necessary and required to completely finish sewerage / drainage system as required by the drawings and specified hereinafter or given in the bill of quantities.

1.12.1.2 Without restricting to the generality of the foregoing, the sewerage system shall include

a. Internal / external sewer line.

b. Excavations including refilling etc.

c. Construction of gully traps, collection chambers, manholes etc.

d. Construction of sump etc.

e. Connection to external sewer line.

f. Storm water drainage and disposal.

1.12.2 **General requirements**

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

1.12.2.2 Sewerage and drainage lines shall be laid to the required gradients and profiles.

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

1.12.2.4 Locations of all manholes, gully traps, catch basins etc. shall be got confirmed by the contractor from the Engineer-in-charge before the actual execution of work at site.

1.12.2.5 All works shall be executed as directed by Engineer-in-charge.

1.13 *SUMP PUMPS*

1.13.1 Sump pumps shall be submersible type for waste water and sewerage. Pump with impeller of approved material shall be mounted on water proof motor. The impeller shall be suitable for handling solids into 38 mm dia or as specified.

1.13.2 The pumps shall operate with high level in the sump and stop at low water level by means of Electronic level controller or automatic float.

SPECIFICATIONS PLUMBING

1.0 PLUMBING / SANITARY MATERIALS

1.1 *Salt Glazed Stoneware Pipes*

Stoneware pipes shall be class A with IS marking, salt glazed, sound, free from cracks, deformities and imperfections in glazing. They shall be cylindrical, straight and to standard dimensions. They shall be made of hard burnt stoneware of dark gray colour, and thoroughly glazed and shall give a sharp clear note when struck with a light hammer.

The pipes shall conform to the requirements of Indian Standard No. 651-1971.

Internal Dia	Thickness of barrel & socket
100 mm	12 mm
150 mm	16 mm
250 mm	20 mm

1.2 *Cement Concrete Pipes*

The pipes shall be with or without reinforcement as required and shall be of specified class. These shall conform to IS: 458-1971. The reinforced concrete pipes shall be manufactured by centrifugal (or spun) process while un-reinforced cement concrete pipes by spun or pressure process. All pipes shall be true to shape, straight perfectly sound and free from cracks and flaws. The external surface of the pipes shall be free from defects resulting from imperfect grading of the aggregate mixing or moulding.

Concrete used for the manufacture of un-reinforced and reinforced spigot and socketed pipes and collars shall not be leaner than 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate). The maximum size of aggregate should not exceed one third of the thickness of the pipe or 20 mm whichever is smaller. The reinforcement in the reinforced concrete pipes shall extend throughout the length of the pipe. The circumferential reinforcement shall be adequate to withstand the specified hydrostatic pressure and further bending stresses due to the weight of water when running full across a span equal to the length of pipe plus three times its own weight.

1.3 *Cast Iron Pipe*

1.3.1 *Centrifugally Cast (Spun) Pipes*

The spun iron pipe shall conform to IS: 1536-1989. The spun iron pipes shall be of cast iron casted centrifugally and vary in diameter from 80mm to 750mm. These shall be either of class LA, class A or class B as specified.

Specials : The specials shall conform to IS: 1538-1976.

1.3.2 *Pipe - Cast Iron (Vertically Cast)*

The pipes shall conform to IS: 1537-1976. The pipes shall be either with spigot and socket ends or flanges ends. The pipes shall be of cast iron casted vertically and vary in diameter from 80mm to 1500mm. These shall be of either class A or class B as specified.

Specials : The specials shall conform to IS: 1538-1976.

1.4 Spigot and socketed Soil, Waste and Ventilating pipes : Sand Cast Iron and Centrifugally Cast (Spun) Iron Pipes and Fittings.

1.4.1 Sand cast iron spigot and socket soil, waste and ventilating pipes, fittings and accessories shall conform to IS: 1729-1979. Centrifugally cast (spun) iron spigot and socket soil, waste and ventilating pipes, fittings and accessories shall confirm to IS: 3989 - 1984. All pipes and fittings shall ring clearly when struck with light hammer.

All pipes and fittings shall be coated internally and externally with the same materials at the factory, the fitting being preheated prior to total immersion in a bath containing a uniformly heated composition having a tar or other suitable base. The coating material shall have good adherence and shall not scale off. In all instances where the coating materials has a tar or similar base it shall be smooth and tenacious and hard enough not to flow when exposed to a temperature of 77^0 C but not so brittle at a temperature of 0^0 C as to chip off when scribed lightly with a pen knife.

The access door fittings shall be designed so as to avoid dead space in which filth may accumulate. Doors shall be provided with 3mm rubber insertion packing and when closed and bolted, these shall be water tight.

All pipes shall have uniform wall thickness for the entire length. These shall conform to IS: 1729-79/ IS: 3989-70.

The standard weights and thickness of pipes shall be as shown in the following table. A tolerance upto minus 10 percent may however be allowed against these standard weights.

S.No.	Nominal dia of bore	Thickness in mm	Overall weight of pipes excluding ears in Kgs.		
			1.5m long	1.8m long	2m long
1.	50 mm	5.0	9.56	11.41	12.65
2.	75 mm	5.0	13.83	16.52	18.37
3.	100 mm	5.0	18.14	21.67	24.15
4.	150 mm	5.0	26.70	31.92	35.66

1.4.2 *Fittings*

Fittings shall b e easy clean type. The thickness of fittings and their sockets and spigot dimensions shall conform to thickness and dimensions specified for the corresponding sizes of straight pipes as per IS codes.

1.4.3 *Jointing*

Soil, waste, vent or anti-siphonage and rain water pipes shall be jointed with refined pig lead conforming to IS:782. Sufficient skein of jute rope shall be caulked to leave a minimum space for pig lead as given in para 2.8.4 to be poured in. After the pouring the lead shall be caulked into the joint with caulking tool and hammer. All surplus lead shall be cut and joint left flush with the rim of the socket neatly.

1.5 ***Galvanized Iron Pipes and Fittings***.

The pipes shall be galvanized mild steel medium / heavy as shown in drawings or as specified, conforming to IS: 1239-1973 Part I & II. All pipes shall be electric resistance welded screwed with taper, threads and sockets shall be cleanly finished, well galvanized in and out and free from cracks, surface flaws, laminations and other defects. All screws threads shall be clean and well cut. The ends shall be cut cleanly and square with axis of the tube.

The fittings shall comply with all the requirements that of pipes. The fittings shall be designated by the respective nominal bores of the pipes for which they are intended.

The standard weight and thickness of pipes shall be as shown in the following table :

Nominal bore in mm tube	Series/Class	Wall Thickness in mm	Nominal Weight of black tube in Kg/m	Nominal Weight of Galvanized in Kg/m
15	Medium = M	2.65	1.22	1.274
	Heavy = H	3.25	1.45	1.505
20	M	2.65	1.58	1.642
	H	3.25	1.90	1.953
25	M	3.25	2.44	2.525
	H	4.05	------	3.053
32	M	3.25	3.14	3.247
	H	4.05	3.84	3.937
40	M	3.25	3.61	3.731
	H	4.05	4.43	4.545
50	M	3.65	5.10	5.236
	H	4.50	6.17	6.329
65	M	3.65	6.51	6.711
	H	4.65	7.90	8.065
80	M	4.05	8.47	8.696
	H	4.85	10.10	10.309
100	M	4.50	12.10	12.658
	H	5.40	14.40	15.085
150	M	4.85	19.20	20.000
	H	5.40	21.20	22.222

1.6 ***Sanitary Fixtures***

All glazed vitreous china sanitary ware fixtures shall be of first quality and of the best Indian make of approved manufacture conforming to IS: 2556. These shall be non porous and fully vitreous with all the visible portions perfectly glazed and should be absolutely free from hair cracks, pinholes and local imperfections. These shall have perfect symmetrical, uniform and smooth curves.

1.7 ***Flushing Cisterns, Foot Valve and Flushing Pipes***

The flushing cistern shall be automatic or manually operated, high level or low level, as specified, for water closets and urinals.

Cisterns shall be cast iron, vitreous china or pressed steel and plastic, as specified, complying with the requirements of IS: 774-1984, IS: 2326-1987 and IS: 7231-1984 respectively.

The body thickness of a cast iron cistern shall not, at any place, less than 5mm and that of vitreous china 10mm. The body of a pressed steel cistern shall be of seamless or welded construction of thickness not less than 1.6mm before coating, and shall be porcelain enameled. The cistern shall be free from manufacturing faults and other defects affecting their utility. All working parts shall be designed to operate smoothly and efficiently. A cistern shall be considered mosquito proof only if there is no clearance anywhere which would permit a 1.6mm wire to pass through in the permanent position of the cistern i.e. in the flushing positions or filling position.

The breadth of a low level cistern from front to back, shall be such that the cover or seat, or both of water closet pan shall come to rest in a stable position when raised.

The cistern shall be supported on two cast iron brackets of size as approved and embedded in cement concrete 1:2:4 block 100x75x150mm. The cast iron brackets shall conform to IS: 775-1970. These shall be properly protected by impervious paint. Alternatively the cisterns shall have two holes in the back set above the overflow level for screwing into the wall, supplemented by two cast iron wall support painted with one coat of primer and two coats of enamel of approved shade.

The cistern shall have a removable cover which shall fit closely on it and be secured against displacement. The outlet fitting each cistern shall be securely connected to the cistern. In the case of high level cisterns, the outlet shall be 32mm nominal bore and in the case of low level cisterns, the outlet shall be of 40mm nominal bore.

Ball cock shall be of screwed type 15mm diameter and shall conform to IS: 1703-1968.

In the case of high level manually operated cistern the lever arm of the cistern shall have a suitable hole near the end through which split ring of 'S' hook type shall pass. A chain shall be attached to the ring or hook. The chain shall be of G.I. and strong enough to sustain a suddenly applied pull of 10 Kg or a dead load of 50 Kg without any apparent or permanent deformation to the shape of the link. The chain shall terminate with a suitable handle for pull. The finish shall be smooth and free from burrs. In case of low level flushing cisterns, the handle shall be of chromium plated brass.

The cast iron cisterns shall be painted with two coats of black bitumastic paint on the inside and two or more coats of paint of approved quality and shade on the outside.

In the case of manually operated cisterns the syphonic action of the flushing cistern shall be capable of being rapidly brought into action by the operating lever, but shall not self siphon or leak. The discharge rate of the cistern shall be about 5 litters in 3 seconds, when connected to an appropriated flush pipe, and there shall be no appreciable change in the force of flush during the period of discharge.

G.I. flush pipe:

The flush pipe shall be of (a) medium quality galvanized iron having a normal internal diameter of 32mm. The flushing pipe shall be of suitable length with bends etc. as required for fixing it with front or the back inlet W.C. pan, (b) Polyethylene

pipes, low density conforming to IS: 3076-1985 or high density conforming to IS: 4984-1987, (c) unplasticized pipes conforming to IS: 4985-1988.

Overflow Pipe :

a) G.I. overflow pipe shall be of 20mm nominal bore and shall have a non corrodible mosquito proof brass cover, having 1.25mm dia perforation.

b) The plastic overflow pipes shall be manufactured from high density polyethylene conforming to IS: 4984-1972 or unplasticized PVC conforming to IS: 4985-1988.

C.P. Brass Flush pipe and bend for low level Cistern.

The flush pipe / bend should be heavy quality C.P. brass 40mm dia. The plating shall conform to IS: 4827-1983. Electroplated of chromium on brass.

1.8 ***Mirror***

The mirror shall be superior sheet glass with edges rounded off or beveled, as specified. It shall be free from flaws, specks or bubbles. The size of the mirror shall be 60x45cm unless specified otherwise and its thickness shall not be less than 5.5mm. It shall be uniformly silver plated at the back as per Indian standards and shall be free from silvering defects. Silvering shall have a protective uniform covering of red lead paint.

Backing of 12mm thick marine plywood shall be provided and fixed with wrapping of polyethylene sheet.

1.9 ***Seats and Covers of Water Closet***

These shall conform to IS: 2548-1967. These shall be made of moulded synthetic materials, which shall be tough and hard with high resistance to solvents and shall be free from blisters and other surface defects and shall have C.P. brass hinges and rubber buffers. These shall be free from twist and the underside shall be flat and underside edge shall be arrised. Each seat shall have at least four rubber buffers of suitable size.

1.10 ***Stainless Steel Sink and Draining Board*** :

These shall be of approved make of pressed stainless steel 1.2mm thick sheets and shall have 40mm dia outlet with grating. These shall be connected to 40mm dia C.P. brass 'P' bottle traps or directly with G.I. pipe. Stainless steel sinks shall conform to IS: 13983-1994.

Fixing :- These shall be supported on C.I. cantilever brackets or placed on wooden or marble counter. The joint between the masonry or wood work shall be filled with mastic filler to make it absolutely water right. The draining board shall be sloped towards the sink in order to drain out all the water in the sink.

1.11 ***Bath Tubs***

These shall be of cast iron or pressed enameled or polymarble / acrylic, one piece construction including integral overflow and drain out conforming to IS: 3489 with detachable, adjustable, foot of approved manufacture. The interior and the turned over edges of the tub shall be evenly coasted with vitreous enamel thoroughly fused to base. The enameling shall conform to IS: 772-1973 or as revised. The enameling

surface shall be glossy, smooth and free from cracks, chips and other flaws which affect the appearance of the serviceability of the tubs. The exteriors of the bath tub except edges shall be painted with two coats of enamel or any other approved paint of specified shade over a priming coat of red lead.

1.12 Water Supply Fixtures

All supply fittings (including mixing fittings and accessories) shall be of brass/copper, heavy chromium plated, or approved make and design specified. The fittings shall be cast fittings, screw type, machined and threaded properly for fixing to the supply pipes.

The plating shall conform to IS: 4827-1983. Electroplated coating of nickel and chromium on brass / copper and copper alloys.

The fittings shall be supplied complete with chromium plated matching flanges and extension pieces of required lengths. C.P. brass metallic washers where required shall also be of chromium plated brass. All bib cocks and stop cocks shall conform to IS: 781-1984. Bib taps and stop cocks for water services, sand cast brass screw down (revised) pillar cocks shall conform to IS: 1795-1982 pillar taps; mixing fittings to IS: 1701-1960 Tub spout, shower arm rose, spout and other fittings shall match the supply fittings and appearance. All fixing accessories and screws shall be similar to fittings with all exposed parts chromium plated. All washers shall conform to IS: 4346-1967 washers for water taps for cold water services.

1.13 *Waste fittings*

All waste fittings (waste, chain, pop-up, overflow) shall be of brass / copper, heavy chromium plated of the make and design specified and match the supply fittings. They shall conform to IS: 2963-1979 waste fittings for wash basins and sinks.

Bottle traps

Bottle traps (for wash basins, sinks, baths etc.) shall be deep seal (minimum 6 seal) cast brass bottle traps, heavy chromium plated. All bottle traps shall be provided with suitable cleaning eye, extension piece flare nut - all chromium plated. Bottle traps shall be of approved make and design. Traps for wash basins shall be 32mm (1-1/4 inch) for sinks 40mm (1-1/2) inch.

Wall Caps

Wall caps shall be provided on all walls, floors, columns etc. wherever supply and disposal pipes pass through them. These wall caps shall be chromium plated brass snugly fittings and shall be large enough to cover the puncture properly and shall conform to IS: 4291.

1.14 *Brass Bib Cock, Stop Cock and Pillar taps:*

The brass bib cock and stop cock shall be polished bright and shall conform to IS: 781-1984. The minimum finished weights of bib tap (cock) and stop tap (cock) shall be as given in the IS specifications as reproduced below.

Size	Minimum finished weight	
	Bib tap in Kg	Stop cock in Kg
15 mm	0.40	0.40

20 mm	0.75	0.75

When the bib or stop cocks are required to be chromium plated the chromium plating shall be of grade B type conforming to IS: 4827-1983. The chromium shall never be deposited on brass unless a heavy coating of nickel in interposed. In case these are required to be nickel plated, the plating shall be of first quality with a good thick deposit of silver whiteness capable of taking high polish which will not easily tarnish or scale.

Pillar taps

Pillar taps shall be chromium plated brass and shall conform to IS: 1795. The nominal sizes of the pillar taps shall be 15mm or 20mm as specified. The chromium plating shall be of grade B type conforming to IS: 4827-1983.

Finished weights of 15mm to 20mm dia pillar taps shall be as shown in the table below.

Particular	Weights for	
	15mm size in gms	20mm size in gms
Body	505	255
Washer plate loose valve	15	28
Back nut	40	50
Tap	650	1175

1.15 ***Valves***

All valves (gate, globe, check, safety) shall be either all brass or gunmetal valves suitable for the particulars service. All valves shall be of the particulars duty and design called for.

Valves shall be tested to 21 kg/m^2 pressure at manufacturer's work. Valves shall either be of the screw type or flange type with suitable flanges and non-corrosive bolts and gasket; tail pieces as required shall be supplied along with valve. Gate, globe and check valves shall conform to IS: 778-1984 and non-return valves to swing check type reflex (non-return) valves IS: 5312 (Part-I) 1969.

Sluice Valve

Sluice valves, where called shall be flanged sluice valves of cast iron body. The spindle, wall seat and edge nuts shall be of gunmetal. They shall have rising spindle and shall be of the particular duty and design as per specification.

The valves shall be supplied with suitable flanges, non-corrosive bolts and asbestos fibre gaskets. Sluice valves shall conform to IS: 780-1984 and IS:2906-1984.

Ball Valves with Floats

Ball valves with floats to be fixed in storage tanks shall consist of cast brass lever arms having copper balls (28 SWG) screwed to the arm integrally. The copper ball shall have bronze welded seams. The closing / opening mechanism incorporating the position and cylinder shall be of a non corrosive metal and include washers. The size

and construction of ball valve and float shall be suitable for desired working pressure operating the supply system. But valves shall be supplied with brass hexagonal beechnuts to secure then to the tanks and a socket to connect to supply pipes.

All ball valves with floats shall conform to IS: 1703-1989.

1.16 ***Ferrule***

The ferrules for connections with C.I. main shall generally conform to IS: 2692-1989. IT shall be of the non-ferrous material with a C.I. bell mouth cover and shall be of nominal bore as specified. The ferrule shall be fitted with a screw and plug or valve capable of completely shutting off the water supply to the communication pipe if and when required. For fixing ferrule the empty main is drilled and tapped at 45^{O} in the vertical and the ferrule screwed in. The ferrule must be so fitted that no portion of the projection of the shank shall be left projected within the main into which it is fitted.

1.17 ***Lawn Hydrants***

Lawn hydrants shall be of 2.5 cms size, unless otherwise indicated. All hydrants shall be provided with gate valves and threaded nipple to received hose pipes. Where called for lawn hydrants shall be located in masonry chambers of appropriate size as indicated.

1.18 ***Water Meters***

Water meters of approved make and designs shall be supplied and installed at locations as shown. The water meters shall meet with the approval of the local supply authorities.

Valves and chambers to house the meters shall also be provided along with meters.

All meters shall conform to IS: 779-1968 or IS: 2373-1968 and of approved manufacture. Where called for water meters shall be located in masonry chambers or appropriate size as indicated.

1.19 ***Pipes Hangers, Brackets etc.***

Sturdy hangers, brackets and caddles of approved design shall be installed to support all pipe lengths which are not embedded over their entire runs. The hangers and brackets shall be of adjustable heights and painted with red oxide primer, and two coats of enamel paint of approved make and shade. Clamps, coils and saddles shall be provided to hold pipes with suitable gaskets of approved quality. The brackets and hangers shall be designed to carry the weights of pipes safely. Wherever required pipes may run along ceiling level in suitable gradient and supported on structural clamps. Spacing for clamps for such pipes shall be as follows:

	Vertical	Horizontal
G.I. Pipes	300 cms	240 cms
H.C.I. Pipes	180 cms	120 cms

1.20 ***Pipes Sleeve***

Adequate number of sleeves (pipe inserts) of Cast Iron or Mild Steel shall be provided where pipes cross through concrete, masonry and similar work. The pipe inserts shall be provided with removable timber plugs to keep foreign matter out till

installation of the services pipe cross the sleeve. The diameter of sleeve should be one size higher than the proposed dia or as instructed by the Engineer-in-charge.

1.21 ***uPVC pipes and fittings (Where specified)***

uPVC pipes for drainage system shall be rigid uPVC pipes of class 6/10 kg/cm^2 as specified, conforming to IS: 4985-1988.

Fittings for pipes shall be injection moulded with approved type of sockets and 'O' rings joint.

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. 10mm) for permissible thermal expansion of pipes.

Use proper uPVC pipe adapters for connections between cast iron pipes, traps and uPVC pipes.

1.21.1 *Fittings*

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

Fittings shall be of required 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.

1.21.2 *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 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 true to slop and clamps adjusted to proper levels so that the pipe fully rests on them.

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

1.22 ***Clamps***

Holder bat clamps shall be of standard design and fabricated from M.S. flats 40x3 mm thick, 12mm dia M.S. road and 6 mm nuts and bolts. They shall be painted with two coats of black bituminous concrete 1:2:4 mix blocks of size 10x10x10 cms deep. Rubber packing shall be provided with clamps on G.I. pipes.

Where holder bat clamps are to fixed in RCC column or slotted angles, walls or beams they shall be fixed with 40x3 mm flat iron "U" type clamps with anchor fasteners of approved design or 6mm nuts and bolts.
Structural clamp shall be fabricated from M.S. structural member e.g. rods, angles, channels, flats as directed. Contractor shall provide all nuts, bolts, welding material

and paint the clamp with one coat of red oxide paint and two or more coats of black enamel paint.
Slotted angle / channel supports on walls shall be provided wherever shown on drawings. Angles / channels shall be of sizes shown on drawings or as specified. Angles / channels shall be fixed to brick wall with bolts embedded in cement concrete blocks and to R.C.C. walls with suitable anchor fasteners. The spacing of support bolts horizontally shall not exceeded 1 m.
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 stone aggregate 20 mm nominal size) as directed by Engineer-in-charge.

1.23 ***Traps***

1.23.1 *Floor traps*

Floor traps shall be of cast iron, deep seal with an effective seal of 50 mm. The trap and waste pipes shall be set in cement concrete blocks firmly supported on the structural floor. The blocks shall be in 1:2:4 mix (1 cement : 2 coarse sand : 4 stone aggregate 20mm 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 and of required depth.

All H.C.I. soil / waste pipes in sunken pipes in sunken portion shall be encased in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 stone aggregate 20 mm nominal size) 75mm thick alround.

1.23.2 *Urinal trap*

Urinal traps shall be cast iron P or S trap with or without vent and set in cement concrete block as specified in 1.23.1 without extra charge.

1.23.3 *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 G.I. / M.S. inlet hopper without or with one, two or three inlet sockets to receive the waste pipe. Joint between waste and hopper inlet socket shall be lead caulked. Hopper shall connected to a C.I. P or S trap with at least 50mm water seal. Floor trap inlet hoppers and traps shall be set in cement concrete blocks as specified in para 1.23.1 without any extra cost.

1.23.4 *C.P. stainless steel gratings*

Floor trap and urinal trap shall be provided with 110-150 mm square or round C.P. / Stainless steel grating, with rim of approved design and shape. Minimum thickness shall be 4 mm.

1.24 ***Copper Pipes and Fittings***

A. All cold and hot water pipes within the building and upto the water main outside shall be copper tubing conforming to BS 2871, Part-I table X. The fittings shall be capillary type to BS 864 with silver brazing rings.

B. If any connection of copper pipe is to be made with a G.I. pipe brass connector should be used in order to prevent direct contact of copper with G.I. pipe.

C. In jointing copper pipes and fittings following procedure should be followed.

1. Cut the copper tube square, remove burr inside and outside.
2. Properly clean the outside portion of the pipe which has to go inside the fitting and also inside of the fitting. Remove all dirt, oxide film, grease and oils.
3. Apply flux to the cleaned surface and insert pipe in the fittings making sure that the pipe is firmly upto the pipe stop. A small twist shall be given for even spreading of the flux.
4. Apply heat evenly around the fitting with oxyacetylene torch until a complete ring of solder alloy appears round the mouth of the socket. Heating shall then be stopped and joint allowed to cool without disturbance.

Clamps

1. Copper pipes risers shall be supported by brass clamps with PVC strip separators.

1.25 *PPR PIPES & FITTINGS*

PPR pipes shall be manufactured as per the norms DIN 8077-8078 in pressure class PN 20 where as Fittings are as per the norms DIN 16962 in pressure class PN 25. PPR pipes shall be durable, lighter in weight and more flexible and make installation work very quick and easy. It shall be absolutely resistant to internal and external corrosion. Pipes shall not burst if water gets frozen in them and do not conduct stray currents. PPR pipes shall be neutral with regards to taste and odour of the water. The non-corrosive nature of pipes shall prevents incrustation and leaching of metal ions into the water thus making water safe for drinking. PPR pipes shall be resistant to chemicals, alkalis, bases and also against majority of known aggressive toxic liquids and gases. They do not require painting and are easily joint by fusion welding system.

Material Properties

Density at 23°C	:	0.909 *g/cm3*
Softening temperature	:	132 °c
E – modulus	:	808 MPa
Coefficient of thermal coductivity	:	0.21 *W/m* °c
Shore hardness	:	60
Impact strength: 23°C - No break, 0 °c	-	*160KJ/m2*
CO. of linear thermal expansion	:	1.5 x 10-4 mm/m.K

Jointing

Polyfusion Welding

Joints of the PPR pipes and fittings are usually jointec together by poly-fusion welding which is a fundamental property of this system. This process consists of mixing of melted material of external surface of the pipe and internal surface of the fitting, after heating them up to 260°C to ± 10°C on the small welding machine called poly-fusion device. Fusion process gives homogeneous, integral long lasting leak proof joints.

Joining Procedure

Preliminary operations:

The surfaces of the pipes and fittings must be clean and without impurities. Fix the required matrices on the polyfusion device with proper tightening. Check whether the polyfusion device operates correctly and set the temperature to 260°C to ± 10°C.

Cutting:

Cut the pipe square to the required length by cutter. Deburr the cut end if necessary. Pipe ends must be clean cut at righ angles.

Cleaning:

Prior to welding, the pipe and fitting should be dried and properly cleaned.

Marking:

Mark the required insertion depth on the pipe with the help of suitable marker. This depth varies with the diameter of pipe.

Heating:

Ensure that the indicator light on the welding device signals that the device is hot enough (260°C) for welding. Heat the pipe and fitting on the polyfusion device as per the recommended heating time. While heating the pipe and fitting in the matrices, apply slight pressure from both sides. Do not turn or twist the pipe or fitting while pushing in to the matrices.

Welding:

After specified heating time, remove the pipe and fitting again without rotating while pulling out of the matrices. Heated end of pipe should be pushed in to the flared end of the hot fitting down to the previously marked depth. Welding time depends on size of the pipe.

Cooling:

After the cooling time, the joint gets a first "stiffness, after this phase fitter/plumber can start to make next joint.

1.26 ***HIGH PRESSURE uPVC THREADED PIPES & FITTINGS***

The pipes shall be as per ASTM –D – 1785 schedule 40 or schedule 80 as required in the bill of quantities.

All fittings shall be as per ASTM – D – 2467, schedule 80.

The pipes and fittings shall be threaded as per IS 554.

The pipes shall be smooth, durable, lighter in weight and make installation work very quick and easy.

The pipes and fittings shall be absolutely resistant to internal and external corrosion.

The pipes and fittings shall be neutral with regards to taste and odour of the water.

The pipes and fittings shall be resistant to chemicals, alkalis, bases and also against majority of known aggressive toxic liquids and gases.

The pipes and fittings shall be free from cracks, surface flaws, laminations and other defects.

Jointing

Where pipes have to cut or re-threaded, ends shall be filled out so that no obstruction to bore is offered. The end of the pipes shall then be threaded conforming to requirements of IS: 554-1955 with pipes dies and tapes carefully in such a manner as will not result in sacking of joints when two pieces are screwed together. The pipes shall be cleaned and cleared of all foreign matters before being laid. A thin coat of PVC solvent cement shall be applied on outer surface of pipe and inner surface of fitting. All pipes and fittings shall be properly jointed to make the joints completely water right and all pipes kept free from dust and during fixing burr shall be removed after screwing.

2.0 LAYING AND JOINTING OF PIPES

2.1 Alignment of Grade

All pipes shall be laid true to alignment and gradients as shown on the drawings. No deviations from the lines, depth of cutting or gradients called for in the drawings shall be permitted without the approval in writing by the Engineer-in-charge.

2.2 Setting out Trenches

The contractor shall set out all trenches, manholes and such other works to true grades and alignments as called for. He shall provide the necessary facilities for checking and verification of the same.

All trenches shall be laid to true and in straight lines and as shown on the drawings. The trenches shall be laid to proper levels by the assistance of bonding rods and sight rails which shall be fixed at intervals not exceeding 10 meters or as directed by the Engineer-in-charge.

2.3 Excavating Trenches for Pipes

The trenches for pipes shall be excavated with bottoms formed to levels and gradients as shown on the drawings or as directed by the Engineer-in-charge. In soft and filled in ground the Engineer-in-charge may require the trenches to be excavated to a greater depth than shown on the drawings and such additional excavation shall be filled up with concrete 1:5:10 consolidated, to bring the required level as shown on the drawings.

All excavation shall be properly protected wherever necessary by suitable timber shoring as approved by the Engineer-in-charge. Excavation below water table shall be done after dewatering of the trenches. No blasting shall be allowed without prior approval in writing from the Engineer-in-charge. It shall be carried out under through and competent supervision with the written permission of the appropriate authorities, taking full precautions connected with blasting operations. All excavated earth shall be kept sufficiently clear of the trenches.

2.4 Refilling

Refilling of the trenches shall not be commenced until the length of the pipes therein has been tested and approved.

Where the pipes are unprotected by concrete haunching selected fine material shall be carefully hand-packed around the lower half of the pipes so as to buttress them to the sides of the trench. The refilling shall then be continued to 150mm. Over the top of the pipes using selected fine hand packed material, watered and rammed on both sides of the pipes with a wooden rammer. The process of filling and tamping shall be processed evenly in layers not exceeding 150mm and each layer being watered and consolidated so as to maintain an equal pressure on both sides of the pipeline. In gardens and fields the top soil and turf if any shall be carefully replaced and compacted as approved.

2.5 Welding

All welding shall be executed only by qualified, certified welders utilizing standard tools and accessories. Welding shall be done strictly as per IS: 6227-1966 and IS:823-1964. The operation of surfaces, the welding process and finally of the joints

shall be subjected to the approval of the Engineer-in-charge. All welded joints shall be structurally sound and absolutely leak proof.

2.6 Drilling and Cutting

Drilling and cutting of installed pipe work shall be restricted to absolute minimum. Where such cuttings and drilling is un avoidable it shall be executed only with the prior permission of the Engineer-in-charge. All cutting and drilling shall be predetermined and suitable sockets and specials shall be employed to effect necessary connections. All cutting and drilling shall be executed by skilled workmen with proper tools.

The disturbed surfaces shall be made smooth upto the satisfaction of the Engineer-in-charge.

2.7 Maker Plates

Maker plates indicating the particular service shall be installed along the routes of pipe trenches. Maker plates shall be of mild steel hot dipped with the type of services and the direction of the flow painted on it. The makers shall be set firmly in a concrete base of approved size and installed at all corners and turning points. Over straight runs, makers shall be spaced at 100 m centers generally.

2.8 Laying and Jointing of Pipes

2.8.1 *General*

The pipes shall generally be laid with sockets loading uphill and shall rest on solid and even foundations for the full length of the barrel. To accommodate sockets, depressions shall be formed in the foundations sufficiently deep to allow ample space for the pipe jointer to work right round the pipes. Each separate pipe shall be individually set for line and levels as described under "Alignment and Grade" and "Setting Out".

Pipes shall be always be installed in accessible positions except where absolutely necessary and indicated.

2.8.2 *Stone Ware Pipes*

The laying and jointing of stoneware pipes shall be executed in accordance with code of practice for laying of glazed stoneware pipes IS: 4127-1967. The glazed stoneware pipes shall be jointed as follows:

Tarred gasket shall first be wrapped round the spigot of such pipe and spigot shall then be placed into the socket of the pipe previously laid. The pipe shall then be adjusted and fixed in the correct position and the gasket caulked tightly home so as not to fill more than quarter of the total depth of the socket. The reminder of the socket shall then be filled with a stiff mixture of cement mortar 1:1 (one part of the cement to one part of washed coarse sand). When the socket is filled shall be formed round the joint with towel, making an angle of 45^{o} with the barrel of the pipe.

After the joint is made, any extra material shall be removed from inside of the joint with a suitable scrapper. The newly made joint shall be protected until set from sun, drying winds, rain or dust. The joint shall be cured by keeping it continuously damp for four days. The inside of the pipes shall be left absolutely clear in bore and free from cement mortar or any other obstruction.

2.8.3 *Cement Concrete Pipes*

Concrete pipes shall be laid and jointed as described in IS: 783/1959 Code of practice for laying of cement concrete pipes.

After setting out the pipes the collar shall be centered over the joint and filled in with tarred gasket, till sufficient space is left on either side of the collar to receive the mortar. This space shall then be filled with cement mortar 1:2 (1 cement : 2 washed coarse sand) and caulked by means of proper tools. All joints shall be finished at an angle of 45^{o} to the longitudinal axis of the pipe on both sides of the collar. The joints shall be cured for at least four days. The joints shall be tested to a head of 150cms for two hours without developing leaks / falls in pressure. In case of leaks the piping shall be redone in such portions and the test is repeated till satisfactory results are obtained.

2.8.4 *Cast Iron Pipes*

Cast iron pipes shall be laid and jointed in conformity with the code of practice for laying of cast iron pipes IS: 3114-1960. Cast iron pipes shall be jointed by best quality caulking lead free from all impurities in wet trenches. Joints shall be made with lead wool. The spigot shall be centered in the adjoining socket unfilled for lead. Where the gasket has been caulked right home, a jointing ring shall be placed round the barrel and against the face of the socket, molten lead shall then poured to a depth of 25 mm in the socket in one operation. The lead shall be then be solidly caulked with suitable tools by hammering right round the joint, to make up for the shrinkage of the molten metal on cooling and shall preferably finish 3 mm behind the socket face.

Lead for caulking shall conform to IS: 782-1978. The quantity of lead to be filled per joint in various sizes of cast iron pipes shall be as follows:

1. Drainage Pipes

50 mm (2") pipe	0.77 Kg/joint
80 mm (3") pipe	0.88 Kg/joint
100 mm (4") pipe	0.99 Kg/joint
150 mm (6") pipe	1.50 Kg/joint

2. Water Main Pipes

80 mm (3") pipe	1.8 Kg/joint
100 mm (4") pipe	2.2 Kg/joint
125 mm (5") pipe	2.6 Kg/joint
150 mm (6") pipe	3.4 Kg/joint
200 mm (8") pipe	5.0 Kg/joint

2.8.5 *Laying and jointing of G.I. pipes and Fittings*

Where pipes have to cut or re-threaded, ends shall be filled out so that no obstruction to bore is offered. The end of the pipes shall then be threaded conforming to requirements of IS: 554-1955 with pipes dies and tapes carefully in such a manner as will not result in sacking of joints when two pieces are screwed together. The pipes shall be cleaned and cleared of all foreign matters before being laid. All pipes and fittings shall be properly jointed to make the joints completely water right and all pipes kept free from dust and during fixing burr shall be removed after screwing. Pipes passing through wall or floor shall be provided with M.S. tube sleeves one size higher than the outside dia of pipe when directed by the Engineer-in-charge.

2.8.6 *Pipe Insulation*

Material : Insulation material shall be resin bonded Fibre glass, mineral wool or approved equivalent. The thermal conductivity of the insulation material shall not exceed 0.043 K Cal/sqm/deg c/mm. at 32^{O}C (90^{O} F) means temperatures and density shall not be less than 24 Kg/m^3 (1.5 lb/cubic foot). Thickness of the insulation shall be as specified for the type of services. Bonding of insulation material shall be with a cold setting compound. Samples of insulation material shall be submitted for approval and shall be got tested for thermal conductivity values. Adhesive used for setting for insulation shall be non-flammable, vapour proof adhesive such as koldfas or approved equivalent.

Pipe Size (mm)	Insulation Thickness (mm)
15 to 20	20
25 to 40	25
50 to 100	50
Above 100	75

2.8.7 *Valves*

Valves shall be provided at accessible locations on every branch from main lines as shown in the drawings. In case of valves with screwed female inlet/outlet, each valve shall be provided with a union, on either side and installed in piping system. On external lines valves shall be installed in a brick masonry chamber with a frame and cover as shown in the drawings.

2.9 Testing

2.9.1 *Sewerage and Drainage Pipes (S.W. and R.C.C. Pipes)*

All lengths of sewer and drain lines 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 meter head of water. The test pressure shall, however, not exceed 6 meter head at any point. The pipe shall be plug preferably with standard designed plugs with rubber plugs on both ends. The upper end shall, however, be connected to a pipe for filling water and getting the required head.

Sewer line shall be tested for straightness by :

a) Inserting smooth ball 12mm 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 to invert of the pipe and emerge at the lower end.

b) Means of a mirror at one end 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.

The contractor will give a smoke test to the drains and sewer lines at his own expense and charges.

A test register shall be maintained which shall be maintained which shall be signed and dated by contractor, Engineer-in-charge and representative of Architect / Consultant.

2.9.2 *Cast Iron pipes and uPVC pipes*

a) All cast iron/uPVC pipes for soil, waste, vent, rainwater, drainage and sewerage shall be tested to a hydraulic test of 45 meter head. A test register shall be maintained which shall be signed and dated by contractor, Engineer-in-charge and representative of Architect / Consultant.

b) Pressure Testing :- The pipeline should be tested for soundness in portions as laying progresses. The procedure for the test as adopted generally is as follows:

i) At a time one section of the pipeline between two sluice valves is taken for testing. The section usually taken is about 500 m long.

ii) One of the valve is closed and the water is admitted into the pipe through the other, manipulating air valves suitably. If there is no sluice valve between the section, the end of the section can be sealed temporarily with an end cap having an outlet which can serve as an air relief or for filling the line as may be required. The pipeline after it is filled should be allowed to stand for 24 hours before pressure testing.

iii) After filling this sluice valve is closed and the pipe section is isolated.

iv) Pressure gauges will be fitted at suitable intervals on the crown in to the holes for the purpose.

v) The pipe section is then connected to the delivery side of a pump through a small valve.

vi) The pump is then worked till the pressure inside reaches the designed valve which can be read from the pressure gauges already fixed.

vii) After the required pressure has been attained the valve is closed and the pump disconnected.

viii) The pipe is then kept under the desired pressure during inspection for any defect i.e. leakages at the joints etc.

ix) The water will be then emptied through scour valves and defects observed in the test will be rectified.

The field test pressure to be imposed should not be less than the greatest of the following:

a) One and half times the maximum sustained operating pressure.

b) One and half times of the maximum pipeline static pressure.

The test pressure will be generally as follows :

Typeof pipe	Dia in mm	Class	Test pressure at works		Max Working Pressure at field	
			in Kg/sqcm	Period in Sec.	in Kg/sqcm	Period in Sec.
C.I. pipe	80-600	LA	35	15	12	Minimum
		A	35	15	18	30
		B	35	15	24	Minutes

Note : Not less than 2/3 of the test pressure maintained for at least 4 hrs. Where field test pressure are less the period of test should be at least 24 hrs. the test pressure being gradually raised @ 1.0 Kg/sqcm/min.

2.9.3 *Water Supply Pipes*

All pipes, fittings and valves, after fixing at site, shall be tested by hydrostatic pressure of 7 Kg/sqcm.

Pressure shall be maintained for a period of at least thirty minutes without any drop.

A test register shall be maintained all entries shall be signed and dated by Contractor(s) and Engineer-in-charge.

In addition to the sectional testing carried out during the construction, Contractor shall test the entire installation after connections to 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 defect liability period without any cost.

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 operate effectively shall be replaced by new ones at no extra cost and the same shall be tested as above.

3.0 PIPING SYSTEM - INSTALLATION AND INSPECTION

3.1 Soil, Waste and Vent Pipes

Unless specified otherwise all soil and waste pipes in shafts, ducts and in concealed locations e.g. false ceiling shall be of sand cast iron pipes, and located in basement floor/service floor shall be of cast iron spun class 'LA'.

The soil pipes shall be of minimum diameter of 100 mm and waste pipes 75 mm. Pipes shall be fixed by means of M.S. clamps in two sections, bolted together, built into the walls, wedged and neatly jointed as directed and approved by engineer-in-charge, keeping 50mm distance from the walls.

Where indicated, the soil and waste pipes shall be continued upwards without any change in its diameter, without any bend or angle to the height shown in the drawings.

Unless specified otherwise soil and waste pipes from urinals/wash basins/sinks upto the floor trap shall be of G.I. medium class pipes. All the traps of water closets and urinals traps shall be provided with antisiphon/relief vent pipes as shown in the drawings and as directed by Engineer-in-charge. All terminal manholes shall be provided with vent pipes. This may be disposed with, if the upper floor soil stacks connected to such manholes are vented. all soil, waste and vent pipes shall be given two coats of approved paint.

3.1.1 All connections between soil, waste, and ventilating pipes shall be made by using pipe fittings with inspection doors for cleaning. The doors shall be provided with 3 mm thick rubber insertion packing, when closed and bolted, shall be air and water tight.

Where soil, waste and ventilating pipes are accommodated in shafts/ducts, adequate access to cleaning eye shall be provided.

Hydraulic performance :- After installation of all appliance, discharge test shall be made, singly or/ and collectively. Obstruction in any of the pipe lines shall be traced and the whole system examined as per hydraulic performance, including the retention of adequate water seal in each trap.

Any defects revealed by the test shall be made good and the test repeated until a satisfactory result is obtained.

Embedding Pipes in Masonry

Pipes shall be embedded in masonry during construction of the building. A hole of size upto 200mm x 200mm as directed shall be kept in the masonry. The pipes shall be centrally placed in the hole and shall be fixed by fixing the space around pipe stacks with cement concrete 1:2:4 (1 cement: 2 coarse sand : 4 graded stone aggregate 20mm nominal size). Where the thickness of wall is 200mm the cement concrete shall be made flush with masonry surface on both sides and the surface roughened with wire brushes to receive plaster. Where the wall thickness is more than 200mm the other side shall be covered with the same class of brick work or stone masonry as provided on the wall.

3.2 Water Supply Pipes

A water supply piping system to cater for all domestic requirements shall be installed as called for on the drawings. Unless specified otherwise the piping system shall consist of galvanized steel pipes and fittings for water mains. As far as possible all

piping inside the building shall run in shaft or ducts provided for this purpose. Outside the buildings, the piping shall be installed as far as possible 60cm below finished grade. Where called for all galvanized steel piping embedded either in the trenches or in concrete and masonry work shall be rightly wrapped with 1mm thick fiber glass tissue sheeting laid in bitumen after testing the pipe. Gate valves (built into chambers where required) shall be provided.

3.2.1 ***Hot Water Supply Pipe Insulation***

Vidoflex Insulation

VIDOFLEX is flexible and light weight elastometric material designed for Thermal Insulation and is available in the form of sheets and tubings. It is black in colour.

Characterstics And Advantages:

It has low thermal conductivity (k value), which makes it highly efficient and effective in the insulation of cooling or heating systems.

The hermetic blister closed cell structure forms an impermeable layer which is in itself a good vapour barrier.

It is suitable for application within the temperature range of -40 C to +105 C.

The material has been specially compounded to be self-extinguishing in nature.

VIDOFLEX has excellent Ozone and Ultraviolet ray resistance.

It is CFC, Chlorine and Fiber free and does not cause skin allergy. It is also inert to majority of chemical agents and neutral to pipe metals.

The extreme flexibility makes installation fast, easy and economical. It is able to withstand tearing, rough handling and severe site conditions.

Much lesser space is required for VIDOFLEX as a thinner wall is required due to its low k value and high resistance to moisture. The vapour diffusion co-efficient of u >3700 is very high when compared to other insulation materials, due to this, very less thickness is required in comparison to other materials.

The smooth surface of VIDOFLEX material gives the finished insulation a neat and aesthetic appearance. No surface finishes required in most indoor installations.

VIDOFLEX also retards heat loss in hot water plumbing, dual temperature piping and solar system. .It protects piping by acting as a vibration damper and giving protection against corrosion by atmospheric and industrial environment.

VIDOFLEX inherent flexibility makes it ideally suited for the insulation of large surface area such as tanks irregular shaped vessels, air ducts and large diameter pipes.

The synthetic rubber in VIDOFLEX provides excellent resistance to oil, grease and virtually all chemical,agents used in industrial process.

Technical Specifications

AVERAGE PHYSICAL

PROPERPRTIES	RATING	TEST METHODS
Density	60-100 Kgs/Cu.Mtrs.	ASTM D 1667
Thermal Conductivity at 20 C	0.0340 W/M A	ASTM C 177
Temperature Range	-40 C to +105 C	
Water Vapour Diffuuion	$\geq$ 3700	DIN52615+ ISO663
Water Vapour Perm-in Max	0.2	ASTM E 96
Ozone Resistance	Excellent No cracking	
Fire Rating	Self Extinguishing	ASTM D 635-91
Flexibility	Excellent	
Resistance to Oil & Grease	Excellent	
Weather & Ultraviolet Rays	Good	
Chemical Resistance	Good	
C.F.C.	Free	
Odour	Negligible	
Mildew Resistance	No fungal Growth	

Installation Procedures

Pipe Insulation For Concealed Hot Water Pipes

VIDOFLEX piping insulation is easy and quick to install. It should be applied to pipes that are clean, dry and unheated. There are two methods of application. The Slip On Method and The Snap On Method. For insulating new pipes the Slip on Method is used before they are installed or connected. The Snap on Method is used when the pipes are installed' and connected VIDOFLEX tubing can be cut to length or slit lengthwise with a sharp knife. The inner surface or tubing is lightly powdered to permit the tubing to be slipped easily over the pipe. Seal pipe ends with plugs while installing the pipe insulation to prevent powder from entering the refrigeration system. VIDOFLEX tubing when applied to new ripe installation copes with corners, valves joints and varying diameters.

It is important not to compress the pipe insulation material as the insulation value may be reduced when compressed and condensation may take place on the compressed area. Avoid stitching the material over the pipe. The length of the material cut should be adequate to cover the section of the pipe to be insulated so that there is no strain on the surfaces and joints. Seal all seams and butt joints with adhesive.

Pipe Insulation For Exposed Hot Water Pipes

Exposed hot water supply piping and fittings after hydraulic test will be insulated by applying one coat of bitumastic paint, fixing 25mm thick resin bounded mineral wool pipe section stitched with 24 SWG G.I. wire, wrapping 20mm G.I. wire mesh and wrapping aluminium foil pasting half overlap over the mesh, holded with 16 SWG G.I. wire. Insulation sections should have a density of 122-145 kg/cum.

3.2.2 *Cold Water Supply Pipe*

Concealed cold water pipes and fittings after hydraulic test will have two coat of bitumen paint, two layers of heavy gauge polyethylene sheet or tape holded with 16 SWG G.I. wire and a final coat of bitumastic paint. The chase will be closed in cement mortar 1:2 (1 cement : 2 coarse sand). Pipes shall be clamped to the wall inside the chase.

Exposed cold water supply after hydraulic test will painted with two or more coats of enamel paint of approved shade over a coat of primer.

3.3 Rain Water Pipes

Rain water down take shall be galvanized mild steel pipes or cast iron pipes as called for in the drawings. The fittings and specials for the pipes shall be of the same materials as that of pipes. The installation of rain water pipes shall be carried out as described in relevant causes under laying and jointing of pipes.

Rain water pipes shall be painted with two coats of approved paint.

4.0 CEMENT CONCRETE AND MASONRY WORKS FOR MANHOLES AND CHAMBERS ETC.

4.1 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 IS: 383 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 IS: 383.

c) Sand

Sand for various constructional purposes shall comply in all respects with IS: 2116. It shall be clean, coarse, hard and strong, 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 IS: 269.

e) Mild steel Reinforcement

The mild steel for the reinforcement bars shall be in the form of round bars conforming to all requirements of IS: 432 (Grade I).

f) Bricks

Bricks shall have uniform colour, thoroughly burnt but not over burnt, shall have plan 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.

g) Other Materials

Other materials not fully specified in these specifications and which may be required in the work shall conform to the latest IS. All such materials shall approved by the Engineer-in-charge.

4.2 Cement Concrete (Pain or Reinforced)

a) Cement concrete pipes bedding, cradles, foundations and RCC 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 pipe trenches and foundations shall be kept dry during the curing period.

4.3 Masonry Work

Masonry work for manholes, chambers, brick masonry pipe trench and such other works as required shall be constructed from 1st class bricks or 2nd class as specified in the bill of quantities in cement mortar 1:5 mix (1 cement : 5 coarse sand). All joints shall be properly raked to receive plaster.

4.4 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 bill of quantities.

b) Unless otherwise directed by the Engineer-in-charge cement for bed, all round or in haunches shall be laid as follows:

	Upto 1.5m Depth	Upto 3m Depth	Beyond 3m Depth
Stoneware pipes in open ground (No sub soil water)	All round (1:4:8)	In haunches (1:4:8)	All round (1:4:8)
RCC & S.W. Pipes (all) in sub soil water condition	All round (1:4:8)	In haunches (1:4:8)	All round (1:4:8)
RCC pipes	All round (1:4:8)	In haunches (1:4:8) or as specified	All round (1:4:8) or as specified
SW/RCC pipes or C.I. Pipes under the building or at road crossing or under public places.	All round (1:4:8)	In haunches (1:4:8)	All round (1:4:8)

(1=1 cement , 3-5= coarse sand, 6-10= stone aggregate 40mm nominal size)

c) R.C.C. pipes or C.I. pipes may be supported on brick masonry or precast R.C.C. or Cast Insitu cradles. Cradles shall be as shown on the drawings.

d) Pipes in loose soil or above ground shall be supported on brick or RCC anchor blocks as shown on the drawings.

4.5 Manholes and Chambers

4.5.1 All manholes, chambers and other such works as specified shall be constructed in brick masonry in cement mortar 1:5 (1 cement : 5 coarse sand) or as specified in the bill of quantities.

4.5.2 All manholes, chambers etc. shall be supported on base of cement concrete of such thickness and mix as given in the bill of quantities or shown on the drawings.

Where not specified, manholes shall be constructed as follows:

(All dimensions internal clear in cms)

Size of manhole	90x80	120x90	140 dia
Type	Rect.	Rect.	Circular
Maximum depth	100	245	any depth beyond 245
Average thickness of R.C.C. slab	15	15	as specified
Size of cover and frame (Internal diameter)	61x45.5	50 or 56 dia	50 or 56 dia
Weight of cover and frame	38 Kg or Heavier or as specified	116 or 208 Kg or as specified	116 or 208 Kg or as specified

4.5.3 All manholes shall be proved with cement concrete benching in 1:2:4 mix (1 cement :2 coarse sand : 4 stone aggregate 20mm nominal size). the benching shall have a slope of 10cm or 1:4 whichever is greater 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.

4.5.4 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 above but with rough plaster.

4.5.5 All manholes with depths greater than 1m shall be provided with 20mm square or 25mm round rods catch rings set in cement concrete blocks 25x10x10 cms in 1:2:4 mix 30cms vertically staggered. foot rests shall be coated with coal tar before embedding.

4.5.6 All manholes shall be provided with cast iron covers and frames and embedded in reinforced cement concrete slab. Weight of cover, frame and thickness of slab shall be as specified in the bill of quantities or as given above.

4.5.7 All rain water collection chamber shall be of the size 50x45x60cm (internal) with horizontal or vertical C.I. grating. The grating along with frame, shall be of size 500x450 mm grating having total weight of app. 38 kg and of approved design and quality as per instructions of Engineer-in-charge. The remaining details of construction shall be same as stated above for the construction of the manholes etc.

4.6 Drop Connection

4.6.1 Drop connections shall be provided between branch sewer and main sewer or in the main sewer itself in steep ground when the difference in invert level of the two exceeds 45cms.

4.6.2 Drop connections from gully traps to main sewer on rectangular manholes shall be made inside the manholes and shall have H.C.I. special type door on top and heel rest bend at bottom connected by a H.C.I. pipe. This pipe shall be supported by holder bat

clamps at 180cms intervals with at least one clamp for each drop connection. All joints shall be lead caulked joints 25mm deep.

4.6.3 Drop connections from branch sewer to main sewer shall be made outside the manhole wall with glazed stoneware pipe tee connections, vertical pipe and bend at the bottoms. The top of the tee shall be finished upto the surface level and provided with a C.I. hinged type frame and cover 30cms x 30cms. The connection shall be embedded in cement concrete 1:2:4 mix 15cms all round the pipe and tee upto the surface chamber of the tee.

4.6.4 Drop connection made from vertical stacks directly into manholes shall not be considered as drop connections. They shall be paid for under the relevant soil and waste pipes.

4.7 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 manholes for the new connection. Contractor shall remove all sewage and water if encountered in making the connection without additional cost.

5.0 **ANCILLARY STRUCTURE**

5.1 Manhole

Excavation, filling back and ramming, disposal of surplus earth, preparation of bottom and sides etc. shall be of sizes and depths as called for in drawings. The manholes shall be of sizes and depths as called for in drawings. The manhole shall be built on a base of concrete 1:4:8 (1 cement : 4 coarse sand : 8 stone aggregate 40mm nominal size) of 150mm thickness for manhole depth upto 1000mm, 200mm thickness for manhole depth upto 2500mm and 300mm thickness for manholes of depth greater than 2500mm.

The walls shall be of brick / stone work of thickness as shown in drawings, in cement mortar 1:5 (1 cement : 5 coarse sand). The joints of brick / stone work shall be racked and plastered internally with cement plaster 1:3 (1 cement : 3 coarse sand) to a thickness of 12/15mm and finished with a coat of neat cement and externally with rough cement plaster in cement mortar 1:3 (1 cement : 3 coarse sand).

At the bottom of the manhole there shall be a semi circular channels of the same diameter as that of pipes. Above the horizontal diameter the sides of the channel shall be suitably rounded off. The branch channel shall also be similarly constructed with respect to the benching but at their junction with the main channel an appropriate fall suitably rounded off in the direction of flow in the main channel shall be given. Rings of Mild Steel of suitable dimensions shall be provided in all manholes over 1000mm depth. These rings shall be set at 30 cms intervals vertically and 300mm apart horizontally.

The top ring shall be 450mm below the manhole cover unless otherwise mentioned. Manholes shall be constructed to the requirements of IS: 4111 (Part I) of 1967 Code of Practice for Ancillary Structures in Sewerage System (Manholes). All manholes shall be constructed so as to be water tight under test. All angles shall be rounded to a 75mm radius. The benching at the sides shall be carried up in such a way that splashing does not occurs incase of accidental flooding.

5.1.1 *C.I. Manhole Cover & Frame*

Manhole covers and frames shall conform to the requirements of IS:1726-1960. Manhole covers with frame shall be of cast iron of an approved make. The covers and frame shall generally be double seal of 600x450mm, 500mm or 650mm dia of 38kg, 116kg or 208kg in weight respectively. Where manholes are located in drive-ways and such other areas, the covers and frame shall be 560mm dia of 208kg weight.

5.1.2 *Precast Fibre Reinforced Concrete Covers and Frames*

Manhole covers with frame shall be prefabricated Fibre R.C.C. Medium or heavy duty cover and frame shall be of 600x450mm, 500mm or 560mm dia and of weights as specified in schedule of quantities. Where manhole are located in drive ways and in such other areas heavy duty cover and frame of 560mm internal dia should be provided.

5.2 Gully Traps

Gully traps recalled for in the drawings at the feet of all waste pipe shall be salt glazed gully traps of approved make with 100mm or 150mm dia outlet. The gully trap shall be embedded in cement concrete 1:2:4 and masonry chamber of internal size 300mm x 300mm shall be built around upto ground level and plastered with C.M. 1:3 and finished with a floating coat of cement. A cast iron square grating shall

be provided inside the gully trap and at the top a cast iron sealed cover of 300mm x 300mm size and of weighting of 7.3kg shall be provided.

5.3 Grease Traps

Grease traps shall be provided on kitchen waste line before it is connected with main sewer lines.

Grease traps shall be built in brick masonry and shall generally have the same specifications of manholes. The sizes and location shall be as shown in drawings. Grease trap shall be provided with drop inlet, drop outlet, galvanized wrought iron sediment pan and baffle wall. Grease trap shall be provided with 2 Nos. double seal manhole cover and frame of 38kg.

5.4 Catch Basin

Catch basins shall be of sizes and depths as called for in the drawings. Catch basins shall be provided with cast iron gratings with frame for effective collection and disposal of surface storm water.

5.5 Intercepting Trap

Building sewer line connection to main municipal sewer shall be made through intercepting trap provided in the manholes as shown on the drawing. Intercepting trap shall be of approved make salt glazed stoneware, with suitable outlet fitted with brass bright stopper with galvanizing iron chain. The intercepting traps shall be set in and surrounded with cement concrete 1:2:4, 150mm thick built into brick and connected to drain.

6.0 SANITARY FIXTURES / FITTINGS

6.1 Installation of Fixtures and Fittings

All plumbing sanitary fixtures and fittings shall be stored in covered stores and handled carefully to prevent damage. The sanitary fittings shall be installed at the correct assigned positions as shown on the drawings and as directed by the Engineer-in-charge. Fixtures shall be installed by skilled workmen with appropriate tools according to the latest practices in the trade. Manufacturer's instructions shall be followed for the installation of the fixtures.

Fixtures in all toilets shall be of standard weight mounted rigid, plumb and true to alignment. The outlet of water closet pans and similar appliances shall be examined to ensure that outlet ends are abutting properly on the receiving pipes before making the joint. It shall be ensured that the receiving pipes are clear of obstruction. When fixtures are being mounted, attention shall be paid to the possibility of movement and settlement by other causes. A check shall be made to ensure that necessary anchoring devices have been provided for supporting water inlet for lavatory, basins, sinks, flushing cisterns and other appliances. Where the built-in types of brackets are used they shall be securely fixed to the slabs and walls by approved means. It shall be ensured that while fixing the fixtures and fitting no tool marks or scratches are developed.

6.2 Protection of Fixtures

Care shall be taken at all times, particularly after fixing to protect fixtures from damage. All opening shall be temporarily plugged during progress of work to prevent obstruction. Fixtures shall be finally cleaned to the satisfaction of the Engineer-in-charge.

7.0 MISCELLANEOUS WORK

7.1 The contractor shall provide all inlets, outlets, washouts, vents, ball cocks, overflow control valves and all such other pipe connections including level indicator to water storage tanks as called for.

Suitable float controls of an approved make, securely fixed to the tank and set in a position so that water inlet into the tank is cut off when filled upto the full water line. The water level in the tank shall be adjusted to 25mm below the line of the overflow pipe. Full way gate valve of approved make shall be provided as near the tank as practicable on every outlet pipe from the storage tank except the overflow pipes.

The overflow pipe shall be so placed as to allow the discharge of water being readily seen. The overflow pipe shall be of size as indicated. A stop valve shall also be provided on the inlet water connection to the tank. The outlet pipes shall be fixed above the bottom of the tank as indicated. A wash out pipe shall be provided at the bottom of the tank towards which the floor of the tank is slopping to enable the tank to be emptied for cleaning.

7.2 Connections to Mechanical Equipment Supplied by other Agencies

All inlets, outlets, valves, piping and other identical work connected with installation of all mechanical equipments supplied by other agencies shall be carried out by the contractor in accordance with the drawings, requirements for proper performance, equipment, manufacturer's instructions and the direction of the Engineer-in charge.

The equipment to be supplied by the other agency of kitchen, laundry, air-conditioning, hospital, boiler, water treatment, sewerage treatment and all the similar equipments. The connections to the various equipment shall be either made with union or with flange. The work of effecting connections shall be executed in consultation with and according to the requirements of equipment suppliers and under the directions of the engineer-in-charge. the various aspects of connection work shall be executed in a manner similar to the work of respective trades mentioned elsewhere in these specifications.

7.3 Clean out Plug

Clean outs shall be provided at the ends of all horizontal runs, wherever same change directions, at the base of all soil and vent stacks and conductor sink and where shown on plans.

Where clean out plugs are in cast iron and wrought iron drainage piping, they shall be made by caulking G.I. socket with brass plugs for wrench into hubs of fittings.

Where piping is under the floor, clean outs shall be brought upto finished floor level and terminated in nickel bronze deck plugs. Clean outs terminating in finished walls shall be finished with stainless steel plated caps.

7.4 Disinfection of Piping System and Storage Tanks

Before commissioning the water supply system, the contractor shall arrange to disinfect the entire system, described in the succeeding paragraph.

Thoroughly mixed sufficient chemical shall be used to give the water a dose of 50 parts of chlorine to one million parts of the water. If ordinary bleaching powder to 1000 litters of water, the powder shall be mixed with water to creamy consistency before being added to the water in the storage tank. If a proprietary brand of chemical is used the proportion shall be as specified by the markets. When the storage tank is

full, the supply shall be stopped and all the taps on the distributing pipes opened successively, working progressively away from storage tank.

Each tap shall be closed when the water discharge beings to small of chlorine. The storage tank shall then be filled up with water from supply pipe and added with more disinfecting chemical in the recommended proportions. The storage tank and pipe shall then remain charged at least for three hours. Finally the tank and pipes shall be thoroughly flushed out before any water is used for domestic purposes.

7.5 Water Heaters

Water heater shall be automatic pressure type water heater (with pressure release valve) with heavy gauge copper container duly tinned, thermostats, indicator lamp and glass wool insulator. the water heaters shall be fitted with pressure release valve, non-return valve and inlet and outlet stop valves as required. Water heaters to conform to IS:2082.

8.0 PUMPS & WATER TREATMENT EQUIPMENT

8.1 Scope of work

Work under this section consists of furnishing all labour, materials, equipment and appliances necessary and required to supply install and commission the water supply, drainage and sewerage pumps, filtration or other water treatment equipment, as described hereinafter and given in the Schedule of Quantities and / or shown on the drawings.

8.2 General Requirements

8.2.1 All materials shall be new of the best quality and make conforming to specifications and subject to the approval of Engineer-in-charge.

8.2.2 All equipment shall be installed on suitable foundation, true to level and in a neat workmanlike manner.

8.2.3 Equipment shall be so installed as to provide sufficient clearance between the end walls and between equipment to equipment.

8.2.4 Piping within the pump house shall be so done as to prevent any obstruction in the movement within the pump house.

8.2.5 Each pumping set shall be provided with a full way gate valve on the suction and delivery side and a flap non-return valve on the delivery side.

8.3 Water Supply System

8.3.1 Pumping sets

8.3.1.1 Water supply pumps (for domestic water)

a) Water supply pumps shall be suitable for clean filtered water. Pumps shall be single or multistage, monoblock horizontal or vertical centrifugal pumps with iron body and gunmetal/bronze impeller, stainless steel shaft mechanical seal and coupled to a TEFC electric motor by means of a flexible coupling. Each pump should operate upto a curve 15m below specified head.

b) Pump and motor shall be mounted on a common M.S. Structural or C.I. base plate.

c) Each pump shall be provided with a totally enclosed fan cooled induction motor of suitable H.P. The motors shall be suitable for 400/440 volts, 3 phase, 50 cycles A.C. power supply and shall conform to IS:325.

d) Each pumping set shall be provided with a 150mm dia gunmetal "Bourden" type pressure gauge with gunmetal isolation cock and connecting piping.

e) Provide appropriate vibration eliminating pads for each pump.

8.3.1.2 Water supply pumps (for raw water & garden hydrant supply pumps)

a) Water supply pumps shall be suitable for tube well water as available at site. Pumps shall be single or multistage, monoblock horizontal or vertical centrifugal pumps with cast iron body and gunmetal/bronze impeller, stainless steel shaft mechanical seal and coupled to a TEFC electric motor by means of a flexible coupling. Each pump should operate upto a curve 15m below specified head.

b) to e) Same as per item No. 8.3.1.1 b) to e)

8.4 Air compressor

a) Air compressor shall be single or double stage having free air displacement as given in the schedule of quantities. Compressor shall be mounted on a common base plate and connected to a totally enclosed fan cooled motor of required H.P. Compressor shall have suitable pulleys, belt drive, safety valve and all standard accessories supplied by the manufacturer. Compressor shall have the 1st charge of oil. No air vessel shall be required for the compressor.

b) One transparent oil and condensate trap shall be provided.

8.5 Pressure Tank and Accessories

8.5.1 *Pressure Tank :-* Pressure tank shall be vertical with dish ends fabricated from M.S. plate. Tank shall be provided with Mcneil type manhole. Tank shall be provided with screwed or flanged connections as required. Tank shall be of fully welded construction. Thickness of plates for shell and ends shall be as given in the Schedule of quantities.

8.5.2 *Painting :-* Pressure tank shall be shop painted with one coat of red oxide outside. On completion of the installation, tank will be painted with two coats of synthetic enamel paint of approved quality and shade outside and two coats of non toxic bitumen paint inside.

8.5.3 *Float switch* :- Pressure tank shall be provided with one mobreys magnetic level control switch model No. S01/F02 for control of air compressor or equivalent for this application and duty.

8.5.4 *Pressure switches* :- Differential type pressure switches (One for each pump) suitable for pressure range specified by Danfoss India Ltd. for duty pumps shall be provided.

8.5.5 *Pressure gauge* :- One "Bourden" type gunmetal pressure gauge 150mm dia with gunmetal isolation cock shall be provided on the pressure tank.

8.5.6 *Safety valves* :- Provide two 25mm dia approved type gunmetal spring loaded pressure relief valves as given in the schedule of quantities.

8.5.7 *Air/water gauge* :- Provide one heavy duty air/water level gauge with total length of half the tank height. Gauge shall be with heavy type gunmetal fittings at top bottom and heavy gauge glass tube.

8.5.8 *Globe valve* :- Provide one gunmetal globe valve 15mm dia tested to 20kg/sq.cm pressure for air inlet conforming to IS: 778

8.5.9 *Drain valve* :- Provide one 50mm dia gunmetal full way valve (IS: 778) tested to 20 kg/sq.cm pressure for drain.

8.5.10 *Water inlet* :- One connection with gunmetal full way valve as specified.

Note :- All items under para 3 shall constitute one item. Contractor may include any other item necessary and required to provide a complete working plant without extra cost.

8.6 Sewage Sump Pumps

Sewage sump pumps shall be vertical type suitable for raw sewage and solids upto 38mm size. Pumps shall be wet pit/submersible type, grease lubricated and having

ample support arrangement for suspension from sump top slab. Pumps shall have mentioned in the Schedule of Quantities. Impeller shall be cast iron with open vanes. Pumps shall be provided with necessary support plates and M.S. sections.

Pumps shall operate with high water level in sump and stop at low water level by means of an electronic level controller or auto float.

8.7 Sump Pumps for Drainage

8.7.1 Drainage sump shall be vertical wet pit submersible type suitable for handling muddy water with solids upto 12mm size.

8.7.2 Pump shall operate with high water level in sump and stop at low water level by means of an electronic level controller or auto float.

8.8 Water Filter

8.8.1 Filter shall be designed in accordance with the code of unfired pressure vessel conforming to IS: 2825.

8.8.2 Water filter shall be sand / gravel pressure filters downward or upward flow type suitable for a rate of filtration given in Schedule of Quantities.

8.8.3 Filter shall be vertical type of required diameter. The shell and dished ends shall be fabricated from M.S. plates conforming to IS: 2002 Gr. 2A or FRP suitable to withstand a working pressure given in Schedule of quantities. The minimum thickness of shell shall be 6mm and dished ends shall be 8mm. The filter shall have at least one pressure tight manhole cover. Each filter shall be provided with screwed or flanged connections for inlet, outlet individual drain connections and all other connections necessary and required. Filter shall be painted inside with two or more coats of non toxic resistant paint and two coats of red primer outside.

8.9 Air Blower

8.9.1 Air blower shall be rotary type for scouring filter and assisting in back was operation.

8.9.2 Air blower shall be driven by a totally enclosed fan cooled induction motor of required H.P. Blower shall be of capacity recommended by filter manufacturer and shall be of reputed make as approved by Architect / Consultant.

8.10 Chemical Dosers

8.10.1 Chemical dosers shall be displacement type complete with rubber bag in M.S. vessel duly painted of 50 litters capacity or as specified in Schedule of Quantities.

8.10.2 Doser shall be suitable for working pressure mentioned in the Schedule of Quantities.

8.10.3 Doser shall be provided with orifice plate assembly, injection nozzle and corrosion proof piping. Piping from main water supply line to the doser shall be G.I. pipes conforming to IS:1239 (Medium class)

8.11 Water Softener

8.11.1 Softener shall be designed in accordance with the code of unfired pressure vessel conforming to IS: 2825.

8.11.2 Softener shall be designed to give zero commercial hardness. Softener shall be with "Cation" exchange resins.

8.11.3 Softener vessel shall be mild steel with dished ends or FRP and self supporting arrangement. Vessel shall be suitable for a working pressure given in Schedule of Quantities. The shell shall have a minimum thickness of 6mm and dished ends 8mm. The vessel shall be painted internally with non toxic bitumen paint or rubber lined and externally with two coats of red oxide. The materials of both shell and dish ends shall conform to IS:2002.

8.11.4 The vessel shall have an internal collecting and distribution system of manufacturers design.

8.11.5 Softener shall have a set of face piping for inlet, outlet and brine injection with all valves. Suitable drain shall be provided. Pipes shall be G.I., Heavy Class (65mm dia and below). Pipe 80mm dia and above shall be C.I. double flanged pipes conforming to IS: 1537 with matching fittings.

8.11.6 One set of hydraulic injector with control valve, brine delivery pipes with adjustable indicating lamps.

8.11.7 One cylindrical salt saturator and measuring tanks of M.S. rubber and provided with brine delivery piping with adjustable level indicating clamp and control valves complete. The tank shall be of capacity as given in the Schedule of Quantities. (The tank shall be paid for separately).

8.11.8 One orifice board for indicating wash and rinse rate to be filtered in drain sump.

8.11.9 One charge of supporting gravel sand and "Cation" resin in requisite quantity.

8.11.10 One water testing kit with instructions for testing water samples.

8.12 Vibration Eliminators

Provide on all suction and delivery lines double flanged reinforced neoprene flexible pipe connectors. Connectors should be suitable for a working pressure of each pump and tested to the test pressure given in the relevant head. Length of the connector shall be as per manufactures details. Flexible connectors shall be as manufactured by Relay Corporation, New Delhi.

8.13 Cable

8.13.1 Contractor shall provide all power and control cables from the motor control centre to various motors.

8.13.2 Cable shall conform to IS:1554 and carry ISI mark.

8.13.3 Wiring cables shall conform to IS: 694.

8.13.4 All power and wiring cables shall be aluminium conductor PVC insulated armoured and PVC sheathed of 1100 volts grade.

8.13.5 All control cables shall be copper conductor PVC insulated armoured and PVC sheathed 100 volt grade.

8.13.6 All cable shall have standard conductors. The cables shall be in drums as far as possible and bear manufacturer's name.

8.13.7 All cable joints shall be made in an approved manner as per standard practice.

8.14 Cables Trays

8.14.1 Contractor shall provide M.S. slotted cables trays at locations as shown on the drawings and of sizes as given in the Schedule of Quantities.

8.14.2 Cables trays shall be supported from the bottom of the slab at intervals of 60 cms at both ends by welding support rods with insert plates or to reinforcement bars. Cutting of holes in the slab for exposing of reinforcement bars and making good the same after welding of support rods shall be included in the rate of the tray and no separate payment shall be made on this account.

8.14.3 Cost of clips, bolts, nuts, support rods and any other materials required to fix the trays in proper manner shall be included in the rate for trays.

8.14.4 Cables trays shall of MEK, DEXION OR PILCO.

8.15 Earthing

All equipment installed by the contractor shall suitable earthed by making proper connection by means of G.I. wires to the main earthing system laid by the electrical contractors.

8.16 Motor Control Centre

8.16.1 Switch board cubicles of approved type shall be fabricated from 16 gauge M.S. sheet with dust and vermin proof construction. It shall be painted with stove enameled paint of approved make and shade. It shall be fitted with suitable etched plastic identification plates for each motor. The cubical shall comprise of the following :- (Switch gear as given in the Schedule of Quantities).

a) Incoming main switch fuse unit of required capacity.

b) Isolation switch fuse unit, one for each motor.

c) Fully automatic DOL/Star Delta starters suitable for motor H.P. with push bottons one for each motor and on/off indicating neon lamps.

d) Single phasing preventer of appropriate rating for each motor.

e) Rotary duty selector switch.

f) Panel type ampere meters one for each motor.

g) Panel type voltmeter on incoming main with rotary selector switch to read voltage between phase to neutral and phase to phase.

h) Neon phase indicating lamps on the incoming main.

i) Rotary switch for manual or auto operation for each pump.

j) Fully taped aluminium bus bars of required capacity.

k) The panel shall be pre-wired with colour coded wiring. All interconnecting wiring from incoming main to switch gear, meters and accessories within the switch board panel.

8.16.2 All switch gears and accessories shall be approved make such as "Siemens, English Electric, Larsen & Turbo" or equivalent.

8.16.3 Switch board cubicles shall be floor or wall mounted type as recommended by manufacturers.

8.17 Measurement

8.17.1 G.I. pipes shall be measured per linear meter of the finished length and shall include all fittings, jointing, clamps for fixing to walls or hangers and testing.

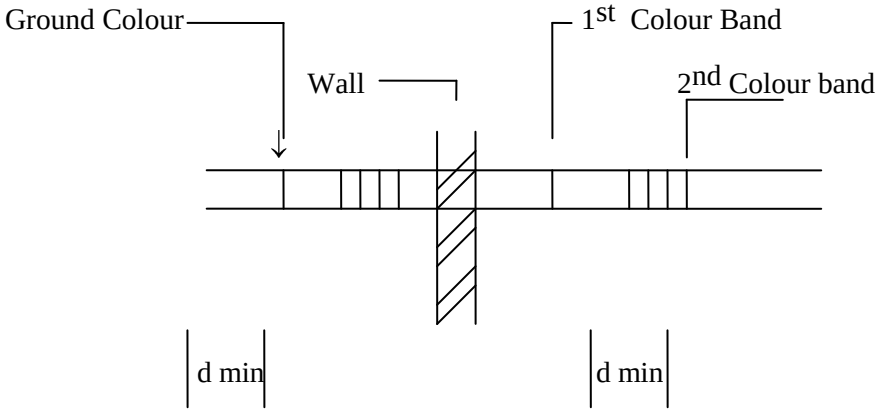
8.17.2 Suction and delivery headers shall be measured per linear meter of finished length and shall include all items as given in the Schedule of Quantities. Painting shall be included in the rate of headers.

8.17.3 Pumps, filter, air blower, softener and chlorinator shall be measured by numbers and shall include all items as given in the specifications and Schedule of Quantities.

8.17.4 Air vessel, fire alarm, motor control panels, earthing station, vibration eliminators and suction strainer shall be measured by numbers and shall include all items as given in the Schedule of Quantities and Specifications.

8.17.5 Power cables, earth wire and tape shall be measured per linear meter and shall include all items given in the Specification and Schedule of Quantities.

Pipe Colour Code



Proportional width of brand 4:1
Note:- Arrow indicating the direction of flow.

	Pipe Lines	Ground Colour	1st Colour Band	2nd Colour Band
1.	Cooling water	sea green	french blue	
2.	Boiler feed	sea green		
3.	Condensate	sea green	light brown	
4.	Drinking water (all cold water lines after filter)	sea green	french blue	signal red
5.	Treated water (soft water)	sea green	light orange	
6.	Central heating 60 deg-100 deg.C.	sea green	dark violet	
7.	Domestic hot water	sea green	light grey	
8.	Compressed air upto 15 kg/sqcm	sky blue		
9.	Steam	sliver grey		
10.	Drainage	black		
11.	Town gas	canary yellow		
12.	Oils			
	Diesel (indicate by letter HSD or LDO)	light brown	brilliant green	
13.	Fire Service	fire red		
14.	Medical gases			
	Air	sky blue	white	black
	Oxygen	canary yellow	white	
	Nitrous oxide	canary yellow	french blue	
	Vacuum	sky blue	black	

This colour code is as per I.S. 2379-1983.

LIST OF APPROVED MAKES/ MANUFACTURERS OF MATERIALS FOR SANITARY, WATER SUPPLY AND DRAINAGE WORKS

It may please be noted that the contractor shall use approved makes of materials. The final selection of materials, out of the approved makes of materials or otherwise to be used at site shall rest with the Employers and it shall be binding on the contractor . The contractor shall get the samples of all brands covered in the approved makes, and get approval from the Employer/Architect before commencing the supply.

S.No.	Material	Conforming to	Brand Names
1	Vitreous China Sanitaryware		
			a) Neycer
			b) Parryware
			c) Hindware
2	Urinal		a) Hindware Alexa-e-secse (sensor based flushing system)
3	Mixer etc. for basin/ shower		a) Jaguar
			b) Ornamix
4	C.P. Brass Fitting accessories and flush valves		a) Jaquar
			b) Parko
5	Sand cast soil pipe and fittings for soil, water		a) B.C.
	and gully trap		b) RIS
			c) RIF
			d) BPL
			e) SRIS
6	G.I. Fittings		a) Unik or Equivalent
7	G.I. Pipes Medium (B), Heavy (C)		a) Jindal Hissar
			b) Tata
			c) Jindal Star
8	Gun metal valves (fullway, check and globe valves)		a) Leader
			b) Zoloto
			c) Sant
9	Stone ware pipes and gully trap		a) Perfect
			b) Priya
10	Insulation for G.I. hot water pipes		a) Llyods or Equivalent
			b) K-flex
			c) Vidoflex
11	G.I. manhole cover and frames		a) RIF or Equivalent
12	Electric motor		a) Cromptono Greaves
			b) Kirloskar
13	Water storage tank		a) Syntex or Equivalent
14	PVC pipe and fittings, PVC fixtures and fittings		a) Prince

S.No.	Material	Conforming to	Brand Names
			b) Prakash
			c) Polymers
			d) Lakshmi
15	Stainless steel sink		a) Neelkanth
			b) Kauret
16	CPVC pipes		a) Astral
			b) Amitex polymers Pvt. Ltd.
			c) Ashirwad
17	Plastic W.C. Seats	IS: 2548 - 1967	a) Commander
			b) Hindustan Sanitary ware
			c) Parryware
			d) Bastolite
18	C.P. Wastes, Spreaders,		a) Jaquar
	Urinal Flush Pipe		b) Parko
			c) ESS ESS
19	Ball Valves		a) ITAP, Italy
			b) TBS Engineers Pvt. Ltd.
			c) Zoloto
			d) RB Italy
20	Ball Valve with Float	IS: 1703-1977	a) Leader
			b) Sant
			c) Zoloto
21	RCC Pipes	IS:458-1971	ISI Mark
22	C.I. Sluice Valve& Non-	IS:780-1969,	a) Kirloskar
	Return Valve	IS: 778-1971	b) IVC
			c) Leader
23	Self Closing Taps/Pillar cocks		a) Jaquar
			b) Tower Stop - Italy
24	C.I. Rainwater inlet fitting/Bronze gratings etc.		a) Sage Metals
			b) GMGR
25	Concealed Cistern		a) Geberit
			b) Hindware
			c) Commander

SPECIAL CONDITIONS FOR FIRE FIGHTING

FIRE PROTECTIONS

1. **PRECEDENCE**

These Special Conditions shall be read in conjunction with the General Conditions of Contract. In the event of conflict between them, the Special Conditions shall prevail.

2. **ORDER OF PRECEDENCE**

In case of any ambiguity or discrepancy the following order of precedence shall be observed.

a. Schedule of Quantities

b. Technical Specifications

c. Special Conditions of Contract

d. Drawings

e. General Conditions of Contract

3. **SCOPE OF WORK**

The Scope of work covers the supply, installation, testing & commissioning of Fire Fighting Wet Riser cum down comer, Hydrant & Sprinkler system to proposed Girls Hostel at SRCC, New Delhi. It will be the responsibility of the Contractor to get all approval and completion certificate from the Local Fire Department without which the work will not be taken over by the owner. All expenses on this account shall be borne by the Contractor.

4. **SPECIFICATION**

The work of Wet Riser cum down commer Hydrant system will be carried out as per CPWD specifications 1985 electric work for Wet Riser system and sprinkler system as per enclosed specification.

5. **PROVISION FOR SLEEVES**

Pipe passing through structural members will be provided with G.I. pipes.

6. **LOCATION OF SITE**

The site of work is located at SRCC, New Delhi.

7. **SITE PARTICULARS**

The intending tenderer shall be deemed to have visited the site and familiarized himself thoroughly with the site conditions before submitting the tender. Non - familiarity with the site conditions will not be considered a reason either for extra claims or for not carrying out the work in strict conformity with the drawings and specifications.

8. **CO-ORDINATION WITH OTHER AGENCIES**

Work shall be carried out in such a manner that the work of other agencies operating at the site is not hampered due to any action of the Contractor. Proper co-ordination with other agencies will be Contractor's responsibility. Contractor shall ensure that the works of

other Contractors are not held up due to non completion of his part of work. In case of any dispute, the decision of Engineer-in-Charge shall be final and binding on the Contractor.

9. **TENDER DRAWINGS**

For guidance of the bidder, drawings as listed in Annexure are enclosed with these tender documents. These drawings are broadly indicative of the work to be carried out. The Contractor on award of work will furnish detailed stage-wise working drawings within 15 days of award of work for approval of Engineer-in-Charge and get the same approved by Local Fire Service and shall remain in the custody of the Department. No claim whatsoever shall be admissible on account of changes that may be introduced by the Engineer-in-Charge/Local Fire Authority.

10. **SHOP DRAWINGS**

The Contractor shall prepare and furnish all shop drawings in quadruplicate at no extra cost for approval by the Engineer-in-Charge before commencing fabrication/manufacture of the equipment. Such shop drawings shall be based on the Architect drawings and requirements laid down in the specifications and as per site conditions. The manufacture of equipment shall be commenced only after the shop drawings are approved in writing by the Engineer-in-Charge. Such drawings shall be co-ordinated with all disciplines of work.

11. **COMPLETION AS BUILT DRAWINGS**

On completion of the work and before issuance of certificate of virtual completion, the Contractor shall submit to the Engineer-in-Charge. General layout drawings, drawn at approved scale indicating layout of pump house piping and its accessories " As installed ". These drawings shall in particular give the following :

a. General layout of pump house.

b. Panels and other equipment location and sizes etc.

c. Complete Schematic as installed.

d. Location of Hydrants, Earth pipes, route of earthing conductors etc.

e. Route of all cables and pipes run along with detail sizes and mode of installation.

12. **DOCUMENTS**

The Contractor shall submit to the Engineer-in-Charge, the following documents on completion of the work and before issuance of virtual completion.

i. Warranty for equipment installed.

ii. Test certificates.

iii. History sheets of the equipments.

iv. Catalogues.

v. Operation and Maintenance manuals.

vi. List of recommended spares and consumables.

vii. Reconciliation statement.

viii. All approvals and sanctions.

13. **SUPPLY AND INSTALLATION SCHEDULE**

The tender shall submit in the bar chart form the supply and installation schedule with in fifteen days after the award of work .

14. **SANCTION/APPROVALS FROM STATUTORY AUTHORITIES/LOCAL FIRE DEPARTMENT**

The Contractor shall be fully responsible and shall carry out following activities :-

a) Submission of working drawing.

b) Obtaining the approval of drawings.

c) Arranging inspection of site by officials of the Authority.

d) Obtaining the final no objection/completion certificate after submitting required documents.

e) Any other statutory approvals required.

15. **MANUFACTURING**

The responsibility for ensuring the manufacture of the equipment as per the specifications shall be solely that of the Contractor. The Contractor shall be responsible for selection of materials as per agreed specifications.

16. **MAKE OF MATERIALS**

Approved make of material shall be used. Alternative make shall be used with the specific written approval of Engineer-in-Charge.

17. **SAMPLE SUBMISSION AND APPROVAL**

List of items, material and equipment to be supplied as a part of the contract together with samples shall be submitted for approval to Engineer-in-Charge within one month of award of contract.

18. **SUBSTITUTE MATERIAL**

Due to non availability of any material mentioned in the specifications, substitute material shall be used only after detail of material accompanied by all technical data, sizes, particulars of material and manufacturers name shall be submitted to Engineer-in-Charge for obtaining written approval for such material.

19. **MANUFACTURER INSTRUCTION**

Any specific instruction furnished by manufacturer covering the points not mentioned in technical specifications of the tender shall be brought to the notice of Engineer-in-Charge in writing for further instructions in this regard at the time of tendering.

20. **MATERIAL TESTING**

The Engineer-in-Charge shall have full power to get any material of work to be tested by an independent agency at Contractor's expense in order to prove the soundness and adequacy.

21. **INTERCHANGE ABILITY**

All similar parts or equipment shall be interchangeable, with one another.

22. **WORKS INSPECTION**

Prior to shipment of equipment the Engineer-in-Charge reserves the right to inspect the same at manufacturer's works and the Contractor shall provide and secure for the Engineer-in-Charge or his authorized representative every reasonable access and facility at the manufacturer works for inspection and testing.

23. **INSPECTION AND TESTING**

a) All equipment shall be inspected and tested as per an agreed Quality Assurance Plan before the same is packed and dispatched from the Contractor's Works. The Contractor shall carry out tests as specified/directed by Engineer-in-Charge.

b) Contractor shall perform all such tests as may be necessary to meet requirements of Local Authorities, Municipal or other statutory laws/ bye-laws in force. No extra shall be paid for these.

c) The Engineer-in-Charge may, at his sole discretion, carry out inspection at different stages during manufacturing and final testing after manufacturing.

d) Approvals or passing of any inspection by the Engineer-in-Charge or his authorized representative shall not, however, prejudice the right of the Engineer-in-Charge to reject the plan if it does not comply with the specification when erected or give complete satisfaction in service.

24. **TRAINING OF DEPARTMENT PERSONNEL**

a) The Contractor shall train the Owner's personnel to become proficient in operating the equipment installed. Training shall be done before the expiry of the defects liability period.

b) The period of training shall be adequate and mutually agreed upon by the Owner and Contractor.

c) The Owner's personnel shall also be trained for routine maintenance work and lubrication, overhauling, adjustments, testing, minor repairs and replacement.

d) Nothing extra shall be paid to the Contractor for training Owner's personnel.

25. **PERFORMANCE GUARANTEE**

At the close of the work and before issue of final certificate of virtual completion by the Construction Manager, the Contractor shall furnish a written guarantee indemnifying the Owner against defective materials and workmanship for a period of one year after completion and handing over. The Contractor shall hold himself fully responsible for reinstallation or replace free of cost to the Owner.

a. Any defective material or equipment supplied by the Contractor.

b. Any material or equipment supplied by the Owner which is proved to be damaged or destroyed as a result of defective workmanship by the Contractor.

SPECIFICATIONS FOR FIRE FIGHTING SYSTEMS

PIPING FOR WET RISER SYSTEM

Scope

This Section covers the details of requirement of piping used in wet riser system, including the associated auxiliary equipment.

General

The wet riser system shall remain pressurized at all times during operation, and as such the piping work shall be carried out to withstand the same.

Pipes and fittings

Pipes for Wet Riser system shall be of black steel conforming to IS: 1239 (Heavy Class)

Fittings for black steel pipes shall be malleable iron suitable for welding or tapered screwed threads.

Jointing

Joint for black steel pipes and fittings shall be metal to screw grid upto 65mm dia welded joints. A small amount of red lead may be used for lubrication and rust prevention in threaded joints.

Joints between C.I. or black steel pipes, valves and other appurtenances, pumps etc. shall be made with C.I. or M.S. flanges with appropriate number of bolts. Flanged joints shall be made with 3mm thick insertion rubber gasket.

Dia of Flange and Hole conforming IS:

Size of pipe	→	80mm	100mm	150mm	200mm	300mm
Dia of flange	→	200mm	220mm	285mm	340mm	445mm
Dia of bolt	→	16mm	16mm	16mm	16mm	16mm
No. of hole	→	4	4	8	8	12

Pipe Protection

a) All pipes above ground and in exposed locations shall be painted with one coat of red oxide primer and two or more coats of synthetic enamel paint of approved shade.

b) Pipes in chase or buried underground shall be painted with two coats of hot bitumen, wrapped with bituminised hessian cloth and finished with one coat of hot bitumen paint or with fiber glass tissue paper.

Pipe Supports

All pipes shall be adequately supported from ceiling or walls from existing inserts by structural clamps fabricated from M.S. structurals e.g. rods, channels, angles and flats. All clamps shall be painted with one coat of red lead and two coats of black enamel paint. Where inserts are not provided the Contractor shall used anchor fasteners.

Pipe Support Spacing	*Horizontal*	*Vertical*
Pipe upto 50 mm	2 Mtr	3 Mtr
Pipe 65 - 100 mm	1.75 Mtr	3 Mtr

Pipe above 100mm	1.50 Mtr	3 Mtr

Orifice Flanges

Contractor shall provide orifice flanges fabricated from 6mm thick stainless steel plates on the branch lines feeding different zones/floors so as to allow required flow of water at 3.5 Kg/sq.cm. pressure. The Contractor shall furnish design for these orifice flanges.

Air Vessel and Air release Valve

Air vessel on top of each wet riser piping shall be installed before execution for approval fabricated out of at least 8mm thick steel to withstand the pressure, with dished ends and supporting legs. This shall be of 250mm dia and 1m high. This shall be completed with necessary flange connection to the wet riser piping and air release valve with necessary piping to meet the functional requirement of the system. The air vessel shall be of continuous welded construction and galvanized to IS: 4736-1968. This shall be tested for twice the working pressure.

Valves, gauges and orifice plates

Sluice valves above 65mm shall be of cast iron body and bronze/gunmetal seat. They shall conform to type PN 1.0 of IS: 780-1980, valves upto 65mm shall be of gunmetal construction. Valve wheels shall be of right hand type and have an arrow head engraved or cast thereon the direction for turning open and closing.

Non return valves shall be of cast iron body and bronze / gunmetal seat. They shall be swing conform to Class 1 of IS: 5312 and have flanged ends. They shall be swing check type in horizontal runs and lift check type in vertical runs of piping. They shall not be spring loaded type.

Pressure gauge of suitable range shall be installed on the discharge side of each pump vacuum gauge shall be provided on suction side for pumps with negative suction. The dial size shall be 250mm. The gauges shall have brass cocks.

Orifice plates shall be of 6mm thick stainless steel to reduce pressure on individual hydrants to operating pressure of 3.5kg/sq.cm. Design of the same shall be given by the Contractor as per location and pressure condition of each hydrant.

External yard hydrants

External yard hydrants shall be of 'Stand Post' type conforming to IS: 908 - 1975 and comprise stand post for single outlet, duck foot bend, flange riser and single headed brass/gunmetal valve conforming type A of IS: 5290-1977.

The stand post column shall be of cast iron, cast in one piece, conforming to grade 20 of IS: 210 -1970 or M.S.pipe. The internal diameter at the top shall be at least 80mm.

The outlet shall be angled towards ground, with instantaneous spring lock type gunmetal female coupling of 63mm dia. for connecting to hose pipe.

Internal Hydrants

The internal hydrant outlet shall comprise 'single/double headed double outlet gunmetal landing valve' conforming to type A/B of IS: 5290-1977. Separate valves one on each of the two heads shall form part of the landing valve construction.

A brass cap with chain is provided on one head of the outlet which will have an instantaneous pattern female coupling for connection to the hose pipe. The landing valve shall be fitted to a tee connection on the wet riser at the landing.

First Aid hose reel equipment

First aid hose reel equipment shall comprise reel hose guide fixing bracket, hose tubing globe valve, stop cock and nozzle. This shall conform to IS: 884-1969. The hose tubing shall conform to IS: 1532-1969.

The hose tubing shall be 20mm dia and 30m long. The gunmetal /brass nozzle and globe valve shall be of 25mm size.

The fixing brackets shall be of swinging type. Operating instructions shall be engraved on the assembly.

Hose pipes, branch pipes and nozzles

Hose pipes:- Hose pipes shall be rubber lined woven jacketed 63mm in diameter and 15m long. They shall conform to type 2 (reinforced rubber lined) of IS: 639-1979. The hose shall be sufficiently flexible and capable of being rolled.

Each run of hose pipe shall be complete with necessary coupling at the ends of match with the landing valve or with another run of hose pipe or with Branch pipe. The coupling shall be of instaneouse spring lock type.

Branch pipe:- Branch pipe shall be of copper, gunmetal or aluminium alloy 63mm dia and be complete with male instaneouse spring lock type coupling for connection to the hose pipe. The branch pipe shall be externally threaded to receive the nozzle.

Nozzle :- The nozzle shall be of copper or gunmetal, 20mm in internal diameter. The screw threads at the inlet connection shall match with the threading on the branch pipe. The inlet end shall have a hexagonal head to facilitate screwing of the nozzle on to the branch pipe with the nozzle spanner.

End couplings, branch pipes, and nozzles shall conform to IS:903-1985. Each hydrant point will be provided with two hoses of 15m each and one gunmetal branch pipe.

Hose Cabinet

The hose cabinet to accommodate the hose pipes, branch pipe nozzle and the hydrant outlets shall be fabricated from 1.5mm thick sheet steel. In case of internal hydrants, this shall accommodate the hose reel equipment also. This shall have lockable, center opening glazed doors.

The scope of work includes provision of masonry or steel frame structure, as specified for installation. The hose cabinet shall be painted red stove enameled.

Fire Brigade inlet connections/ Draw off connection

One set of 2/4 way collector head Fire Brigade connection shall be provided at under ground sumps, sprinkler system and individual wet risers as specified.

The inlet to the wet riser sprinkler header shall be with 100/150mm dia sluice valve and non return valve. The scope shall include necessary reducers, tees bends and special fittings as required.

It should be provided with M.S. enclosure fabricated from 1.5mm thick M.S. sheet, front glass locking arrangement supported on M.S. structural members, painting with two coats of postal red enamel.

Fire Extinguishers

These shall be of make as specified. These shall be ISI marked.

ELECTRIC DRIVE, HORIZONTAL FIRE PUMPS

***Scope of* Work**

A. Work under this section shall consist of furnishing all labour, materials, equipments and appliances necessary and required to completely install electrically operated pumps as required by the drawings and specified hereinafter or given in the Schedule of Quantities.

B. Without restricting to the generality of the foregoing, the pumps and ancillary equipment shall include the following:

1. Electrically operated pumps with motors, base plates and accessories.

2. Alarm system with all accessories, wiring and connections.

3. Pressure gauges with isolation valves and piping, bleed and block valves.

4. M.S. pipes, valves, suction strainers, delivery headers and accessories.

5. Foundations, vibration eliminator pads and foundation bolts.

Quality Control

A. These shall comply with the IS Codes as specified.

Submissions

A. Product Manuals

B. Hydraulic Details

Storage

A. These shall be stored as delivered in original packings.

FIRE, SPRINKLER AND JOCKEY PUMPS

A. Pumping Sets

1. Pumping sets shall be single/multi stage horizontal centrifugal single outlet with cast iron body and bronze dynamically balanced impellers. Connecting shaft shall be stainless steel with bronze sleeve and grease-lubricated bearings.

2. Pumps shall be connected to the drive by means of spacer type love joy couplings, which shall be individually balanced dynamically and statically.

3. The coupling joining the prime movers with the pump shall be provided with a sheet metal guard.

4. Pumps shall be provided with approved type of mechanical seals.

5. Pumps shall be capable of delivering not less than 150% of the rated capacity of water at a head of not less than 65% of the rated head. The shut off head shall not exceed 120% of the rated head.

6. The pump shall meet the requirements of the Tariff Advisory Committee and the unit shall be design proven in fire protection services.

Electric Drive

A. Electrically driven pumps shall be provided with totally enclosed fan cooled induction motors. For fire pumps the motors should be rated not to draw starting current more than 3 times normal running current.

B. Motors for fire protection pumps shall be at least equivalent to the horse power required to drive the pump at 150% of its rated discharge and shall be designed for continuous full load duty and shall be design proven in similar service.

C. Motors shall be wound for class B insulation and winding shall be vacuum impregnated with heat and moisture resistant varnish glass fibre insulated.

D. Motors for fire pumps shall meet all requirements and specifications of the Tariff Advisory Committee.

E. Motors shall be suitable for 415 volts, 3 phase 50 cycles a/c supply and shall be designed for 38 deg. C ambient temperature. Motors shall conform to I.S. 325.

F. Motors shall be designed for two start system.

G. Motors shall be capable of handling the required starting torque of the pumps.

H. Contractor shall provide inbuilt heating arrangements for the motors for main pumps to ensure that motor windings shall remain dry.

I. Speed of the motors shall be compatible with the speed of the pump.

Air Vessel

A. Provide one air vessel fabricated from 10 mm M.S. plate with dished ends and suitable supporting legs. Air vessel shall be provided with a 100mm dia flanged connection from pump, one 25mm dia drain with valve, one gunmetal water level gauge and 15 mm sockets for pressure switches. The vessel shall be 300 mm dia x 1000 mm high and tested to 20 kg/sq.cm pressure.

B. The fire pumps shall operate on drop of pressure in the mains as given below. The pump operating sequence shall be arranged in a manner to start the pump automatically but should be stopped manually by starter push buttons only.

Operating Conditions for Fire & Sprinkler Pumps

		Cut in	Cut out
A.	*Operating pressure*	← ----------7.0 Kg/sq.cm ---------→	
	Jockey pump	6.00 Kg/sq. cm	7.0 Kg/sq.cm

Fire Electric Pump 1	5.75 Kg/sq.cm	manual
Fire Electric Pump 2	2.50 Kg/sq.cm	manual

B. *Notes*

1. Jockey pump shall start and stop through pressure switch automatically.

2. Jockey pump shall stop when main pump starts.

3. Main pump shall start automatically on fall of pressure but stopping shall be manual.

Vibration Eliminators

A. Provide on all suction and delivery lines double flanged reinforced neoprene flexible pipe connectors. Connectors should be suitable for a working pressure of each pump and tested to the test pressure given in the relevant head. Length of the connector shall be as per manufacturers details.

Installation

A. Pumps shall be installed true to level on suitable concrete foundations. Base plate shall be firmly fixed by foundation bolts properly grouted in the concrete foundations.

B. Pumps and motors shall be truly aligned by suitable instruments.

C. All pump connections shall be standard flanged type with appropriate number of bolts. In case of non-standard flanges companion flanges shall be provided with the pumps.

D. Manufacturer's instructions regarding installation, connections and commissioning shall be followed with respect to all pumps and accessories.

E. Contractor shall provide necessary test certificates and performance charts with NPSH requirement of the pumps from the manufacturer. The contractor shall provide facilities to the Architect or their authorised representative for inspection of equipment during manufacturing and also to witness various tests at the manufacturers works without any cost to the owners.

F. Each pump shall be provided with a 150mm dia pressure gauge, isolation cock and connecting piping, bleed and block valve.

G. Provide vibration eliminating pad and connectors for each pump.

The Contractor shall submit with this tender a list of recommended spare parts for two years of normal operation and quote the prices for the same.

DIESEL DRIVE, HORIZONTAL FIRE PUMPS

Scope of Work

A. Work under this section shall consist of furnishing all labour, materials, equipments and appliances necessary and required to completely install diesel

driven pumps as required by the drawings, specified hereinafter or given in the Schedule of Quantities.

B. Without restricting to the generality of the foregoing, the pumps and ancillary equipment shall include the following:

1. Diesel driven pumps with motors, base plates and accessories.

2. Alarm system with all accessories, wiring and connections.

3. Pressure gauges with isolation valves and piping, bleed and block valves.

4. M.S. pipes, valves, suction strainers, delivery headers and accessories.

5. Foundations, vibration eliminator pads and foundation bolts.

Quality Control

A. These shall comply with the IS Codes as specified.

Submissions

A. Product Manuals

B. Hydraulic Details

Storage

A. These shall be stored as delivered in original packings.

FIRE, SPRINKLER AND JOCKEY PUMPS

A. Pumping Sets

1. Pumping sets shall be single/multi stage horizontal centrifugal single outlet with cast iron body and bronze dynamically balanced impellers. Connecting shaft shall be stainless steel with bronze sleeve and grease lubricated bearings.

2. Pumps shall be connected to the drive by means of spacer type love joy couplings, which shall be individually balanced dynamically and statically.

3. The coupling joining the prime movers with the pump shall be provided with a sheet metal guard.

4. Pumps shall be provided with approved type of mechanical seals.

5. Pumps shall be capable of delivering not less than 150% of the rated capacity of water at a head of not less than 65% of the rated head. The shut off head shall not exceed 120% of the rated head.

6. The pump shall meet the requirements of the Tariff Advisory Committee and the unit shall be design proven in fire protection services.

Diesel Engine

A. Diesel engine shall be of 6 cylinders with individual head assemblies. The engine shall be water cooled and shall include heat exchanger and connecting piping, strainer, isolating and pressure reducing valves, bye-pass line complete in all respects.

B. Engineer shall be direct injection type with low noise and exhaust emission levels.

C. The speed of the engine shall match the pump speed for direct drive.

D. The engine shall be capable of being started without the use of wicks, cartridge heater, plugs or either at engine room temperature of 7 deg. C and shall take full load within 15 seconds from the receipt of the signal to start.

E. The engine shall efficiently operate at 38 deg. C ambient temperature at 50 m above mean sea level.

F. Noise level of the engine shall not exceed 105 DBA (free field sound pressure) at 3 m distance.

G. The engine shall be self starting type upto 4 deg. C and shall be provided with one 24 V heavy duty DC battery, starter, cut-out, battery leads complete in all respects. One additional spare battery shall be provided. The battery shall have a capacity of 180 to 200 ampere hours and 640 amps cold cranking amperage.

H. Provide a battery recharger of 10 to 15 amperes capacity with trickle and booster charging facility and regulator.

I. Annunciation panel shall be suitable for working on 24 volts D.C. Arrangement for starting shall be automatic on receiving the signal but shutting off shall be manual.

J. The engine shall be provided with an oil bath or dry type air cleaner as per manufacturer's design.

K. Engine shall be suitable for running on high speed diesel oil.

L. The system shall be provided with a control panel with push button starting arrangement also and wired to operate the engine on a differential pressure gauge.

M. The entire system shall be mounted on a common structural base plate with antivibration mountings and flexible connections on the suction and delivery piping.

N. Provide one fully mounted and supported day oil tank fabricated from 5mm thick M.S. sheet electrically welded with a capacity of 8 hours working load but not less than 200 lit. Provide level indicating gauge glass on the day oil tank and low fuel indication on the control panel.

O. Provide one exhaust pipe with suitable muffler (residential type) to discharge the engine gases to outside open air as per site conditions.

P. Provide all accessories fittings and fixtures necessary and required for a complete operating engine set.

Q. Contractor shall indicate special requirements, if any, for the ventilation of the pump room.

Operating Conditions for Fire & Sprinkler Pumps

	Cut in	Cut out
Operating pressure	← ----------7.0 Kg/sq.cm ---------→	
Jockey pump	6.50 Kg/sq. cm	7.0 Kg/sq.cm
Fire Electric Pump 1	5.75 Kg/sq.cm	manual
Fire Electric Pump 2	5.0 Kg/sq.cm	manual
Diesel Engine driven pump	4.50 Kg/sq.cm	manual

Note:- The diesel pump shall start automatically, on fall of pressure in the pipe line, in the absence of electric supply, but the stopping shall be manual.

Vibration Eliminators

A. Provide on all suction and delivery lines double flanged reinforced neoprene flexible pipe connectors. Connectors should be suitable for a working pressure of each pump and tested to the test pressure given in the relevant head. Length of the connector shall be as per manufacturers details.

Installation

A. Pumps shall be installed true to level on suitable concrete foundations. Base plate shall be firmly fixed by foundation bolts properly grouted in the concrete foundations.

B. Pumps and motors shall be truly aligned by suitable instruments.

C. All pump connections shall be standard flanged type with appropriate number of bolts. In case of non standard flanges companion flanges shall be provided with the pumps.

D. Manufacturer's instructions regarding installation, connections and commissioning shall be followed with respect to all pumps and accessories.

E. Contractor shall provide necessary test certificates and performance charts with NPSH requirement of the pumps from the manufacturer. The contractor shall provide facilities to the Architect or their authorised representative for inspection of equipment during manufacturing and also to witness various tests at the manufacturers works without any cost to the owners.

F. Each pump shall be provided with a 150mm dia pressure gauge, isolation cock and connecting piping, bleed and block valve.

G. Provide vibration eliminating pad and connectors for each pump.

H. The Contractor shall submit with this tender a list of recommended spare parts for two years of normal operation and quote the prices for the same.

POWER AND CONTROL PANEL AND OTHER CONTROL COMPONENTS

Scope

This section covers the detailed requirements of the power and the control panel for the wet riser system, and also for the various control components in the system.

Power and Control panel Constructional requirements

General Features:- The power and control panel shall be totally enclosed dust and vermin proof free standing floor mounted cubicle type, fabricated out of sheet steel not less than 2mm thick. Where necessary, additional stiffening shall be provided by angle iron frame work. General construction shall be of compartmentalisation and sectionalisation such as mains incomer, electric fire pump, diesel fire pump, pressurisation pump, priming pump and control, so that there is no mix up of power and control wiring and connections in the same sections as far as possible. The panel shall be front operated type with all connections accessible from the front. Front doors shall be hinged type. Back doors shall be hinged type or removable type for inspection. The door hinges shall be of concealed type, the doors shall be provided with quick fixing doors knobs with indication. The general arrangement of the panel shall be got approved before fabrication. The cubical construction shall be to IP 21 as per IS: 2147, painted with approved make and shade stove enamel paint, aluminium identification plate for each compartment danger plate surrounding of busbar and live contact parts, wiring diagram etc. red, white or black enamel coated aluminium plate to be fixed on visible location.

Cable entries and gland plates:-All cable entries shall be through double compression plates which are removable and stationalised. Necessary compression type glands shall also be provided. Where heavy cables are brought in and terminated, suitable clamps shall be incorporated to relieve the stress on the glands due to the weight of the cable. Cable entries may be from top or bottom depending on the equipment layout and cable scheme as approved.

Busbar and connections :- The busbars shall be air insulated and of aluminium of high conductivity electrolytic quality (grade E91 E to IS 5082) and of adequate cross section. Current deOwnery shall not exceed 1.6 sq.mm per amps. sq.cm. All connections to individual, circuits from the busbars shall preferably be with solid connections. The busbar and the connections shall be suitable covered with PVC sleeves or in an approved manner. Busbars shall be suitably support using non hygroscope insulated supports such that they may stand 50KA RMS symmetrical current for one second. High tensile bolts and spring washers shall be provided at busbar joints with red, yellow paint and neutral with black colour paint.

Earthing Arrangement:- GI strip 25mm x 5mm shall be run at the rear of the board, bonding all the sections suitably. 2 nos. earth terminals shall be provided at the ends of the GI strip for connection to earth system. Earth terminals shall be with a flexible loop and the hardware shall be of GI or passivated and plated iron.

Terminal Blocks and Small Wiring :- Terminal blocks shall be of heavy duty type and generally not less than 15Amps 250V grade upto 100V, and 600V grade for the rent of the functions. They shall be easily accessible for maintenance. All control wiring inside the panel shall be with PVC insulated copper conductor of 2.5 sq.mm size and 600 V grade

conforming to IS: 694-1977. Suitable colour cadying may be adopted. Wiring harness shall be neatly formed and run preferably function wise, and as far as possible segregated voltage wise. Identification ferrules shall be used at both ends of the wires.

Instruments and lamps: All indication lamps and instruments shall be flush mounted type in front of the panel. The voltmeter and ammeter shall be of size 100mm conforming to clause 1.5 of 1248 for accuracy.

Current transformers shall be provided with ammeters, wherever necessary.

Indicating lamps to indicate the availability of electric supply shall be provided at the incoming section. Necessary indicating lamps for alarm indications and battery charging shall be provided in the respective sections.

All indicating lamps and voltmeter shall be protected with HRC cartridge type fuses.

Labels :- All internal components shall be provided with suitable identification labels. Aluminium sheet engraved labels shall be fixed at the panel for all switches, instruments, push buttons, indicating lamps, danger plate etc.

Painting :- The entire panel shall be given a primer coat of red after degreasing and phosphating treatment and 2 coat of powder/stove enameled paint of approved shade before assembly of various items. The panels for the terrace pump shall be of cubic design. The specifications of powder and control panel for the wet riser shall be applicable for those panels, with controls and indications.

Equipment Requirements

General :- The power and control panel shall comprise individual section for the various equipments of the system and controls, in a combined cubical type design. Where particularly specified, totally independent panels for each equipment shall be provided in cubical design and the main equipment panel and the individual panels in such a case shall incorporate isolation arrangement of appropriate capacity. All switch fuse/ fuse switch units shall be to AC 23 duty to IS: 4064.

Incomer section :- The incoming section shall comprise :

(i) Fuse switch unit with HRC fuses, ammeter, voltmeter, selector switch set of phase indication lamps and fuses. (Fuse rating to suit consideration (i) below)

(ii) Aluminium busbars.

(iii) TP&N outgoing switch fuse unit with HRC fuses for electric fire pump. (Fuse rating to take continuously 250% of full load current of fire pump motor.)

(iv) TP&N outgoing switch fuse unit with HRC fuses for pressurization pump, priming pump and terrace pump (where specified) and for local lighting control.

(v) TP&N switch fuse unit with HRC fuses for battery charger unit control.

(vi) TP&N switch fuse unit with HRC fuses outgoing (spares, as specified.)
Note : - Terminal blocks, inter-connections, labels etc. as necessary.

Electric Fire Pump Section:- This section shall incorporate the following facilities.

(i) TP&N isolator

(ii) Control system components and equipment such as relays, Contractors, timers etc. for automatic operation.

(iii) Starter Unit, Current Transformer and Ammeter.

(iv) Indication lamps, their fuses, terminal block, push bottons, control and selector switches etc. as required.

(v) Pump lock out devices due to faults or abnormalities as specified.

(vi) Visual/audio alarms, indications and communications facility as specified.

(vii) Necessary inter connection control and power cable work, cable glands, lags and internal wiring and connections.

Engine Section :- The engine section shall incorporate the following facilities.

(i) Control system components and equipment such as relays, Contractors, timers etc. for automatic operation.

(ii) Instruments, indicator lamps, fuses, terminal blocks, push buttons, control and selector switches etc. as are required.

(iii) Engine shut down and block out devices due to faults or abnormalities as specified.

(iv) Visual /audio alarm indication and enunciator facility as specified.

(v) Inter-connection control and power cable work, cable glands, lags, all internal wiring and connection etc.

Jockey Pump Section :- Each of the auxiliary pump section for pressurization and priming pump shall incorporate the following :

(i) TP&N isolator.

(ii) Control system components such as relays, times, Contractors etc. as are necessary for functional requirements.

(iii) Starter unit, current transformer and ammeter.

(iv) Indication lamps, fuses, terminal blocks, push buttons selector, switch etc. as required.

(v) Inter-connections, power and control cable work, cable plants lugs, internal wiring and connections.

(vi) Low water level alarm for terrace tank, where provided.

Control Section :- This section shall incorporate the following:

(i) Control components integrating the various sections, so as to satisfy the functional requirements.

(ii) Battery charger unit with boost/float charge facility with voltmeter, capable of independently charging 2 sets of batteries at a time.

(iii) Visual/audio alarms, not covered in individual sections.

(iv) Lamps healthy test facility.

(v) Instruments, indicating lamps, push buttons, fuse terminal blocks etc. as are required.

(vi) Test facility to stimulate operation of hydrants.

Other Control Components

Pressure Switches :

Pressure Switches shall be provided for switching on and off the pressurization pump at present pressures and also for switching of the fire pump at priest pressure. Being the main component for initiating the signal for the operation of the pumps, the pressure switches shall be totally reliable, sturdy in construction and of long life. The pressure settings shall be adjustable.

Low Water Level Indication and Switch :

To prevent the dry running of the fire pumps due emptying of the static tank, a water level indication and switch shall be provided. This shall trip the electric motor or stop the diesel engine, as the case may be when the water level goes below a present level. This shall also furnish a distinct low water level audio visual alarm. This should indicate the level of water at different stages is the power and control panel.

Power Supply for Controls:

In order ensure that the control systems remains co-operational at all times, the control system shall be designed for 24 VDC operation, fed from 24V wet battery. This shall be independent of the starting battery for the engine i.e., battery shall remain trickle charged at all times from the common battery, charges at the control section.

ELECTRICAL WORK AND EARTHING

Scope

This section covers the detailed requirements of electrical works including earthing, for the materials installation.

Electric power supply shall be terminated in the incoming switch gear of the power and control panel by the electrical contractor approved by the Owner/Department. All further connections to the various components of the riser system shall be the responsibility of the Contractor, for a complete and working system satisfying all the functional requirements.

The scope shall particularly include the following:

All inter-connections with multi-core armoured copper cables of size as approved between various control units and control panel(s).

All power cable connections with multi-core armoured aluminium cables of size as approved between panels motors etc. either clamped on all run on cable trays or laid in duct etc. as the case may be. Trays, clamps, supports and all labour shall be inclusive within the quoted cost.

Necessary earthing with 2 Nos. G.I. pipe electrodes and loop earthing.

The work shall be carried out conforming to CPWD General Specifications for electrical works Part-I (Internal) 1994 amended upto date and Part II (External) 1994 amended upto date.

INSTALLATION AND TESTING

Scope

This section covers the requirements of installation of the various components of the wet riser system.

A survey of the site of the work shall be made by the Contractor before preparation of the detailed drawings for submission to the department for approval. The installation shall be carried out strictly in accordance with the approved drawing.

The scope of installation work shall include the following, where or not expressly mentioned in the schedule of work.

i. Cement concrete (1:2:4mix) foundation for all pump sets.

ii. Vibration isolation arrangement for all pump sets.

iii. Filling up the hole in flooring with cement concrete, after laying the wet riser pipes.

iv. Necessary supports and clamps for wet riser pump room.

v. Necessary supports and clamps for wet riser plumbing the building.

vi. Supporting bracket/frame work for the fuel oil tank of the engine.

vii. Excavation of the earth, consolidation and refilling after laying of wet riser piping in ground.

viii. Provision of necessary brick base or intermediate support as required in approved manner in case of soils which are no strong enough to support the pipes, thereby likely to case different settlement.

ix. Necessary anchor block of ample dimensions in 1:2:4 cement concrete at all bends, tee connections, foot of the wet riser, and other places as required to stand the pressure thrust in pipes.

x. Necessary masonry work/steel work for supporting hose cabinets near external (yard) hydrants.

xi. Valve chambers of approved design with external (yard) hydrant.

xii. Ground level hydrants of approved design, where specifies.

xiii. Cutting and making good the damages for the installation work of the riser system

xiv. Strainers and foot valves for pumps with negative suction and strainers for pumps with positive suction.

xv. All the required control piping, exhaust piping (5m long) from engine, oil piping for fuel oil and lubricating oil for the engine, drain piping from the pumps to the drain pint in the pump room, overflow piping from priming tank to the sump. The piping work shall include all necessary fittings, valve and accessories for effective functional requirements.

xvi. Inter-connecting cable work with controls, control panel, batteries etc. including battery leads.

xvii. Orifice plates at individual hydrants, as required.

Where provision of GI/MS pipe shall below ground become inescapable as indicated in 6.1, it shall be protected from soil corrosion by 2 coats of coal tar hot enamel paint and 2 wraps of reinforced fiber glass tissue or bitumenised horizon.

Each CI pipe/GI pipe shall be subjected to hydraulic pressure test before installation, in presence of the Engineer-in-charge or his authorised representative.

External (yard) hydrants shall be located at least 2m away from the face of the buildings but not more than 15m and be accessible.

Where external hydrants below ground level are specifically indicated in tender specifications, there shall be enclosed in masonry or cast iron structure of size 75cm^2 and 8cm above ground level. The hydrant shall be with in 8cm from the top of the enclosure.

Necessary facility for draining the rise pipe shall be provided at ground floor level with 40mm size sluice valve.

Internal hydrants at each floor shall be located at about 1m above floor level.

Valve chambers shall be of 1m^2 in size, with cover.

Hoses and Hose Cabinet

All hoses shall be numbered and a record submitted with completion plane. The number and length shall be easily recognizable on each hose pipe.

External hose boxes shall be installed such that the hose is not exposed to sun rays.

Painting

Painting of the entire wet riser piping over the ground shall be done with anti corrosive primer and 2 coats of approved paint. The colour shall be red to shade No. 536 of Is 5/1961. Paint shall conform to IS: 2932 / 1964.

The pumps and engine shall be painted after installation with a coat of approved paint to similar shade as per original supply.

Testing of the system

After laying and jointing, the entire piping shall be tested to hydrostatic test pressure. The pipes shall be slowly charged with water so that the air is expelled from the pipes. The pipes shall be allowed to stand full of water for a period of not less than 24 hours and then tested under pressure. The test pressure shall be 10kg/cm^2. The test pressure shall be applied by means of manually operated test pump or by a power driven test pump to be provided by the Contractor. In either case precautions shall be taken to ensure that the required test pressure is not exceeded.

The open end of the piping shall be temporarily closed for testing.

Test shall be conducted on each pump set after completion of the installation with respect of delivery head, flow and B.H.P. The test shall be carried out by the Contractor at his own cost.

All leaks and defects in different joints noticed during the testing and before commissioning shall satisfaction of Engineer-in-charge.

Testing of fittings/equipments shall be carried out either at site or at works in the pressure of a representative of the Department. Test certificates shall also be furnished by the Contractor.

The automatic operation of the system for the various functional requirements and alarms as laid down in his specification shall be satisfactory carried out on pressure of the Engineer-in-charge.

Approval by Local Bodies

It shall be the responsibility of the Contractor to obtain the approval of drawings and to get the installation inspected and approved by the concerned authorities as may be necessary as per local by laws, any fee payable to the local bodies for such activities shall also be borne by the Owner on production of receipts for money paid and the other expenses will be borne by the Contractor.

Pipe Work associated with Diesel Engine :

Pipe works for fuel system, lub. oil system and exhaust system shall be complete with all required supports, clamps, hangers etc. for a complete work.

Fuel feed is by gravity and the fuel tank shall be located at least 60cm above the fuel injection pump.

Fuel pipe of copper shall not be soldered but brazed or welded.

No valves or cocks shall be provided in the fuel feed line to engine from the fuel tank.

Precautions shall be taken to prevent any air locks in any part of the fuel system. No air relief cock shall be permitted and where inescapable, screwed plugs shall be provided for the purpose.

The installation of the fuel supply system shall be such that a completely primed condition is maintained, free from air lock.

Filters shall be provided in fuel oil and lub. oil circuits allocations that are easily accessible for maintenance.

Wet Riser Pipe Work :

The suction line for each pump shall be independent.

No sluice valve shall be provided in suction line, where the pump is located above the water level in the sump foot valve and strainer shall however be provided.

Sluice valve shall be provided in situation line, where the pump is located below the water level in the sump, strainer at the suction end shall be provided.

Each external (yard) hydrant shall be controlled by a sluice valve at ground level.

Sluice valves shall be kept in open position and the scope of work includes provision of necessary leather strap and pad lock so as to prevent unauthorized closing of valve.

The installation work includes provision of all clamps, supports, anchors etc.
Spacing between vertical supports shall not exceed 1.5m and horizontally at 2m upto 50mm and 1.5m for higher diameters. Clamps shall be provided on either side of the Tee joints for internal hydrants. Necessary anchors/ thrust pads shall be provided as approved at locations of bends, tees etc. as required within the scope of work.

Under ground pipes of the wet riser system shall be laid 1m below ground level and at least 2m away from the face of the buildings. The run of piping shall be preferably along roads and foot-paths and shall not be under buildings. Where specifically indicated to cross buildings, these shall be laid in masonry trenches with removable covers. With cut off valves at the entry and exit points.

STANDARDS AND CODES

1.	IS 1648	Code of practice for fire safety of building (general) fire fighting equipment and maintenance.
2.	IS 3844	Code of practice for installation of internal fire hydrant in multistorey buildings
3.	IS 2217	Recommendations for providing first aid and fire fighting arrangement in public buildings.
4.	IS 2190	Code of practice for selection, installation and maintenance of portable first aid fire appliances.
5.	Part IV, fire fighting	National building code
6.	IS 5290	External fire hydrants
7.	IS 5290	Internal landing valves
8.	IS 904	2 & 3 way suction collecting heads
9.	IS 884	First aid hose reel
10.	IS 5132	High pressure rubber pipe
11.	IS 1537	C.I. Double flanged pipes
12.	IS 1538	C.I. Double flanged fittings
13.	IS 780	C.I. Sluice valves and Gunmetal valves
14.	IS 934	Specifications for portable chemical fire extinguisher soda acid type.
15.	IS 2873	Specifications for fire extinguisher of Carbon-di-oxide.

LIST OF APPROVED MAKES OF MATERIALS FOR FIRE-FIGHTING WORKS

It may please be noted that the contractor shall use approved makes of materials. The final selection of materials, out of the approved makes of materials or otherwise to be used at site shall rest with the Employers and it shall be binding on the contractor . The contractor shall get the samples of all times, not covered in the approved makes, approved from the Employer/Architect before commencing the supply.

S.No.	Material	Conforming to IS No.	Brand Names
1	M.S. / G.I. Pipes	1239	TATA
			Jindal- Hissar
			Jindal Star
2	G.I. Fittings (malleable cast iron)	1879(Part I to X)	R' , Zoloto, Unik.
3	Forged steel fitting		VS/Sant
4	Sluice Valve		Kirloskar
			IVC
5	Ball valve (Gunmetal/white metal)		Leader
			Zoloto
6	Fire hydrant valves and branch pipe	5290	Minimax
			Newage
			Safex
7	Canvas RRL Fire hose	636 II	Jayshree
			Newage
			CRC
8	First aid hose reels drum	884	Minimax
			Newage
			Safex
9	Rubber hose(20mm)	5132	Deep Jyoti
			Maruti
10	Fire pumps		Mather & Platt
			Kirloskar
			Crompton Greaves
11	Motors		Kirloskar
			Siemens
			Crompton Greaves
12	Diesel Engine		Kirloskar Oil
			Cummins/Ashoka Leyland
13	Cables		
a)	Control cables		Gloster
			Cable Corporation Of India
			Finolex
b)	Power cables		Gloster

S.No.	Material	Conforming to IS No.	Brand Names
14	Fire extinguishers		Minimax
			Newage
			Nitin
15	Switchgear		Siemens
			L&T
			GE Power
16	Contactors		Siemens
			L&T
			GE Power
17	MCCB		Siemens
			L&T
			GE Power
18	Terminal Block		Elmex
			Wago
19	Pressure Gauge		Fiebeg
			H. Guru
20	Flow switch		System Sensor
			Potter
21	Pressure switch		Indfoss
			Switzer
22	Vibration Isolator		Resistoflex
			Kanwal
23	Current Transformer		AE
			L & T
24	Meters		AE
			Rishab
			Meco
25	Indicating Lamps/ Push buttons		Siemens
			L&T
			GE Power
26	Selector switch		Kaycee
			Salzer
27	C.I. Butterfly valves	13095	Audco
			Zoloto
			KSB
28	Dual Plat types non-return valves		Audco
			C & R
			KSB
29	Gate valve(Gunmetal)		Leader

S.No.	Material	Conforming to IS No.	Brand Names
			Zoloto
30	C.I. Double flanged sluice valve	780	Kirloskar
			Indian Valve Company
31	C.I. Double flanged non-return	5312	Kirloskar
			Indian Valve Company
32	Installation valve		HD
			Spraysafe
			Mather & Platt
33	Protective tape		IWL (Pypkote)
			Rustech Products (Coatek)
34	Enamel		Asian
			Nerolac
			ICI
			Berger
35	Primer		Jenson
			Nicholson
			Berger
36	Fastners		Hilti
			Fischer
37	Welding rods		Advani
			Oerlikon
			ESAB
38	Standpost hydrant	908	Minimax
			Safex
			Newage
39	Battery		Exide / Amco - yuasa

I) SPECIAL CONDITIONS OF CONTRACT: (ELECTRICAL WORK)

1.0 GENERAL

These special conditions are meant to amplify the specifications and General Conditions of Contract. If any discrepancy is noticed between these conditions, General Conditions of Contract, Specifications, Bills of Quantities and Drawings, the most stringent of the above shall apply for execution of the work as per decision of Engineer-in-charge (Client's representative) at site.

The materials, design and workmanship shall satisfy the specifications contained herein and Codes referred to. Where the technical specifications stipulate the requirement in addition to those contained in the Standard Codes and specifications those additional requirements shall also be satisfied. In the absence of any Standard/ Specifications covering any part of the work covered in this tender document, the instruction/ directions of Client/Project Engineer will be binding on the contractor.

The scope of this section is to describe materials and systems for complete electrical installations of building which form together with the project documents, a complete volume of work and quality description.

All electrical installation shall be of high quality, safe, complete and fully operational including all necessary items and accessories whether or not specified in detail. All electrical work shall be completed in accordance with the regulations and standards to the satisfaction of the Client/Consultants. The general provisions, special provisions and general requirements apply to the entire installation.

The work shall be carried out simultaneously with building work and shall be continued till it is completed satisfactorily along with the completion of essential portions of the building works.

During the progress of work, completed portion of the building may be occupied and be put to use by the owner but the contractor shall remain fully responsible for the maintenance of electrical installations till the entire work covered by this contract is satisfactorily completed by him and handed over to the owner.

2.0 OWNER & SERVICES CONSULTANTS:

The Architect & Services Consultants for the subject work are:

ARCHITECT:
M/s. VIJAY GUPTA ARCHITECTS
603, Chiranjiv Tower 43,
Nehru Place, New Delhi .
TEL: 011-26414763, 26465428, 26410790
E-mail: mail@vga.co.in

3.0 SCOPE OF WORK

3.1.0 The scope under this contract shall include the internal electrical installation for the proposed project. The work to be carried out under this contract shall cover the supply, installation, testing and commissioning of the complete electrical installation as detailed herein under and shown in the drawings and specifications.

In general the work to be performed under this contract shall comprise of the following :

a) Supply, installation, testing and commissioning of H.T. switchgear, H.T. Cables, Transformers, cabling, earthing and associated works.

b) Supply, installation, testing and commissioning of H.T./L.T. cables and cable trays.

c) Supply, installation of substation safety equipments.

d) Supply, installation, testing & commissioning of earthing system.

e) Dismantling & removal of existing equipments.

f) Obtaining approvals from the electrical inspectorate and all other statutary authorities for the complete scope of work as described above like pollution control board etc.

g) Liaison work with Electrical Authority for obtaining approval and electricity supply connection.

Contractor shall carry out and complete the said work under this contract in every respect in conformity with the current rules and regulations of the local electricity authority. The contractor shall furnish all labour and install all materials, appliances, equipment (except those items which will be supplied by the Owner to the contractor at site), necessary for the complete provision and testing of the whole electrical installation as specified herein and shown on the drawings. This also includes any materials, appliances, equipment not specifically mentioned herein or noted on the drawings as being furnished or installed but which are necessary and customary to make complete installation with all outlets for power, light, telephone conduits, street lighting and other electrical systems shown on the schedule and described herein, properly connected and in working condition.

The work shall include all incidental jobs connected with electrical installation such as excavation in trenches and back filling, cutting/drilling and grouting for fixing of fixtures, equipment, making good the damages etc.

If any breakage of finished walls or floors are done after the other agencies completed their work, electrical contractor shall bear all expenses towards redoing & finishing the same to the satisfaction of Client/Consultants.

4.0 RATES:

4.1.0 The rates quoted shall be deemed to allow for all minor extras and constructional details which are not specifically shown on drawings or given in the specifications but are essential in the opinion of the Client/Consultants to the execution of works to conform to good workmanship and sound engineering practice. The Client/ Consultants reserve the right to make any minor changes during the execution without any extra payment.

4.1.1 The Consultants decision to clarify any item under minor changes, minor extras and constructional details shall be final, conclusive and binding on the Contractor.

4.1.2 The rates quoted by the Contractor shall be net so as to include all requirements described in the contract agreement and no claim whatsoever due to fluctuations in the price of material and labour will be entertained.

4.1.3 The rates quoted by the Contractor shall include for supplying material and labour separately for completing the work in the best and most workmanship like manner to the satisfaction of the Client/Consultants and which in the opinion of the Consultants cannot be made better. The rates

shall be complete in all respects including cost of materials, erection, fabrication, labour, supervision, tools and plant, transport, sales and other taxes, royalties, duties and materials, contingencies, breakage, wastage, sundries, scaffoldings, etc on the basis of works contract. The rates quoted shall also include work contract tax, insurances, octroi, or any other levies applicable under the statute.

4.1.4 In case the rates of identical items under different sub-heads/parts are different, the lowest of these will be taken for the purpose of making the payments.

4.1.5 The rates for different items are for all heights, depths, widths and positions, unless otherwise specified against the item. No claim in respect of any leads/lifts for any item specified in the Schedule of Quantities, for which separate items for lead/lift do not exist in that schedule, will be entertained.

4.1.6 The work shall be executed as per the programme drawn or approved by the Client and it shall be so arranged as to have full co-ordination with any other agency employed at site. No claim for idle labour shall be entertained nor shall any claim on account of delay in the completion of the work be tenable except extension of time secured by the contractor on request to be submitted to the Client.

4.1.7 The Contractor shall permit free access and afford normal facilities and usual convenience to other agencies or departmental workmen to carry out connected work or other services under separate arrangements. The Contractor will not be allowed any extra payment on this account.

4.1.8 The contractor shall provide all equipments, instruments, labour and such other assistance required by the Architect/Consultant for measurement of the works, materials etc.

4.1.9 Even though the payment shall be effected under different items in the schedule of quantities, the various items in the schedule of quantities shall be deemed to cover all aspects of the work for the completion of the work as per drawings, from excavation to the finishing not withstanding any space adjustment possible omission in the description of the item and specifications thereof regarding incidental items of work, without which the whole work cannot be deemed to have been included under the scope of the different items of the schedule of quantities. The Contractor is advised to keep this in mind while quoting rates as no claims in this regard shall be entertained.

5.0 AWARENESS OF SITE CONDITIONS AND CARRYING OUT OF SITE INSPECTION PRIOR TO TENDER SUBMISSION

Prior to the preparation and submission this Tender, the Contractor shall make visits to the site and carry out all the necessary inspections and investigations in order to obtain all information and to make his own assessment of the conditions and constraints at site, including the means of access to it. The Contractor shall make himself aware of all the features of the site and the working conditions and space and shall, in general, be responsible for obtaining all the necessary and requisite information needed for him to prepare and submit his Tender.

Should the Contractor require any clarifications he shall seek these in writing from the Client before submitting his Tender. At no stage will any extra claims be entertained or allowed on any matter or for any reason arising from or as a consequence of the Contractor's failure to comply with all the requirements stipulated in this Clause.

6.0 WORK AND WORKMANSHIP

6.1.0 To determine the acceptable standard of workmanship, the Client/Consultant may order the Contractor to execute certain portions of works and services under the close supervision of the Client/ Consultant. On approval, these items shall be labelled by them as guiding samples so that further works are executed to conform to these samples.

7.0 APPROVAL BY STATUTORY BODIES

The complete electrical installation shall be in conformity with the Tender Specification and shall comply with the statutory regulations and requirements. Contractor upon the award of work shall immediately bring to the notice of Client/Consultants, any item not in compliance with statutory regulation. He shall be responsible to obtain the approval of the drawings and installation from the statutory bodies and Chief Electrical Inspectorate.

8.0 FEES, PERMITS AND TESTS

The Contractor shall pay necessary fees and obtain approval of drawings and installation from the concerned authorities. If he does not happen to be a Licenced contractor in the State of Delhi, he shall register himself & obtain necessary licence to execute the subject work in compliance with statutory requirements. Contractor shall be responsible for getting all the protective relays and energy meters tested and calibrated by authorised agencies of Government of Delhi at his cost. On completion of the work the contractor shall obtain and deliver to the Client/Consultants certificates of final inspection and approval by the local electric supply authority and the electrical inspector. All the legally payable fees for application/approvals shall be borne by the client on production of treasury challans.

9.0 CO-ORDINATION WITH OTHER CONTRACTORS AND AGENCIES

The Contractor during the execution of the Works shall co-ordinate with other Contractors, and other Agencies associated with the Project and shall work in harmony with them without causing any hindrance or obstruction or impeding the progress of their work in any way.

In respect of the work of other Contractors and Agencies, where the commencement or progress of such work of any other Contractor, or Agency is dependent upon the completion of particular portions of the Contractor's Works or generally upon the Contractor maintaining progress in accordance with the approved co-ordinated construction programme, it shall be the responsibility of the Contractor to complete such portions and maintain such progress.

Should any differences arise between the Contractor and the other Contractors, and Agencies, these shall immediately be brought to the attention of the Client/Consultants who after reviewing the matters causing the differences will give his decision which shall be final and binding on the Contractor.

9.1 Co-ordination with Fire Protection System Contractors

9.1.1 To collect all relevant information regarding requirement of location of and power supply to panels.

9.1.2 To co-ordinate light fixtures and cable trays in relation with sprinkler and hydrant pipes.

9.2 Co-ordination with Civil Contractors

9.2.1 To prepare detailed drawings for related electrical works in accordance with the civil construction drawings.

9.2.2 To provide all pipes, boxes, sleeves, insert plates, supports, openings etc., necessary for the electrical installation in compliance with construction programme.

9.2.3 To co-ordinate with the civil work contractor, especially with regard to conduit placing in slabs & walls, switch boxes, switch plates, chasing etc.,

9.3 Co-ordination with HVAC Contractor

9.3.1 To collect all relevant information regarding the location and power requirements for AHUs, FCUs, Ventilation fans, exhaust fans, pumps etc.,

9.3.2 To co-ordinate bus duct crossing of pipes & ducts.

9.3.3 To co-ordinate the lighting, cable tray and conduit layout with regard to ducting, piping and ventilation system layout.

9.4 Co-ordination with Sanitary & Water Supply Contractor

9.4.1 To collect all the relevant information regarding the location and power requirement of pumps, panels etc.,

9.4.2 To co-ordinate bus duct crossing of pipes.

9.4.3 To co-ordinate light fixtures, cable tray routing with regard to sanitary & water supply pipes.

9.5 Co-ordination with Elevator Contractors

9.5.1 To collect all relevant information regarding power and exact location of elevator panels.

9.5.2 To provide adequate lighting and earthing in elevator shaft and machine room.

9.6 Co-ordination with Building Automation and Security System Contractor

9.6.1 To provide power supply for equipments at locations where required.

9.6.2 To provide cable trays and conduit pipes as required.

9.7 Co-ordination with Telephone Contractor

9.7.1 To collect all relevant information regarding the requirement of services to be provided to the telephone contractor and to incorporate this information in shop drawings.

9.7.2 Provide cable trays & conduits, boxes, outlets etc., for telephone system where called for.

9.7.3 To provide power supply to telephone equipments in the location where required.

10.0 ASSOCIATED CIVIL WORKS

Following civil works associated with electrical installation are excluded from the scope of this tender. These shall be executed by other agencies in accordance with approved drawings and under direct supervision of electrical contractor.

10.1 RCC foundation for electrical panels.

10.2 Metal insert plates to be embedded in ceiling for supporting services.

11.0 VARIATION IN QUANTITIES:

11.1.0 The quantities shown in BOQ are indicative and may vary to the any extent .

If required the Contractor shall have to execute additional works within the project site to any extent of the variation in contract sum. No adjustment of rates shall be made up to this limit of variation in quantities and the terms and conditions of the contract shall remain unaltered.

12.0 RESTRICTED AREA:

12.1.0 For all purposes of this contract the site is considered as a Restricted Area. The Contractor shall ensure that he obtains entry passes for all his workmen and employees. The Contractor shall obtain special permission in writing from the Owner if he desires to continue working beyond office hours or on Holidays. The Contractor shall also observe and abide by the security regulations applicable during the currency of the contract.

13.0 PROTECTION OF OTHER CONTRACTOR'S WORKS AND SAFETY OF PERSONNEL AT SITE

Since many other contractors and agencies will be engaged on site and working simultaneously, the Contractor shall ensure at all times that during the execution of his work or during the operations and movements of equipments and supply vehicles and machinery, no damage or injury is caused to the work or property or personnel of other contractors and agencies.

In case of any such loss or damage the Contractor shall take full responsibility for same and shall bear all cost and expenses thereof. Also, the Contractor shall be responsible and liable for all delays caused due to such damage and or injury and for the consequences which the other Contractors and Agencies may have to face or to which they may be subjected to or be accountable for as a result of such delays.

14.0 SAFETY OF MATERIALS

The contractor shall provide proper and adequate storage facilities to protect all the materials and equipment including those issued by the owner against damage from any cause whatsoever.

15.0 MATERIALS SUPPLIED BY THE OWNER

The Contractor shall conduct all checks and carry out all tests and obtain test certificates necessary to ascertain and ensure that the Owner supplied materials are in conformity with the requirements stipulated in the Contract Documents. Should any of the Owner supplied materials obtained from any supplier not be in conformity with the requirements stipulated in the Contract Documents then the Contractor shall not take acceptance of such materials and he shall not incorporate them in the Works unless so specifically authorised by the Client/Consultants and it shall be the Contractor's responsibility to bring this matter to the immediate attention of the Client/Consultants and seek his instructions in respect of the disposal of such materials. Should the Contractor fail to comply with this procedure then all costs and/or delays which are a result and consequence thereof shall be to the account of the Contractor.

With respect to reconciliation of Owner supplied materials, the quantities of such materials allowed towards consumption for the Works by the Contractor shall be the theoretical requirement plus permissible wastage. The theoretical requirement shall be determined by measurements made in accordance with the dimensions shown on the Drawings to which the Works shall be executed. Owner supplied materials used due to any reason whatsoever for replacement and/or rectification work shall not be deemed to be theoretical requirement, and the costs in respect of these materials used for such work shall be borne by the Contractor.

16.0 TOOLS, TACKLES, EQUIPMENTS & SCAFFOLDING

All tools, tackles & equipments necessary for the electrical installation and testing shall be provided by the contractor. The quoted rates shall take into account for providing any such equipment, which may not form part of the installation, but are necessary for the execution of the job. Contractor shall be responsible to make his own arrangement to provide

scaffolding/supports etc., necessary for his work. However the contractor may use the civil contractors scaffoldings if available with prior understanding with the civil contractors.

17.0 ACTUAL ROUTE OF CABLES AND CONDUITS

The location of the conduits, cables, panel boards etc., indicated in the drawing is only indicative. The actual route of cables and conduits may differ from the plans according to the details of the building construction and the conditions of executions of the installations.

The contractor shall supply and install at his expense all secondary materials and special fittings found necessary to overcome the interference and to supply the modifications on the route of cables and conduits that are found necessary during the work, to the complete satisfaction of the Client/Consultants.

18.0 DRILLING/CUTTING

The contractor shall have to do all drilling and cutting of walls or other elements of the building for the complete and proper installation of the conduits, cable, panel boards and other equipments by using electrically operated tools. Manual drilling or chisseling shall be permitted on special request only.

Beams, girders and other principal structural members shall not be cut or drilled unless prior permission has been granted by the Client/Consultants.

If such drilling and cutting are made on finished surfaces, any marring of the surfaces shall be made good by repair at the electrical contractor's expense.

19.0 PLASTERING OF WALL CHASES/OPENING ETC.,

All chases and openings made by the contractor for his conduits, boxes etc., shall be filled/covered over with cement plaster in reasonable manner, to be finished by the civil contractor.

Before rough plastering on the conduit surface the concealed conduits shall be secured to the wall by using saddles and nails.

20.0 MANUFACTURERS

Where manufacturers have furnished specific instructions relating to the materials used in this job, covering points not specifically mentioned in these documents, these instructions shall be followed in all cases.

Where manufacturer's names and/or catalogue numbers are given, this is an indication of the quality, standards and performance required.

For items not covered under the `List of Approved Makes', contractor shall offer items of first class quality, standards and performance and obtain the approval of Client/Consultants before procuring them.

Where interfacing occurs, equipment shall be mutually compatible in all respects.

21.0 RATING

Rating of all items shall be appropriate for the conditions on the particular site on which the item will be used. All the equipment shall be fit for continuous work under the most severe conditions of site and shall be rated for the following ambient condition.

- Outdoor temperature 45^{o}C

- Temperature under shade 42^{o}C

22.0 INSPECTION AND TESTING

The Client reserves the right to request inspection and testing at manufacturer's works at all reasonable times during manufacture of items for this contract. Tests on site of completed works shall demonstrate, among other things :

22.1 That the equipment installed complies with specification in all particulars and is of the correct rating for the duty and site conditions.

22.2 That all items operate efficiently and quietly to meet the specified requirements.

22.3 That all circuits are correctly protected and that protective devices are properly coordinated.

22.4 That all non-current carrying metal parts are properly and safely grounded in accordance with the specifications and Codes of Practice.

The contractor shall provide all necessary instruments and labour for testing, shall make adequate records of test procedures and readings, shall repeat any tests requested by the Client/Consultants and shall provide test certificates signed by a properly authorised person. Such test shall be conducted on all materials and equipments and on completed work as called for by the Client/Consultants.

If it is proved that the installation or part there of is not satisfactorily carried out then the contractor shall be liable for the rectification and retesting of the same as called for by the Client/Consultants at the cost of the contractor. The Client/ Consultants decision as to what constitutes a satisfactory test shall be final.

The above general requirements as to testing shall be read in conjunction with any particular requirements specified elsewhere. All tests shall be carried out by a test house approved by the Client/Consultants.

23.0 TEST CERTIFICATES

The contractor shall submit test certificates for all the major electrical equipment such as circuit breakers, CTs, PTs, instruments, relays, busducts, rising mains, busbars etc., and panel as a whole, issued by Central Power Research Institute, Bangalore/Bhopal. Type tests shall be carried out as per relevant standards issued by Bureau of Indian Standards. For other items, such test certificates issued by Government recognised inspection office certifying that all equipment, materials, construction and functions are in compliance with the requirements of these specifications and accepted standards of BIS/International standards.

Calibration and test certificates of relays and meters issued by the Meter and Relay Testing Department of Tamil Nadu State Electricity Board Contractor.

24.0 SAMPLES AND CATALOGUES

Before ordering the material necessary for these installations, the contractor shall submit to the Client/Consultants for approval, a sample of every kind of material such as cables, conductors, conduits, switches, socket outlets, circuit breakers, lighting fixtures, boxes etc., along with the catalogues with their dimensional details.

For major items such as sub lighting panels distribution boards, the submission of drawings/catalogues along with technical details shall be enough. Prior to ordering any electrical equipment/material/system, the contractor shall submit to the Client/Consultants the catalogues, along with the samples, where applicable, from the approved manufacturer. The

contractor shall arrange inspection and testing at the manufacturer's factory or assembly shop for final approval. No material shall be procured prior to the approval of the Client/Consultants.

Also contractor shall ensure that the dimensional details of the equipment fit into the allotted space provided in the building.

25.0 VENDOR AND SHOP DRAWINGS

The contractor shall prepare and submit to the Client/Consultants for his approval six (6) sets of detailed fabrication drawings of all main lighting panels, sub lighting panels, distribution boards, switch boards, outlet boxes, special pull boxes, and other likewise material, equipment to be fabricated by the contractor, or by other vendors including drawings showing conduit layout, cable layout, wiring system, cable trays etc., within 30 days of signing of the contract.

He shall prepare shop drawings incorporating the details given by manufacturers for the items included in his contract and also owner supplied items and any other items which need to be co-ordinated with other contractors for interfacing. The fabrication shall not commence till final approval is given by Client/Consultants.

Before starting the work, the contractor shall submit to the Client/Consultants for his approval in the prescribed manner, the shop/execution drawings for the entire installation, specially the main connections and junctions, the route of conduits and cables, number and size of wires drawn through the conduits, location of all the outlet points, and switch boards and distribution boards and any other information required by the Client/Consultants.

The Client/Consultants, reserves the right to alter or modify these drawings if they are found to be insufficient or not complying with the established technical standards or if they do not offer the most satisfactory performance or accessibility for maintenance. Contractor shall supply in eight (8) sets of all approved shop drawings for execution.

26.0 "AS BUILT" DRAWINGS

At the completion of work and before issuance of certificate of virtual completion the contractor shall submit eight (8) sets to the Client/Consultants, layout drawing drawn at appropriate scale indicating the complete wiring system "as installed". These drawings must provide:

26.1 Run, location and size of conduits, inspection, junction, and pull boxes.

26.2 Number and size of conductors in each conduit.

26.3 Location and rating of sockets and switches containing the light and power outlets.

26.4 Location and details of distribution boards, main switches, switchgear and other particulars.

26.5 A complete wiring diagram, as installed and scheduled showing all connections in the complete electrical system.

26.6 Location of outlets, junction boxes, sizes of various conduits for telephone, fire alarm, sound system and all other extra low voltage system.

26.7 Location of all earthing stations, route and size of all earthing conductors, manholes etc.,

26.8 Route and particulars of all cables and cable trays.

27.0 INSTRUCTION/MAINTENANCE MANUAL

The Contractor shall prepare and produce instruction, operation and maintenance manuals in English for the use, operation and the maintenance of the supplied equipment and installations,

and submit to the Client/Consultants in (8) copies at the time of handing over. The manual shall generally consist of the following:

a) Description of the project.

b) Operating instructions.

c) Maintenance instructions including procedures for preventive maintenance.

d) Manufacturers catalogues.

e) Spare parts list.

f) Trouble shooting charts.

g) Drawings.

h) Type and routine test certificates of major items.

i) One (1) set of reproducible `as built' drawings.

28.0 COMPLETION CERTIFICATE

On completion of the electrical installation a certificate shall be furnished by the contractor countersigned by the licensed supervisor, under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as required by the local supply authority. The contractor shall be responsible for getting the electrical installation inspected and approved by the local concerned authorities and for obtaining the necessary clearance certificates from the authorities.

29.0 GUARANTEE

At the close of the work and before issuance of final certificate of virtual completion by the Client/ Consultants, the contractor shall furnish written guarantee indemnifying the owner against defective materials and workmanship for a period of one year after completion. The contractor shall hold himself fully responsible for reinstallation or replacement, free of cost to owner, the following :

29.1 Any defective work or material supplied by the Contractor.

29.2 Any material or equipment supplied by the owner which is damaged or destroyed as a result of defective workmanship by the contractor.

29.3 Any material or equipment damaged or destroyed as a result of defective workmanship by the contractor.

30.0 RATE ANALYSIS

At anytime and at the request of the Client/Consultants the contractor shall provide details or breakdown of costs and prices of any part or parts of the works.

31.0 STAFF

The contractor shall employ competent fully licensed qualified, full time electrical engineers to direct the work of electrical installation in accordance with the drawings and specifications. The engineers shall be available at all times at site to receive instructions from the Client/Consultants., in the day to day activities throughout the duration of contract. The engineer shall correlate the progress of the work in conjunction with all the relevant requirement of the supply authority.

32.0 WATER AND POWER:

The contractor will make his own arrangement for water and Electricity. Electricity shall be supplied at one point at site and the contractor shall be responsible for providing the kilo watt hour meter and draw electricity from this point. The cost of meter, cabling, distribution etc. shall be borne by the contractor. Also the cost of electricity consumed will be charged from the contractor at the same rate as of the electricity authority. The owner, however, does not guarantee continuity and sufficiency of power at all times. In such an event electricity shall be drawn from the DG Set provided by the main civil contractor and rate of electricity consumed shall be payable by the contractor at a agreed rate or the contractor shall arrange alternative source of electricity supply (DG Set) at his own cost.

The rate of electricity from standby generator will vary from project to project depending on the negotiation with the main civil contractor.

33.0 SAFETY BARRIERS AND CONSTRUCTION SAFETY

The Contractor shall at his own cost provide for the protection and safety of the persons working in the area, safety barriers around all openings in every location and at the periphery and edges of all slabs, staircases and stairwells, lift shafts, ducts etc., all to the approval and satisfaction of the Client/Consultants. However contractor shall take appropriate safety precautions suitable for specific locations/ situations and as instructed by the Client.

The Contractor shall, in general, be fully responsible for all matters with regard to every form of safety during construction and in connection with the execution of the Works, and the Contractor shall take all necessary precautions and provide at his cost everything necessary to ensure such safety at all times. Should any accidents occur due to the Contractor's failure to comply with such safety requirements and to take all other safety measures necessary, the Contractor shall be fully responsible for all such accidents and he shall bear and pay for all costs and damages in connection therewith and as a consequence thereof. The Contractor shall indemnify the Owner from and against all claims in this regard.

The Client shall have powers to withhold amounts from payment certificates in case of Contractor's persistent non compliance with provisions of this clause. Also the Client is empowered to employ another agency at Contractor's cost after one week's notice to implement this Clause in case of Contractor's non compliance with provisions of this Clause.

34.0 DISPOSAL OF RUBBISH FROM THE WORKS AND THE SITE AND PROVISION OF SAFETY NETTING/SCREENS BY CONTRACTOR

The Contractor shall at all times keep the Works and the site in clean, neat and tidy condition. All rubbish from the Works and the site shall be collected and deposited in large bins provided on the site for such purpose by the Contractor at his own cost. The rubbish from such bins shall be regularly carted away by the Contractor to rubbish tips and dump yards beyond the site.

At no time or stage shall any rubbish be thrown over the edges of slabs or through any openings or shafts or ducts or stairwells.

The Contractor shall, at his own cost and to the approval and satisfaction of the Client, provide safety netting/screens at the periphery of all slabs and at all openings, shafts, ducts and stairwells and/or canopies to prevent any rubbish or material falling over or into such areas and endangering the safety of the persons working below. Should the Contractor fail to provide such safety measures and to take other necessary precautions in accidents that may occur, he shall bear all costs and damages as decided by Client in connection therewith and as a consequence thereof. The Contractor shall indemnify the owner from and against all claims in this regard.

The Client shall have powers to withhold amounts from payment certificates in case of Contractor's persistent non compliance with provisions of this clause. Also the Client is empowered to employ another agency at Contractor's cost after one week's notice to implement this Clause in case of Contractor's non compliance with provisions of this Clause.

35.0 SANITARY ARRANGEMENTS AT SITE

Contractor shall provide and install adequate latrines and urinals for use by the workmen around the periphery of the site. He shall ensure that the workmen shall avail of this facility and not commit any nuisance within the area under construction. This provision shall be strictly enforced by the contractor.

36.0 SPACE FOR CONTRACTOR'S CONSTRUCTION YARD, STORES, LABOUR CAMPS ETC.,

The owner shall provide adequate storage/office space to the contractor for his use. The space has to be maintained/ constructed by the contractor as per his usage requirements.

All spaces allotted to the contractor, as described above shall be vacated and all structures removed from site at any time as and when required and directed by the relevant authorities or by the Owner, unconditionally and without any reservation. The authorities or the Owner will not be obliged to give any reason for such removal. Upon receiving instructions to vacate the space, the contractor shall immediately remove all his structures, materials, etc., from the spaces and clear and clean-up the site to the satisfaction of the Client.

It shall be the specific responsibility of the Contractor to safeguard the site and ensure that no illegal encroachments are made by outside elements within the area allotted to the Contractor. Upon completion of the work or earlier as required by Owner/Authorities, the Contractor shall vacate the land totally without any reservations. Necessary Bond to this effect on a stamp paper shall be signed by the contractor in a prescribed form.

The Performance Bond and/or guarantees towards retention amount furnished by the Contractor shall not be released until the spaces allotted to the contractor are fully vacated and handed over to the owner as per the instructions of the Owner.

37.0 FENCING AND SECURITY

The Contractor will arrange to erect, at his cost, barbed wire or other appropriate fence around the infrastructure site, with entry/exit gates at suitable points. The Contractor shall, at his own cost, provide and erect suitable fencing around the spaces allotted to him at the infrastructure sites to ensure the security of his men, materials and equipment within the sites and in relation to other contractors who will also be allotted spaces at above sites.

The security of workmen, materials, equipment stores, etc., within the area allotted to the contractor shall be the responsibility of the contractor.

38.0 CARRYING OUT WORK BEYOND NORMAL WORKING HOURS OR IN SHIFTS

In order to achieve the milestone and completion dates and to keep pace with the approved construction programme, the Contractor shall be permitted to carry out his work beyond the normal working hours or in shifts. The Contractor shall be responsible for obtaining any necessary permissions from the relevant authorities that may be required for him to carry out the work beyond the normal working hours or in shifts. Also, the Contractor shall give prior notice to and make arrangements with the Client for the supervision of work carried out beyond the normal working hours or in shifts. The Contractor shall make his own arrangements in respect of the provision of adequate lighting and any other facilities that may be required for carrying out the work beyond the normal working hours or in shifts. No extra payments shall be made to the Contractor for or in connection with any such overtime or shift work. The Contractor will not be required to bear the overtime expenses of the Client in respect of the supervision of such overtime or shift work of the Contractor.

39.0 USE OF CIVIL CONTRACTOR'S ESTABLISHED/AVAILABLE FACILITIES AT SITE BY SPECIALIST AND SERVICES CONTRACTORS/NOMINATED SUB-CONTRACTORS

The civil contractor at his discretion may allow the use of his established/available facilities at site such as storage, scaffolding, lifting and hoisting, other plant and machinery, means of access, water, power, labour camp etc to the Contractor subject to prior arrangements being made by the contractor with the civil work Contractor.

40.0 PERIOD AND TIME LIMIT FOR VIRTUAL COMPLETION OF WORKS

The period and time limit for Virtual Completion of the Works shall be_____ Calendar Months from the date of issue of Work Order to commence works or handing over of site in respect of the award of Contract. This time period shall be inclusive of the mobilisation period and monsoon period.

41.0 PROFESSIONAL INTEGRITY AND TEAM SPIRIT

It is the intent of the Owner, Architect and Consultants that this project will be executed in a spirit of team and full professional integrity. Contractor is expected to cooperate with all the agencies involved in the project to fulfil this objective.

42.0 MALPRACTICES

The Contractor shall not try to influence in any manner the employees, staff or anyone else of the Owner, Architect and his Consultants by offering undue favours, monetary gains, or any such illegal gratifications for any reason whatsoever. If it is established that the Contractor has indulged in such activity, the Owner reserves the right to terminate the Contract forthwith.

43.0 LIST OF APPROVED MAKES

ANNEXURE - I

TO SPECIAL CONDITIONS SUBMITTALS TO BE MADE BY THE CONTRACTOR DURING THE EXECUTION OF THE WORK

1. Weekly progress report including number of men employed under each trade, Equipments at site etc.

2. Fortnightly progress report showing progress against programme.

3. Programme of work for the forth coming week.

4. Labour and Equipment Deployed at site - programmed requirement VS actual deployed -- weekly.

5. Updated approved monthly PERT chart along with monthly progress chart -- weekly.

6. Construction Materials by Contractor : status and mobilisation programme - Fortnightly.

7. Owner supplied Materials for the coming (next) month - monthly.

8. Reconciliation of owner supplied materials -- Monthly.

9. Value of work anticipated to be done in the forth coming month including value of any materials / equipment of large value -- Monthly.

TECHNICAL SPECIFICATION FOR ELECTRIFICATION WORK AT HOSTEL BLOCK OF SHREE RAM COLLEGE OF COMMERCE.DELHI UNIVERSITY, N. DELHI

1.0 TECHNICAL SPECIFICATION FOR 415 VOLTS, LOW TENSION PANELS AND POWER AND CONTROL CENTRES

1.1 General Specification of Equipment

1.2 The scope of work comprises of Designing, Obtaining Approval of the Consultants, Fabricating as per approved Drawings, Testing at Works, Packing and Forwarding, Supplying , Storing at Site, Checking at site Touching Up all Damaged portions, Erection and testing at site.

1.3 The Main L.T. Panel and Power Control Centers shall be metal clad, totally enclosed, rigid, floor mounting air-insulated, cubicle type for use on 415 volts, 3 phase 50 cycles system.

1.4 The equipment shall be designed for operation in high ambient temperature and high humidity tropical atmospheric conditions. Means shall be provided to facilitate ease of inspection, cleaning and repairs in the installations where continuity of operation is of prime importance.

1.5 Standards

1.6 The equipment shall be designed to conform to the following requirements and to the latest amendments in the codes or relevant I.S. applicable standards :-

(i) IS,,8623 - Factory Built Assemblies of switchgear and control gear.

(ii) IS,,4237 - General requirements for switchgears and control gear for voltages not exceeding 1000 Volts.

(iii) IS,,2147 - Degrees of protection provided by enclosures for low voltage switchgear and control gear.

(iv) IS,,375 - Marking and arrangement of busbars.

1.7 Individual equipment's housed in the power control center shall conform to the following IS specifications :

(i) Air Circuit Breakers – IS 3947, IEC-60947-2.

(ii) Fuse switch and switch fuse units – IS .4064: 1979

(iii) HRC Fuse links – IS 2208:1962 or IS 9224:1979.

(iv) Current transformers- IS 2705

(v) Voltage Transformers- IS 3165

(vi) Relays –IS 3231

(vii) Indicating Instruments – IS 1248

(viii) Integrating Instruments – IS 722

(ix) Control switches & Push Buttons – IS 6875

(x) AC contactors.. – IS 2959

3.0 CONSTRUCTION

3.1 The Main LT Panel and power control centers shall be :

(i) Of the metal enclosed, indoor, floor, mounted, free standing type.
(ii) Be made up of the requisite vertical sections, which, when couple together shall form continuous deal front switchboards.
(iii) Provide dust and vermin proof design.
(iv) Be readily extensible on both sides by the addition of vertical sections after removal of the end covers.

3.2 The power control center shall be constructed only of materials capable of withstanding the mechanical, electrical and thermal stresses, as well as the effects of humidity, which are likely to be encountered on normal service.

3.3 Each vertical section shall comprise.

(i) A front framed structure of rolled/folded sheet steel channel section, of minimum 14 Gauge thickness, rigidly bolted together. This structure shall house the components contributing to the major weight of the

equipment such as circuit breaker cassettes, fuse switch units main horizontal busbars, vertical risers and other front mounted accessories. The structure shall be mounted on a rigid base frame of folded sheet steel of minimum 3 mm thickness and 100mm height. The design shall ensure that weight of the components is adequately supported without deformation or loss of alignment during transit or during operation.

(ii) A rear cable chamber housing the cable and connections, and power control cable terminations. The design shall ensure generous availability of space for case of installation and maintenance of cabling, and adequately safely for working in one vertical section without coming into accidental contact with live parts in an adjacent section.

(iii) A cover plate at the top of vertical section, provided with ventilating hood where necessary aperture for ventilation shall be covered with perforated sheet having less than 1 mm diameter perforations to prevent entry of vermin.

(iv) Front and rear doors fitted with dust excluding synthetic rubber gaskets with fasteners designed to ensure proper compression of gaskets, generous overlap shall be assured between sheet steel surfaces with closely spaced fasteners to preclude the entry of dust.

3.4 The height of the panel should not be more that 2100mm the total depth of the panel should be adequate to cater for proper cabling space and should not be less then 1300mm for ACB sections and 450/650 mm for switch fuse unit and MCCB sections.

3.5 Doors shall be of minimum 16 gauge thick sheet steel. Sheet steel shrouds and partitions shall be of minimum 16 gauge thickness,. All sheets steel work forming the exterior of switchboards shall be smoothly finished, leveled and free from flaws. The corners should be rounded.

3.6 The apparatus and circuits in the power control centers shall be so arranged as to facilitate their operation and maintenance and at the same time to ensure the necessary degree of safety.

3.7 Apparatus forming part of the power control centers shall have the following recommended minimum clearances for uninstalled busbars or should be as per relevant IS codes.

(i) Between phases- 37 mm.

(ii) Between phases and neutral – 37 mm.

(iii) Between phases and earth – 37 mm.

(iv) Between natural and earth – 37 mm.

When, for any reason, the above clearances are not available suitable insulation shall be provided. Clearances shall be maintained during normal service conditions.

Creepage distances shall comply to those specified in relevant standards.

3.8 All insulating material used in the construction of the equipment shall be of non-hygroscopic material duly treated to withstand the effects of high humidity high temperature tropical ambient service conditions.

3.9 Functional units such as circuit breakers and fuse switches shall be arranged in multi-tier formation, except that not more than two air circuit breakers shall be housed in a single vertical section.

3.10 Metallic / insulated barriers shall be provided within vertical sections and between adjacent sections to ensure prevention of accidental contact with :

(i) Main busbars and vertical risers during operation, inspection or maintenance of functional units and front mounted accessories.

3.11 All doors/ covers providing access to live power equipment's circuits shall be provided with tool operated fasteners to prevent unauthorized access.

3.12 Provision shall be made for permanently earthling the frames and other metal parts of the switcher by two independent connections.

4.0 METAL TREATMENT AND FINISH

4.1 All steelwork used in the construction of the switch board should have undergone a rigorous metal treatment process as follows.

(i) Effective Cleaning by hot alkaline degreasing solution followed by cold water rinsing to remove traces of alkaline solution.

(ii) Pickling in dilute sulfuric acid to remove oxide seals and rust formation, if any, followed by cold water rinsing to remove traces of acidic solution.

(iii) A recognized phosphating process to facilitate durable coating of the paint on the metal surface and also to prevent the speared of rustling in the event of the paint film being mechanically damaged. This again, shall be followed by hot water rinsing to remove traces of phosphate solution.

(iv) Passivating in de-oxalate solution to retain and augment the effects of phosphating.

(v) Drying with compressed air in a dust free atmosphere.

(vi) Two coats of unicoat light gray IS,,5,, shade 631 is spray painted on the phosphate panels on each side, by wet on wet process with an interval of 2-3 minutes between coats. One coat involve 2 phases horizontally/vertically over the entire surface on each side and Egg Shell White from inside.

5.0 **BUSBARS**

5.1 The busbars shall be air insulated and made of high conductivity high strength copper.

5.2 The busbars shall be suitably braced with non hygroscope SMC supports to the neutral as well as the earth bar should also be cable of withstanding the stress of electrical fault. Ridges shall be provided on the SMC supports to prevent tracking between adjacent busbars.

5.3 Large clearances and creepage distances shall be provided on the busbars system to minimized the possibility of a fault.

5.4 High tensile bolts and spring washers shall be provided at all busbars joints.

5.5 The cross section of the busbars and risers for various ratings shall have been decided on the basis of temperature rise tests results carried out on some other Panels for the stated sections.

5.6 Connections from the main busbars to functional circuits shall be arranged and supported so ass to withstand without any damage or deformation the thermal and dynamic stresses due to short circuit currents.

5.7 Busbars shall be colour coded for easy identification of individual phases and neutral.

6.0 CIRCUIT BREAKERS

Circuit breakers shall be triple pole, air break, horizontal drawout type, designed to be maintained.

6.1 The breakers shall comply with the requirements of IS 516 (Parts I & II/Sec I) –1977- Short Circuit Performance Category P-2, and shall have :

1. A short circuit breaking capacity of not less than 50 KA RMS at 415 Volts 50 Hz AC.
2. A short circuit making capacity of 105 KA.
3. A short-time withstand circuit of 50 KA for 1 second.
4. Mechanical and electrical endurance for 2000 operating cycles out of which 100 cycles should he for electrical endurance.
5. Electrical overload performance at 6 times the rated current, 110% of the rated voltage as recovery voltage and 0.5 power factor.
6. Dielectric test of 2.5 KV applied for one minute on main circuits.

Test Certificates from the manufacturer tested in a recognized Laboratory/Institution should be furnished for compliance of the breakers with the above requirements.

6.1 The circuit breakers shall be fitted with detachable arc chutes on each pole designed to permit rapid dispersion, cooling and extinction of the are. Interface barriers shall be provided to prevent flashover between phases.

6.2 Arcing contacts shall be of hard wearing material of copper tungsten of silver tungsten and shall be readily replaceable. Main contacts shall be of pure silver of high pressure but type of generous cross section.

6.3 The operating mechanism shall be of robust design, with a minimum number of linkages to ensure maximum reliability. Manually operated circuit breakers shall be provided with spring operated

closing mechanism which are independent of speed of manual operation. Electrically operated breakers shall have a motor wound spring charged closing mechanism. Breaker operation shall be independent of the motor which shall be used solely for charging the closing spring.

6.4 The operating mechanism shall be such that the breaker is at all times free to open immediately the trip coil is energized.

6.5 Mechanical operation indicators shall be provided to show open and closes position of the breaker. Electrically operated breakers shall be additionally provided with mechanical indications to show charged and discharged conditions of the charging spring.

6.6 Means shall be provided for slow closing and opening of the breaker for maintenance purposes, and for manual charging and closing of electrically operated breakers during emergencies.

6.7 Provision shall be available for fitting a minimum of five trip devices
– three over current, a shunt trip and an under voltage release or two over current, and earth fault release, a shunt trip and one under voltage release. The breakers shall be of the shunt or series trip type as specified. For static trip device either a shunt trip or an under voltage coil will be provided.

6.8 Circuit breakers shall be individually housed in sheet metal cassettes provided with hinged doors. The breaker along with its operating mechanism shall be mounted on a robust carriage moving on guide rollers within the cassettes. Isolating contacts for both power and control circuits shall be of robust design and fully self lying. The assembly shall be designed to allow smooth and easy movement of the breaker within its cassette.

6.9 The breaker shall have three distinct position within the cassette as follows :-

(i) Service position : with main and auxiliary contacts connected.

(ii) Test position : with power contacts fully disconnected and control circuit contacts connected.

(iii) Isolated position : with both power and control circuit contacts fully disconnected.

It shall be possible to achieve any of the above positions with the cassette door closed. Mechanical position indicators shall be provided for the three positions of the breakers.

6.10 The moving portion of the circuit breaker shall be so interlocked that :

(i) It shall not be possible to isolate it from the connected position, or to plug it in from the isolated position with the breaker closed.

(ii) The circuit breaker can be closed only when it is in one of the three positions or when it is fully out of the cassette.

(iii) It shall not be possible to open the hinged door of the cassette unless the breaker is drawn to the isolated position.

(iv) Inadvertent withdrawal of the circuit breaker too far beyond its supports is prevented by suitable stops.

6.10.1 Moving portions of breakers of the same ratings shall be interchangeable.

6.11 Provision shall be available for the padlocking of the circuit breaker access flaps in any of three positions.

6.12 Automatically operated safety shutters shall be provided to screen the fixed isolating contacts when the breaker is drawn out from the cassette.

6.13 The moving portion of the circuit breaker shall be provided with a heavy duty self aligning earth contact, which shall make before and break after the main isolating contacts during insertion in to and withdrawal from the service position of the breaker. Even in the isolated position positive earthling contact should exist.

6.14 Auxiliary switches directly operated by the breaker operating mechanism and having 4 NO and 4 NC contacts, shall be provided on each breaker. The auxiliary switch contacts shall have a minimum rated thermal current of 10 Amps.

7.0 CURRENT TRANSFORMERS

7.1 Current transformers shall comply with the requirements of IS 2785. They shall have ratios, outputs and accuracy's as specified/required.

8.0 INDICATING/INTEGRATING METERS

8.1 All indicating instruments shall be of flush mounting industrial pattern, conforming to the requirements of I.S.

8.2 The instruments shall have non-reflecting bezels, clearly divided and indelibly marked scales and shall be provided with zero adjusting devices in the front.

8.2.1. Integrating instruments shall be of flush mounting switchboard pattern complying with the requirements of I.S.

9.0 RELAYS

9.1 Circuit breakers shall be provided with integrally mounted solid state relays. The relay shall have a set of 3 phase characteristics which shall be adjustable over wide range to provided discrimination between

a multiplicity of devices. The relay shall be able to provide over current and earthfault protection.

9.2 Electro magnetic relays shall be used for other applications including auto changeover. These relays shall be draw out type with built-in test facilities. They shall conform to IS 3221. Flag indicators shall be provided in these relays capable of being reset without opening the relay case.

10.0 CONTROL SWITCHES

10.1 Control switches shall be of the heavy duty rotary type with escutcheon plates clearly marked to show the operating position. They shall be semi-flush mounting with only the front plate and operating handle projecting.

10.2 Circuit breaker control switches shall be of the spring return to neutral type, while instrument selector switches shall be of the stay-put type.

10.3 Indicating lamps shall be of the filament type of low watt consumption, provided with series resistors where necessary, and with translucent lamp covers. Bulbs idleness shall be easily replaceable from the front.

11.0 PUSH BUTTONS

11.1 Push buttons shall be of the momentary contact, push to actuate type, fitted with self reset contacts and provided with integral escutcheon plates marked with its functions.

12.0 CABLE TERMINATIONS

12.1 Cable entries and terminals shall be provided in the switchboard to suit the number , type and size of aluminum conductor power cables and copper conductor control cable specified in the detailed specifications.

12.2 Provision shall be made for top or bottom entry of cables as repaired. Generous size of cabling chambers shall be provided with the position of cable gland and terminals such that cables can be easily and safely terminated. The minimum depth of the panel shall be restricted to suit for this purpose.

12.3 Barriers or shrouds shall be provided to permit safe working at the terminals of one circuit without accidentally touching that of another live circuit.

12.4 Cable risers shall be adequately supported to withstand the effects of rated short circuit currents without damage and without causing secondary faults.

12.5 Cable sockets shall be of copper and of the crimping type as specified.

13.0 CONTROL WIRING

13.1 All control wiring shall be carried out with 1100/660 Volts grade single core PVC cable conforming to IS 694/IS 813- having stranded copper conductors of minimum 1.5 Sq.mm. section for potential circuits and 2.5 sq.mm. section for current transformer circuits.

13.2 Wiring shall be neatly bunched, adequately supported and properly routed to allow for easy access and maintenance.

13.3 Wires shall be identified by numbered ferrules at each end. The ferrules shall be of the ring type and of non-deterioration material. They shall be firmly located on each wire so as to prevent free movement.

13.4 All control circuits fuses shall be mounted in front of the panel and shall be easily accessible.

14.0 TERMINAL BLOCKS

14.1 Terminal blocks shall be of 500 volts grade of the suitable type. Insulating barriers shall be provided between adjacent terminals.

14.2 Terminal blocks shall have a minimum current rating of 10 Amps. Provisions shall be made for label inscriptions.

15.0 LABELS

15.1 Labels shall be of anodized aluminum with white engraving on black background. They shall be properly secured with fasteners.

16.0 TESTS

16.1 Routine tests shall be conducted on each power control center in accordance with relevant IS codes and shall comprise :-

a) Inspection of the Power Control Center including inspection of wiring and electrical operational tests where necessary.

b) Checking of Protective Measures and electrical continuity of the protective circuits.

c) High Voltage Test with 2.5 KV. 1 minute for checking insulation and Megar tests before and after the installation.

1.0 TECHNICAL SPECIFICATIONS FOR POWER DISTRIBUTION BOARDS AND LIGHTING DISTRIBUTION BOARDS

1.1 This specifications is applicable to all the Power and lighting distribution boards for medium voltage system. The scope includes design, fabricate and supply , per the specifications and schedules indicated herein.

1.2 Applicable Standards

The relevant sections of Indian Standards Specification as more particularly stated herein and broadly to all the codes of standards applicable shall be enforced. Few of them are as noted herein :

BS 159	-	Busbars and Busbar connections.
IS 1248	-	Direct acting Electrical Indicating Instruments.
IS 2147	-	Degree of Protection provided by enclosures for low voltage switchgear and control gear.
IS 2208	-	HRC cartridge link fuse upto 600 Volts.
IS 13947	-	AC Circuit breakers.
IS 080500	-	Current Transformers.
IS 080500	--	Voltage Transformers.
IS 3043	-	Code of Practice for Earthling.

IS 4237 - Minimum clearance in air for

1.3 Lighting and Power Distribution Boards

1.3.1 Miniature Circuit Breakers Board

a) Miniature circuit breaker shall be of mounded design and shall be housed in totally enclosed, hinged door distribution boards.
b) The housing of MCBs shall be such that they shall be totally heat resistant and shall withstand all mechanical stresses operation.
c) The fault level of MCB shall not ve less than 9 KA at 230 volts AC supply.
d) The contacts of the MCB on both the sides shall be made up of either nickel silver alloy and/or graphite silver alloy.
e) When MCBs shall be incorporated in distribution boards of cubicle pattern they shall be separately housed as per the number of ways., hinged door compartment.
f) All the MCBs shall be tested and certified as per the relevant section of Indian Standard Specifications.
g) They shall mainly comply to DS 3871 (part –I) and shall be of quick make and break type.

1.4 Notes

a) All lighting and power distribution board and sub -distribution board shall comply with all relevant sections of I.S.
b) Earthling studs shall be brought out and connected to the Main Earth Bus of the installation.
c) All lighting and power distribution and sub -distribution boards shall be factory wired and assembled and tested.
d) The Contractor is instructed to obtain the approval of the Consultants prior to fabricating the cubicle pattern, lighting and power distribution boards and sub-distribution boards.
e) The adequate mounting foundation frames fabricated out of ISMC or angle iron frame work for floor mounting of all cubicle pattern boards shall be also included.

SPECIFICATIONS FOR L.T. CAPACITORS

1.0 Scope

This specifications covers the design, manufacture testing and supplying of all L.T. Capacitors required to be installed in L.T. Room of the sub-station.

0.0 Standards

All relevant Indian Standards shall be made applicable with latest amendments and in particularly IS-E- 081210 . Also any other specific application is required, then the same shall be complied to.

1.0 **Specifications:**

3.1 The capacitors are to be provided with non-metallic containers made of touch reinforced plastics and should be heat-proof, dust-proof, and rain-proof.

3.2 The containers should be scratch and rust proof.

3.3 Terminal insulators are required for the cover.

3.4 The container should be of non-metallic construction and the frame should be earthen .

3.5 The raw materials should be of Metallised polypropylene and Castor Oil as impregnate.

3.6 Each phase of the capacitor should be protected by a fuse mounted inside the container.

3.7 In-rush current limiting coils should be provided within each container which should limit the current in the event of switching surges or motor start.

3.8 The Metallised Polypropylene shall be of self-healing quality.

3.9 The dielectric loss should be very low in the order of 0.5 Watts/KVAR or lower.

3.10 Each unit shall be capable of withstanding a continuous over voltage of 10% and designed for low power loss using impregnated paper with metallised polypropylene type.

3.11 Each unit shall have fuses rated to isolate itself immediately from the line supply as soon as it has developed any fault.

3.12 The Capacitors shall be of the 3 Phase, Delta connected self cooled weather proof type with all live parts totally enclosed and suitable for floor mounting type.

3.13 The basic unit of the capacitor bank shall be of 50 KVAR banked to give 50 KVAR as basic step.

3.14 The Capacitors banks shall be erected on an angle from frame with mounting stands and with complete treatment done to frame work. The frame work shall be effectively earthed to the earthling grid to the Hospital .

2.0 **Discharge Resistance**

4.1 The Capacitors shall be provided with permanently connected discharge resistors so that residual voltage of the capacitor shall be reduced to 50 volts or less within one minute after the capacitor is disconnected form the source of supply.

3.0 **Testing**

5.1 The Capacitor bank shall be subject to tests as specified in relevant Indian Standards at the factory and the test certificates shall be furnished.

5.1.1 Residual voltage after switching of the capacitors shall not be more than 50 Volts after one minute.

5.1.2 Insulation resistance shall be tested with a 1000 Volts meager between phases and phase to earth.

5.1.3 Each discharge resistors shall be tested for its working.

SPECIFICATIONS FOR SUPPLY OF L.V. CABLES

1.0 Codes and standards

1.1 The design, manufacture, testing and supply of the cables under this specification shall comply with the latest revisions including amendments of the following standards.

IS	:	1554 –I	PVC insulated heavy duty cables for working Voltages upto 1100 volts.
IS	:	3961-II	Recommended current ratings for cables
IS	:	8130	Conductors for insulated cables.
IS	:	5831	PVC insulation and sheath of electric cables.
IS	:	10810	Test Procedures for cables.
IS	:	10418	Specification for drums for electric cables.
IS	:	3975	Mild steel wire, strips, and tapes for armouring of cables.

2.0 Technical Requirements :

2.1 Power cables shall be 1100 volts grade, multi core constructed as per IS : 1554-I as follows :-

Stranded aluminum conductor.

Extruded PVC insulation

Cores laid up

Lapped PVC inner sheath

Galvanised steel wire armoured

Extruded PVC outer sheath.

2.2 Conductor shall be of hard drawn aluminium wires grade H2 as per IS : 8130.

2.3 Insulation shall be of PVC type-A as per IS 5831 general purpose insulation for maximum rated conductor temperature 70 degree centigrade.

2.4 Inner sheath shall be of PVC type – ST1 and out sheath shall be of PVC type ST2 as per IS : 5831.

2.5 Insulation, inner sheath and outer sheath shall be applied by extrusion and lapping up process only.

2.6 Armoring shall be of galvanised steel wire/ flat.

2.7 Repaired cables shall not be used.

2.8 Current ratings of the cables shall be as per IS : 3961.

2.9.1 The PVC insulated cables shall conform to latest revision IS: 1554 (Part-I) read along with this specifications. The conductor shall be stranded aluminium circular/sector shaped and compacted. In multi core cables the core shall be identified by red, yellow, blue and black colouring of insulation.

2.9.2 The PVC (70 degree C) insulated 1100 volts grade power cables shall conform to IS : 1554 (Part-I) and shall be suitable for a steady conductor temperature of 70 degree centigrade. The conductor shall be stranded aluminium. The insulation shall be extruded PVC as per IS : 5831.

2.10.1 The cables shall be suitable for laying in racks, ducts, trenches, conduits and underground buried installation with uncontrolled back filled and chances of flooding by water.

2.10.2 Cables shall be designed to withstand all mechanical electrical and thermal stresses under steady state and transit operating conditions.

2.10.3 The cable should withstand the system fault current with insulation screen/ Armour insulated at one end. Bidder shall furnish calculations in support of capability of cables for 3-phase fault. Armour shall be designed to withstand the earth fault currents. The current carrying capacity of Armour shall not be less than the earth fault current values of the system.

2.10.4 Progressive automatic in line sequential marking of the length of cables in meters at every one meter shall be provided on the outer sheath of all cables.

2.10.5 Cables shall be supplied in non returnable wooden drums as per IS:10418.

Both ends of the cables shall be properly sealed with PVC/Rubber caps so as to eliminate ingress of water during transportation, storage and erection.

3.0 Tests and test Reports

Cable shall be subjected to type tests, acceptance tests and routine tests as per IS : 1554 and IS 10810. The owner reserves the right to witness any or all the tests for which at least 20 days advance notice shall be given by the contractor. Six (6) copies of all test reports shall be submitted for approval by owner before despatch of the materials from works.

TECHINICAL SPECIFICATIONS – EARTHING

1.0 Scope

a) Earthing system to be provided shall comprise of earth electrode of copper plate in earth pits, earth bus/grid or copper flats and bare copper wires as earth continuity conductor.

b) Lighting protection system shall comprise of earth electrode of cu plate in earth pits, earth bus of down conductors of cu flats.

c) Earthing of compound, flood lighting and road lighting poles shall be done by sing cu plates in earth pits near pole and 7/16 size galvanised strained wire for connecting to the pole or as specified in the schedule or in drawings.

d) Entire earth system shall conform to the code to practice as per IS : 3043.

2.0 **General Requirement** :-

a) Enclosures and frame work of all current carrying equipment and accessories, structural steel/ columns shall be adequately earthed to a single Earthing systems are specifically stipulated. All electrical equipment shall be earthed at two distinct points.

b) Earthing loads and risers shall follow as direct and short a path as possible. Suitable risers shall be provided as directed if equipment is not available when Earthing is installed.

c)

3.0 Earth Electrodos :

Plate electrodes of G I shall be 600x600x6.30 mm thick and of copper shall be 600x600x3.15 mm thick unless otherwise specified .

4.0 Earth Bus and Earth Continuity Conductor

a) Earth bus is a copper strip or flat of specified size interconnecting all earth electrodes.

b) Switchgears and Power Distribution Boards shall be earthed by a copper flat strip.

c) Panels, fused DBs and motors up to 30 KW rating shall be earthed by a continuity conductor, as specified . Minimum size of continuity conductor shall be 14 gauge bare copper , soft drawn .

d) Road Lighting Poles shall be earthed with cu stranded wire conductor while for lighting and power wiring bare copper conductor shall be provided unless otherwise specified to use insulated conductor.

5.0 Earth Bus Station

Earth Bus Station shall be provided to facilitate tapping of earth continuity conductor from earth bus/grid very conveniently. It will comprise of a 400 mm long 38x3mm bare copper strips/flat fixed with rawl plugs/bolts securely on wall/column above floor level. Spacers of 20mm to 25mm shall be provided to keep the flat away from wall and facilitate connections of earth conductor for which 6mm dia holes 8 to 10 numbers are provided with proper size brass nuts, bolts, and washers. Earth bus is connected to it.

6.0 Lighting Protection System

a) Air termination shall be give prong type copper and securely clamped/installed to withstand severe weather conditions and provide protection against lighting. Horizontal air termination conductors shall be cu flat/strip and shall be provided where specified.

b) Earth electrodes for lightning protection system shall be cu plate installed in earth pits as per IS.

c) The down conductors from air terminals shall be done in tinned cu flat strip, of size 50mm X 3 mm as required. The down conductors shall follow a direct path to the earth electrode without any sharp bend, turn or kinks. These down conductors shall not be connected to other Earthing conductors above qround level but the metallic parts in the vicinity of lighting protection conductor such as laders, pipes etc. shall be effectively connected and bonded.

d) A test joint as per IS shall be provided for every down conductor within 1500mm above ground level.

e) Hardware and clamps shall be similar as used for the Earthing systems.

7.0 Artificial Treatment of Soil

If the earth resistance is too high and the multiple electrode Earthing does not give adequate low resistance to earth, then the soil resistivity immediately surrounding the earth electrodes shall be reduced by adding sodium chloride, calcium chloride, sodium carbonate, copper sulfate, salt and soft coke or charcoal in suitable proportions.

8.0 Resistance to Earth

The resistance to each Earthing system shall not exceed 1.0 ohm.

9.0 Earthing Station

9.1 Plate Electrode Earthing.

Earthing electrode shall consist of a tinned copper plate not less than 600 X 600 X 3 mm thick, 600 X 600 X 3mm G.I. as called for in the drawings. The plate electrode shall be buried as far as practicable below permanent moisture level but in any case not less than 3 mtrs. Below ground level. Wherever possible earth electrode shall be located as near the water tap., water drain or a down take pipe as possible. Earth electrodes shall not be installed in proximity to a metal fence.

It shall be kept clear of the buildings foundations and in no case shall it be nearer than 2 meters from the outdoor face of the wall. The earth plate shall be set vertically and surrounded with 150 mm thick layer of charcoal dust and salt mixture 20 mm G.I. pipe shall run from the top edge of the plate to the ground level. The top of the pipe shall be provided with a funnel and a mesh for watering the earth through the earth. The main earth conductors shall be connected to the electrode just below the funnel., with proper terminal lugs and checks nuts. The funnel over the G. I. Pipe and earth connections houses 300 mm wide and 300 mm deep. The masonry chamber shall be provided with a cast iron cover resting cover a C.I. frame embedded in masonry.

9.2 **Pipe Electrode Earthing**

Earthing electrode shall consist of a G.I. Pipe (Class ‘B’) Indian Tube Company make or approved equal, not less than 40 mm dia and 5 meters long. G.I. Pipe electrode shall be cut tapered at the bottom and provided with holes of 12 mm dia drilled at 75 mm interval up to 2.5 meters length from bottom. The electrode shall buried vertically in the ground as far as practicable below permanent moisture level with its top not less than 200 mm below ground level. The electrode shall in one piece and no joints shall be allowed in the electrode. Wherever possible earth electrodes shall be located as near water tap, water drain or a down take pipe. Earth electrode shall not be located in

proximity to a metal fence. It shall be kept clear of the building foundations and in no case shall be nearer than 2 meters from the outer face of the wall.

The pipe earth electrode shall be kept vertically and surrounded with 150 mm thick layer of charcoal dust and salt mixture up to a height of 2.5 meters from the bottom. At the top of the electrode a funnel with a mesh shall be provided for watering.

TECHNICAL SPECIFICATIONS FOR CONCEALED/SURFACE CONDUIT WORK USING PVC . CONDUIT

1.0 LIGHTING AND POWERD WIRING MATERIALS

1.1 Scope

The scope of this section comprises the supply, delivery, erection, testing

and commissioning of Conducting, wiring and Power wiring of the installation.

1.2 Conduit

Conduit shall be heavy gauge 2.0mm PVC . Conduit, as per IS: 9537 P-III including latest amendments and in accordance with the requirements set out in the schedule. The thickness of the conduit shall be 2.0mm heavy duty and the tubing must be perfectly circular and capable of clean and tight fitting joints. The Galvanized conduit shall also be used wherever the conduits are exposed to weather i.e. run outside the structure.

1.3 Accessories

Conduit accessories shall be of G.I iron and shall comply with IS 2667 of 1964 and be of threaded type with clean tight fitting threads. The cover of accessories for outdoor use shall be made water tight in an approved manner. Normal bends/elbows can be used only after obtaining specific approval. Junction boxes used for suspension of fittings shall be secured to the ceiling, clamps or spacers as the case may be. High dome junction boxes shall be used where a SP tumbler switch is to be mounted or a 15 Amps porcelain connector is to be housed for looping wires.

1.4 Fixing or Conduit.

a) The conduit shall be fixed to the structures by means of adequate numbers and appropriate size of G.I saddles of minimum 18 Gauge fixed on MS clamps or on MS spacers as specified and shall run throughout adjacent to either steel work, walls or ceiling.

b) Where the conduits or PVC cables pass through the flooring the same shall be passed through a 2.0mm thick PVC pipe of suitable size fixed in the flooring so that conduits, cable or wires can be renewed at any time

without breaking the floor. The PVC pipe shall extend 75 mm above the flooring and shall be flush with ceiling surface on other side. In case the same are passing through the wall PVC . conduit flush with walls on both sides shall be used.

c) All conduit wiring in the building, workshops, substations, sheds, pump houses, shall be fixed on MS clamps or on MS spacers as specified and shall be of appropriate size. The conduit wiring in offices and quarters running at ceiling height shall be fixed on MS spacers, the raising main being fixed on clamps unless otherwise specified in the notes. The minimum size of MS spacers shall be 15 mm wide and 4 mm thick.

d) M.S. clamps for fixing conduits shall normally be prepared form M.S. flates of size 25x3 mm . In case more than 5 conduits are running side by side the M.S. flats of size 30 x 5 mm (minimum) shall be used for this purpose. For suspension of conduits from ceiling or structural member at a distance of more than 100 mm clamps made of flats of size 37 x 5 mm shall be used with additional supports in the run as required to keep the conduits held firm in position.

e) M.S. clamps for conduit run on brick walls should necessarily be grouted and on R.C.C. works the same are to be screwed to instructions. Philip or teakwood plug shall be inserted in punched or drilled holes of appropriate size to secure the screws to the walls.

f) The spacing of clamps or spacers in the straight runs shall not exceed 800 mm and additional clamps or spacers shall be provided near bends, curves and under/near junction boxes for fittings so as to make the whole fixture quite rigid.

g) For metallic fastenings, galvanized bolts and nuts shall be used. No holes shall be drilled in the steel supports of the shed structure for the purpose of fixing or suspending conduit, switchgear, fitting etc. For this purpose suitable clamps shall be provided.

h) The run of the conduit must be such as to give an esthetic appearance to the finished work and with that end in view all the conduits entering or leaving a D.B. or switch should be neatly arranged. Any crossing of conduit should be avoided as far as possible, but if required to cross, the conduits shall be neatly bent and fixed.

i) At every six meters straight run the conduits shall be provided with sufficient extra threads and a check-nut for easy running of the coupling back on the conduit for the purpose of renewal of wires etc. Sufficient number of inspection bends and junction boxes shall be provided for easy drawing in of new and repair works in future. Normal bends shall only be used after obtaining specific approval.

j) Termination of the conduit runs must invariably have check nuts on either side of the entry to the metal clad boards, switches and fittings and shall be provided with insulating bushes of appropriate size screwed tight on to the end of the conduit so as to prevent any cutting of the insulation by rubbing against the ends. Even individual lengths of conduits should have no burrs left on the ends after a die has been run for threading the ends. The continuity of whole conduit system shall conform with the requirements of the Regulations issued by the Institute of Electrical

Engineers, London. The entire conduit work shall be given two coats of approved brand and colour of enamel paint on completion of the work. All the threads, running coukplers, lock nuts joins of entry into boxes and abrasions resulting in exposure of the metal shall be given two coats of approved brand of black enamel paint or any other colour shade as approved immediately after erection.

2.0 **Conduit Capacity**

The maximum capacity of a conduit for drawing in PVC insulated multistrand FRLS wires shall be in accordance with IS 732 of 1963. The minimum size of conduit to be used shall not be less than 19 mm (approx.) and not more than two circuits connected to same phase be bunched in one conduit. Two different phases are not allowed in one conduit.

Commonly used sizes of 250/440 Volts PVC wires and conduit capacities are as tabulated below :-

Size of Wire	Voltage Grade	**Capacity of the Conduit** 19 mm/20 mm	25 mm
1.5 sq.mm.	230/440	4 Nos.	8 Nos.
2.5 sq.mm	230/440	4 Nos.	6 Nos.
4.0 sq.mm	230/440	2 Nos.	4 Nos.
6.0 sq.mm	650/1100	2 Nos.	3 Nos.
10 sq.mm	650/1100	" " " "	3 Nos.

2.1 **Point Wiring**

The wiring shall be of the looping in system as different form the tree system. Connectors should not be used without specific prior approval. Looping in on the phase side shall be at the switches and that on the neutral side at the ceiling roses. Every light point, fan point and plug point shall have individual control switch unless stated otherwise. Earthing shall be provided for all the points according to the statutory requirement wherever necessary. The number of points per circuit shall not exceed 8 in any case.

2.2 a) The point wiring in conduit consists of wiring from the branch Distribution board in conduit with its ancillary work, such as inspection bends, junction boxes and in PVC insulated multi strand FRLS wires upto the fixed terminals of ceiling roses, connectors batten holders, etc. depending upon the type of point

b) The colour coding as specified in relevant IS must be followed strictly. The wiring shall be rejected if not found in accordance with standards as specified.

c) The control switches for lights, fans, wall sockets and fan regulators shall suitably be grouped on sheet steel cases of all welded design fabricated out of 1.2 mm (approx.) Light\ Fan\ Plug\Power point control switches. Will be of modular type made of Urea.

d) The in PVC insulated multi strand FRLS wiresas per IS 694 of grade 440/660 Volts for lighting and power wiring.

2.3 **Main and Sub-Mains Wiring.**

This shall include the cost of all PVC-A-PVC cables, conduit accessories, clamps spacers, in PVC insulated multi strand FRLS wires, PVC/ PVC wires on battens depending upon the type of wiring, all masonry work, such as cutting, neat finishing of walls, floor openings etc. Only approximate lengths are included in the Schedule of Quantities and Rates, but the actual lengths of the mains and sub-mains executed will be measured between terminating points and will be paid for. Where the mains and sub-mains pass through the flooring, or through the wall, the same shall pass as specified in 3 (b) above. Mains and Sub-Mains risers in conduit shall be bonded together with 4.0 sq.mm. bare aluminum/copper as specifically mentioned in Schedule and earth clips on each floor landing / mid landing. The PVC heavy duty cable are provided as mains and sub-mains , the same shall be fixed as per specifications.

3.0 **Switches, Sockets & Ceiling Roses**

3.1 **Ceiling Roses**

These shall be of Bakelite and of approved make and colour and shall not contain fuse terminals. These shall be provided with brass ceiling plate and M.T. Brass screws and washers with cord grip for termination of wires.

3.2 Modular Type Switches

These shall be of single pole type, shock proof, manufactured as per relevant I.S. The Switches shall be surface mounting and minimum continuous ratings shal be of 5A + 250 V AC. Higher ratings shall be provided as specifically stated in Schedules.

3.3 Plate type, moulded design – switches on white Urea Power pressed cover plates

These shall be of single pole, double pole, two ways, one ways or otherwise as called for in the Schedule. These shall be manufactured as per relevant IS Codes and shall amply to Indian Electricity Rules. The minimum rating shall be 5A at 250 V AC.

3.4 Socket Outlets With Plugs

These shall be with porcelain base, in 2 Pin and earth design of best quality suitable for single phase, 250 volts supply, The earth pin shall be effectively connected to the nearest conduit or earth connections in distribution board with not less than 3 mm2 (No. 14 SWG) copper wire. The socket outlet shall be complete unit shall be with ratings of 5 Amps. 250 Volts or 15 Amps 250 volts to suit individual requirement as stated in Schedule of Quantities and Rates. The socket outlets shall be in tumbler type dosing or Piano type, flush mounting or on plate designs as called for in the Schedule.

3.5 Interlocked Metal Clad Switch Fuse Units

a) The Metal Clad switch fuse unit shall be of the heavy duty type, quick make and quick break action of approved pattern and capable of carrying continuously the current specified. All the switch fuse units shall have 'U' type contacts on fuse carriers and the switch fuse units of capacities 30 Amps. And above shall be provided with spring type contacts on the fuse bases. Unless otherwise specifically brought out in the Schedule the metal cases shall be of cast iron and shall be provided with knock-outs for incoming and outgoing pipes or cables and earthing terminals. The cover of the switch shall be interlocked with the switch handle so that the cover cannot be opened unless the switch is 'OFF' and the switch cannot be made on unless the cover is fixed.

b) The fuse shall be either rewirable type or HRC type as detailed in Schedule of Quantities and Rates. The Switches with HRC fuse links shall be supplied with insulated fuse removers.

TECHNICAL SPECIFICATIONS FOR CONCEALED CONDUIT WORK

1.0 Scope of Work –

The scope of this section comprises of supply, delivery, store at site, prepare the conduit assembly, fix and erect in proper position, 2.0mm thick heavy duty PVC conduit concealed work , check before casting of slab, measure and tie the assembly to reinforcements, complete with providing GI pull wires.

1.1 Applicable Standards -

The relevant sections of Indian Standard Specifications as more particularly stated herein and broadly to all the coddles, stated herein and broadly to all the coddles, statues and regulations as applicable shall be strictly enforced and adhered to. More particularly following codes should be strictly followed.

IS 9537 P-III-	PVC Conduits
IS 2667 of 1964 -	Cast Iron Conduit Accessories.

IS	694	-	Wiring Practice
IS	3043	-	Code of Practice for Earthing
IS	3202	-	Climate proofing of Electrical System
IS	3837	-	Accessories for rigid steel Conduits
IS	5133 (Part-I)	-	Sheet Steel Boxes.

2.0 PVC . Conduit Work

2.1 Material

The PVC Conduits shall be of2.0mm thickness, as per relevant sections of IS codes mentioned above .

a) The minimum thickness permitted for concealed conducting shall be 2.0mm.
b) The tubing must be perfectly circular, without any burrs or kinks.
c) The Conduit shall be of such type, so as to be capable of making tight fitting joints .
d) The minimum size of PVC Conduits allowed in concealed work shall be of 19 mm (3/4") or above.

2.2 Conduit Accessories

a) All conduit accessories that are to be used in concealed work shall be of Cast Iron type conforming to latest and relevant IS code.
b) Conduit accessories shall be of threaded type and capable of clean and tight fittings.
c) Conduit accessories of screwed or bolted type are expressly not allowed in concealed work.
d) All junction boxes of one way or above shall be of high dome type with a depth of minimum 75 mm. Any other type of accessories shall be used only after obtaining specific approvals from Consulting Engineers.
e) In concealed work, inspection types of bends are not allowed, normal bends/elbows may be permitted after specific approval.

2.3 Conduit Assembly Work

a) Initially all drawings for concealed conduit work shall be inspected. Any discrepancies or otherwise occurring due to site conditions or change in internal layouts in walls shall be reported. After rectification of the same, then the measurements and marking shall be done for the conduit assembly, on the shuttering of the slab.

b) All PVC .Conduits, shall be assembled. Wherever straight runs exceeds 6 mts. , additional pull boxes or junction boxes shall be provided, However, the entire assembly shall be so assembled in order to facilitate renewal of wires etc. in the future.

c) Wherever fluorescent light fixtures are shown in the layout, the conduit shall be terminated in a high dome junction boxes at the centre of the fixture, unless otherwise specified or indicated in drawings.

d) In the concealed conduit work , all junction boxes, bends, elbows, shall have check nuts on either side to ensure security of the accessories in its place. They shall also PVC tapped at all joints in order to prevent cement, water, or slurry entering the PVC. conduit assembly .

e) All precautions should be taken in concealed work, to ensure no entry of cement slurry or blocking of conduits due to concreting.

f) For all circuit wiring, i.e. from Lighting Distribution Boards to Individual Switchboards, minimum 25 mm 2.0mm thick conduits shall be used.

g) All P.V.C conduit drops that are to be taken for the purpose of joining the Distribution Board or Switch Boards shall be taken out of the shuttering with a clean hole. Sand then shall be provided at the bottom most part of the entry in the shuttering. The projected part of the PVC.conduit shall have proper threaded portion and a coupling provided over the same.
h) The entire PVC conduit assembly shall be properly secured and bonded by means of GI steel wires, twisted and fixed to the reinforcements. Additional fixing shall be done near joints, junction boxes, pull boxes etc.
i) The entire assembly then shall be checked for rigidity and no movement shall e allowed in the assembly.
j) The entire PVC conduit assembly shall be provided with proper GI pull wires of minimum 14 gauge.
k) Adequate number of M.S , pull boxes or of Cast Iron Boxes shall be provided in the PVC conduit assembly .
l) It shall be the entire responsibility of the Contractor to supervise the concealed conduit assembly work during the casting of the slabs. Adequate precautions should be taken to spread fine sand covering the opening of the M.S boxes or Junction Boxes of the bottom of the slab.
m) Where the conduit passes through the flooring the same shall be passed through galvanized pipe of suitable size fixed in the flooring, so that conduits, cables or wires can be renewed at any time without breaking the floor.
n) Where the conduit runs in brick walls same should necessarily fixed by using M.S clamps. In the straight run the distance between the two clamps shall not exceed 800 mm and additional clamps should be provided near bend and junction box.

SECTION – VI : SPECIFICATIONS FOR INSTALLATION OF ELECTRICAL

EQIPMENTS.

1.0 Specification for Installation of Main L.T. Panel

1.1 The Main L.T. Panel shall be installed in the electrical room allotted at site. The panels shall be properly assembled if dispatched in sections. All bus bars fish plates will be thoroughly cleaned, greased and bolted to instructions. The Main Panel will be mounted on base frame of adequate size using 100 x 50 x 6 mm ISMC channels fabricated to meet the design of the base frame of the Main L.T. Panel. The fabricated frame shall be welded in design and will undergo metal treatment process as stated in the specifications elsewhere. The base frame shall have adequate size foundation bolts which shall be grouted in the flooring. The base frame of the panels will then be aligned with the fabricated base frame already grouted. The whole structure will be rigid and will not in any way move while operating any of the switchers. If found necessary, then, additional supports by way of angles horizontally bolted to the panel and grouted in the nearby wall shall be done. All necessary civil works such as digging for the foundations bolts, grouting, refinishing to match the surrounding surfaces and all masonry works are included in the erection of the Main L.T. panel. The entire creation of the panel shall have a neat and esthetic appearance.

2.0 Specifications for Installation of Sub-Power and Sub Lighting Distribution Boards and Power & Lighting Distribution Boards

2.1 Before erecting the SI.OB and LDBs and PDBs at site, a thorough inspection shall be done by the Contractor and reported to the Consultants if any difficulties are envisaged for erection. Thereafter, an erection sketch shall be prepared, indicating the dimensions and the clearances between the Boards. A similar marking will also be made at site.

2.2 All Power and Distribution Boards shall be tested for mechanical endurance. After checking wiring and cable connections the entire boards, shall be erected in places indicated and marked on the plan. All touching up work of points shall then be done and foundation bolts granted. All necessary holes and civil works shall be done as per directions. The Panel after duly testing shall be put to commission for trial. All the lighting and power distribution boards shall be mounted on MS angle iron frame works fabricated to suit the site requirements. The angle iron frame works shall be fabricated using 50 x 50 x 6 mm MS angles and 25 x 3 mm MS flats welded and grouted.

3.0 Specification for installation of L.T. Capacitors

3.1 L.T. Capacitor shall be neatly arranged and installed in tier formation, Proper checks should be done to ensure proper banking and number of L.T. Capacitors banked together. The Capacitors after installation and cable joints, shall be finally checked for any leakage's etc. The L.T. Capacitors banks shall be fixed on angle iron frame work firmly granted in the floor and fixed as MS Channel frames. All Joints shall

be checked for proper connections and after conducting all tests, the Capacitor Banks shall be commissioned. The Capacitor Banks shall be commissioned. The operation of banks shall also be tested and terminal voltages discharge should be tested and noted prior to commissioning.

4.0 Specifications for installation of MV/LV cables

5.1 General

5.1.1 MV Cables shall be inspected prior to laying, laid tested and commissioned in accordance with drawings, specifications, relevant Indian Standards Specifications and cable Manufacturer's instructions. The cable shall be delivered at site in original drums with manufacturer's name clearly written in the drum.

5.1.2 The recommendations of the cable manufacturer with regard to jointing and sealing shall be strictly followed.

5.2 Inspection

5.2.1 All cables shall be inspected upon receipt at site and checked for any damage during transit.

5.2.2 While selecting cable routes, corrosive soils, ground surrounding sewage effluent etc. shall be avoided ; where this is not feasible, special precautions as decided by the consultants, shall be taken. Street lighting and service line to each area have separate route.

5.2.3 Proximity to communication cables

a) Power and communication cables shall as far as possible cross at right angles. Where power cables are laid in proximity to communication cables the horizontal and vertical clearances shall not normally be less than 60 cms.

5.2.4 Laying methods

a) Cables shall be laid direct in ground, in pipes/closed ducts, in open ducts or on surface depending on environmental site conditions.

b) During the preliminary stages of laying the cables, consideration should be given to proper location of the joint position so that when the cables are actually laid the joints are made in the most suitable places. As far as possible water logged locations, carriage ways, pavements, proximity to telephone cables, gas of water mains, inaccessible places, ducts pipes racks etc. shall be avoided for joint position.

5.3 laying direct in ground

5.3.1 General

This method shall be adopted where the cable route is through open country, along roads/lanes etc. and where no frequent excavations are encountered and where re-excavations is easily possible without affecting other services.

5.4 Trenching :

5.4.1 Width of trench : The width of the trench shall first be determined on the following basis.

a) The minimum width of trench for laying single cable shall be 35 cm.
b) Where more than one cable is to be laid in the same trench in horizontal formation, the width of trench shall be increased such that the inter – axial spacing between the cables, except where otherwise specified shall be at least 20 cm.
c) There shall be a clearance of at least 15 cm between axis of the end cables and the sides of the trench.

5.4.2 **Depth of Trench –** The depth of the trench shall be determined on the following basis :

a) Where cables are laid in single tier formation, the total depth of trench shall not be less than 75 cm. For cables up to 1.1 KV and 1.20 m for cables above 1.1 KV.
b) When more than one tier of cables is unavoidable and vertical formation of laying is adopted, depth of trench in above shall be increased by 30 cm for each additional tier to be formed.

5.4.3 Excavation of Trenches

a) The trenches shall be excavated in reasonably straight lines. Wherever there is a change in direction, suitable curvature shall be provided complying with the requirements of the manufacturer.
b) Adequate precautions should be taken not to damage any existing cable(s) , pipes or other such installation in the proposed route during excavation Wherever bricks, tiles or protective covers or bare cables are encountered, further excavation shall not be carried out without the approval of the Consultants.
c) If there is any danger of a trench collapsing or endangering adjacent structures, the sides should be well shored up with timbering and/or sheeting as the excavation proceeds. Where necessary, these may even be left in places when back filling the trench.
d) Excavation through lawns shall be done in consultation with the staff of the department/ owner concerned.
e) The bottom of the trench shall be level and free from stone, brick bats etc. The trench shall then be provided with a layer of clean, dry sand cushion of not less than 8 cm in depth.

5.5 Laying of Cable in trench

5.5.1 At the time of issue of cable for laying the cores shall be tested for continuity and insulation resistance.

5.5.2 When the cable has been properly straightened, the cores ,tested for continuity , insulation resistance and the cable is then measured. The ends of all lead sheathed cables shall be sealed with solder immediately. In case of PVC cables suitable moisture seal tape shall be used for this purpose.

5.5.3 a) Cable laid in trenches in a single timer formation shall have a covering of clean, dry sand of not less than 17 cms. Above the base cushion of sand before the protective cover is laid.

c) In the case of vertical multi-tier formation after the first cable has been laid, a sand cushion of 30 cms. Shall be provided over the initial bed before the second tier is laid. If additional tiers are formed, each of the subsequent tiers also shall have a sand cushion of 30cms. As stated above. The top most cable shall have a final sand covering not less than 17 cms. Before the protective cover is laid.

5.5.4 At the time of original installation, approximately 3 m of surplus cable shall be left on each end of the cable and on each side of underground joints (straight through/Tee/Termination) and at entries and places as may be decided by the Consultants. The surplus cable shall be left in the form of a loop. Where there are long runs of cable length, loose cable may be left at suitable intervals as specified by the Consultants.

5.5.5 Unless otherwise specified, the cables shall be protected by second class bricks of not less than 20 cm x 10 cm x 10 cm (nominal size) protection covers placed on top of the sand, (bricks to be laid breadth wise) for the full length of the cable to the satisfaction of the consultants. Where more than one cable is to be laid in the same trench, this protective covering shall cover all the cables and projects at least 5 cm. Over the sides of the end cables.

5.6 Back filling

5.6.1 The trenches shall be then back filled with excavated earth free from stones or other sharp edged debris and shall be rammed and watered, if necessary, in successive layers not exceeding 30cm. Unless otherwise specifies, a crown of earth not less that 50 mm. In the center and tapering towards the sides of the trench shall be left to allow for subsidence. The crown of earth however should not exceed 10cm. So as not to be a hazard to vehicular traffic. The temporary reinstatements of roadways should be inspected at regular intervals, particularly during the wet weather, and any settlement should be made good by further filling as may be required. After the subsidence has ceased, trenches cut through roadways or other paved areas shall be restored to the same density and material as the surrounding area and repave to the satisfaction of the consultants.

5.6.2 Where road burms or lawns, have been cut to kerb stones displaced, the same shall be repaired and made good except Turing / asphalting to the satisfaction of the consultants and all surplus earth or rock removed to places as specified.

5.9 Laying in pipes/ Closed Ducts

5.9.1 In locations such as road crossing, entry to buildings, on poles, in paved areas etc. cables shall be laid in pipes or closed ducts.

5.9.2 Stone ware pipes, GI, CI or Spun reinforced concrete pipes shall be used for such purposes. In the case of new construction. Pipes as required shall be laid along with the civil works, and jointed as per the instructions of the consultants, the size of the pipe shall be decided by the consultants and shall not be less than 10cm. In diameter for a single cable and not less than 15cm. In diameter for a single cable and not less that 15cm. For more than one cable. These pipes except for SW pipe which shall be laid over 10cm. Thick cement concrete 1:5:10 (1 cement : 5 Coarse sand : 10 graded stone aggregate of 40 mm nominal size) bed. No sand cushioning or tiles need be used in such situations, Unless otherwise specified the top surface of pipes shall be at a minimum depth of 1m. from the ground level when laid under roads, pavements. etc.

Where steel pipes are employed for protection of single core cables feeding AC load, the pipe should be large enough to contain both cables in the case of single phase system and all cables in the case of poly phase system.

5.9.3 Pipes for cable entries to the building shall slope downwards from the building and suitably sealed to prevent entry of water inside the building. Further, the mouth of the pipes at the building end shall be suitable sealed to avoid entry of water.

5.9.4 All chases and passage necessary for the laying of service cable connections to buildings shall be cut as required and made good to the original finish and to the satisfaction of the consultants.

5.9.5 Cable grips. Drew wires and winches etc. may be employed for drawing cables through pipes/closed ducts etc.

5.10 Laying in open ducts

5.10.1 Open ducts with suitable removable covers shall be preferred in sub-stations, switch rooms, plant rooms, workshops etc.

5.10.2 The cable ducts should be of suitable dimensions so that the cables can be conveniently laid, if necessary, cables may be fixed with clamps on the walls of the duct or taken in troughs in duct. The duct should be covered with removable slabs or chequered plates.

5.10.3 Ducts may be filled with dry sand after the cable is laid and covered as above or finished with cement plaster specially in high voltage applications.

5.10.4 Splices or joints of any type shall not be permitted inside the ducts.

5.10.5 As far as possible laying of cables with different voltage ratings in the same duct shall be avoided.

5.10.6 Where considered necessary, hooks or racks shall be provided for supporting the cables in masonry/concrete cable ducts, cable troughs, otherwise cables shall be laid direct in the trench or through etc. while deciding the layout of cable in such ducts, care should be exercised to ensure, that, unnecessary crossing of cables is avoided.

5.11 Laying on surface

5.11.1 The cables may be laid in through or brackets at regular intervals or directly cleated to wall/ ceiling. When laid over bracket supports, the cables shall be clamped to prevent undue sag.

5.11.2 Cable clamps shall be made from materials such as mild steel, porcelain, wood aluminum etc. in case of single core cables the clamps shall be non-magnetic

materials. A suitable non-corrosive packing shall be used for clamping unarmored cables, to prevent damage to the cable sheath.

5.12 Cable Identification Tags.

5.12.1 Wherever more than one cable is laid/run side by side, marker tags as approved, inscribed with cable identification details shall be permanently attached to all the cables in the main holes /open ducts etc. These shall also be attached to various cables laid direct in ground at suitable intervals as decided by the consultants before trenches are filled up.

5.13 Jointing :

5.13.1 Jointing work shall be carried out only by a licenses/ experienced cable jointer.

5.13.2 At the preliminary stages of laying a cable, a proper jointing position should be selected.

5.13.3 Sufficient surplus cable shall be left on each side of joints as mentioned in clause 3.5.3.4.

5.13.4 Joints shall be staggered by 2 to 3 m when two or more cables are laid together in the same trench.

5.13.5 Jointing materials and accessories like conductor ferrules, solder, insulating and protective tapes, filling compound, jointing boxes etc. of right quality and correct sizes, conforming to relevant Indian Standards, wherever they exist, shall be used. The design of the joint box and the composition of the filling compound shall be such as to provide an effective sealing against entry of moisture in addition to affording proper electrical characteristic to joints. where special type of splicing connector kits or epoxy resin spliced joints are specified materials approved for such application shall be used and instructions of the manufacturer/supplier of such materials shall be strictly followed.

5.13.6 Insulation resistance of cables to be jointed shall be measured with 500volts meggar for cables of higher voltages. Unless the insulation resistance values are satisfactory, jointing shall not be done.

5.13.7 Cores of the cables must be properly identified before jointing.

5.13.8 Where a cable is to be jointed with the existing cable, the sequence should be so arranged as to avoid crossing of cores while jointing.

5.14 Testing

5.15.1 All cables before laying shall be tested with a 500 volts megger for 1.1kv grade or with a 2,500/5,000 volts meggar for cables of higher voltages. The cable cores shall be tested for continuity, absence of cross phasing, insulation resistance to earth/sheath/armour and insulation resistance between conductors.

5.15.2 All cables shall be subjected to above mentioned tests during laying, before covering the cables by protective covers and back filling and also before the jointing operations.

5.15.3 In the absence of facilities for pressure testing, it s sufficient to test for one minute with 1,000 volts meggar for cables for 1.1kv grade and with 2,500/5,000 volts meggar for cables of higher voltages.

5.16 Completion Plan and Completion Certificate

5.16.1 The work shall be carried out in accordance with the drawings enclosed with the tender and also in accordance with the modifications thereto from time to time approved by the consultants.

5.16.2 For all works costing more than Rs. 10,000/- completion certificate, after completion of work, shall be submitted to the consultants. Completion plan drawn to a suitable scale in tracing cloth with ink indicating the following along with three blue print copies of the same shall also be submitted.

5.16.3 Layout of cable work.

5.16.4 Length, size type and grade of cables.

5.16.5 Method of laying i.e. direct in ground, in pipes etc.

5.16.6 Location of each joint with jointing method followed.

5.16.7 Route marker and joint marker with respect to permanent land marks available at site.

5.16.8 Name of work, Job number, accepted tender reference, date of completion, names of division and sub-division, names of contractor with their signature and scale of drawing.

5.0 Lighting Fixtures

The lighting fixtures erected inside the building shall be on nipples/short/long down rods on walls socket arrangement. The height of the lighting fixtures shall be maintained uniformly all throughout the various areas. The fitting prior to erection shall be tested. The wiring checked and then erected. The wiring from the ceiling rose/terminal block shall be done in flexible. The lighting fixtures in the office area and the urinals shall also be erected as stated herein and finally to the instructions of the site Engineer/Consultants. The tubes to be fixed in the light fixtures shall be of approved type and shall be fixed with tube clip holders in place for specific light fittings when indicated in the schedule. The lighting fixtures fixed on poles etc. shall be done as per directions and instructions. In the outside lighting all other fixtures such as Post Top Lantern etc. shall be erected using appropriate diameter G.I. pipe of 'B' class and wiring complete from control gearbox and the fitting. The cost of these should be included in the erection cost of the fixture.

6.0 Specification for installation of Point wiring equipment

The method of installation shall comply to Standard practice of wiring methods. Then the conduit alongw3ith its accessories shall be erected in the layout suggested in drawings. The downward bends and the drops shall be properly done and fixed in a row. All hardware and spacers shall necessarily be of galvanized iron. The conduit entering and leaving the junction boxes, distribution boards shall have adequate and firm gripping device, final work of the conduit shall have a neat appearance to directions by the consultants. All emergency light wiring and other similar type shall have a coloured band 'RED' and shall be distinctly kept different from the other point wiring equipment.

7.1 Before erecting the conduit assembly work, the entire conduit route shall be thoroughly inspected at site and reported to the consultants in case of any difficulties. As far as possible, all crossings and overlapping of various conduits should be avoided.

7.2 Before laying or erecting the conduit work the contractors shall discuss with the consultants and the consultants all final locations and heights of various switches/switch boards/plug and sockets, telephone outlets or any other point wiring outlets and then proceed with the work. As a result of any interior

changes made by the consultants during the course of the work or even after erection, it is felt that, the conduit routing has to be altered, then., the same shall be executed by the contractor without any additional cost or claim for re-work. The contractor is advised to consider such incidental cost while quoting the tender.

7.3 While erecting the point wiring materials, all works such as chasing in the flooring and finishing the same to instructions and matching the existing flooring is work and also RCC works. All costs incidental to this work including removing of the debris is to be borne by the contractor at no extra cost.

7.4 In case the conduits or sub-mains or circuit cables or cables to individual LDBs are to be laid on cable racks then, the routing of the rack should be first discussed with the consultants and the consultants, a close Co-ordination then have to be maintained between the AC Contractor, Plumbing contractor and the other various agencies working at site.

7.0 Specifications for Earthing Grid and Earth Stations

The earthing system shall comply with the relevant standard as laid down in the fire insurance and Indian Standard specification.

The earthing stations for pipes and plate Earthing shall be as per drawings. Entire civil works, salt, charcoal in proper proportions, watering chamber with wire mixing etc. shall be done. The earth tapes wherever indicated shall be obtained by using Earth meggar. The results should comply with the standards bid down by the Indian standards specifications.

The lighting Arrestors shall be fixed on angle from frame work secure to the building walls at the top most painted and at all other points wherever indicated on the plan. They shall be connected to earth by using have completed earth grid running around the unit and the same shall be inter-connected. The entire works of earthing should be complete in all respects such as welding the GI tape joints, tapping etc. there shall be no place where earthing strips are not connected to earth stations. G.I. tape shall be fixed on walls or laid in prepared trenches or chiseled in ground and redone etc. as per directions.

T E S T I N G

1.0 General

At the completion of the work, the entire installation shall be subjected to the following tests :-

a) Insulation Continuity Test.
b) Insulation resistance test.
c) Earth continuity test.
d) Earth resistively test.

Besides the above tests, any other test specified by the local Authority shall also be carried out.

2.0 Testing of wiring

All the wiring system shall be tested for continuity of circuits, short circuits and earthing after the wiring as completed and before charging .

3.0 Insulation Resistance Test

The insulation resistance shall be measured by applying between earth and the whole system of conductors. or any section thereof, with all fuses in place and all switches closed and except in concentric wiring all lamps in position of both poles of the installation otherwise electrically connected together, a direct current pressure provided that it does not exceed 60 volts for medium voltage circuit, where the supply is derived from AC there phase system the neutral pole of which is connected to earth, either direct or through added resistance, pressure shall be deemed to be that which is maintained between the phase conductor and the neutral. The insulation resistance measured as above shall not be less that 50 divided by the number of points on thee circuit provided that the whole installation shall not be required to have an insulation greater than one mega ohm.

The insulation resistance shall also be measured between all conductors connected to one phase conductor of the supply and all the conductors connected to the middle wire of the neutral or to the other phase conductors of the supply. Such a test shall be carried our after removing all metallic connections between the two poles of the installation and in those circumstances the installation shall not be less than that specified above. The insulation resistance between the case of frame work of housing and power appliances, and all live parts of each appliance shall not be less than that specified in the relevant Indian Standard Specifications or where there is no such specification shall not be less than half a meg ohm.

4. Testing of Earth Continuity Test

The earth continuity conductor metallic envelopes of cable shall be tested for electric continuity and the electrical continuity and the electrical resistance of the same along with the earthing leas but excluding any added resistance or earth leakage circuit breaker measured from the connection with the earth electrode to completed installation shall not exceed one ohm.

5. Testing of Polarity of non linked single pole switches

In a two wire installation a test shall be made to verify that all non-linked single pole switches have been fitted in the same conductor through out and such conductor shall be leveled or marked for connections, to an outer or phase conductor or to the non-earthen conductor of the supply. In the three of four wire installation a test shall be made to verify that every non-linked single pole switch fitted in a conductor to one of the outer or phase conductor of the supply. The

entire electrical installation shall be subject to the final acceptance of Architect/Consultants as well as the local authorities.

6. Earth Resistively Test

Earth Resistively Test shall be carried out in accordance with Indian Standard Code of Practice for earthing IS 3043 – 1966 . All tests shall be carried out in the presence of the Architect/Consultants.

TESTING, MANUFACTURER'S TESTS PRECOMMISSIONING TESTS AND COMPLETE COMMISSIONING

The General Intent of this specification is to mention all the relevant tests to be done and furnished to the management of Shree Ram College of commerce, by the Contractor, prior to commissioning of the electrical work. These are guidelines however, the Contractor shall carryout all such tests and complete all formalities as per relevant Indian Standard Specifications, Tariff Advisory Committee's Rules and Fire Insurance Requirements and / or Electricity Rules and Regulations as per Government as per Government Gazette and Publications.

1. Testing of Equipment's

All equipment's before installing on the site work shall be tested and all such results produced to the Owner. Nothing shall absolve the Contractor from re performing any tests that the Contractor may be called upon specifically by the Architect/Owner.

2. Manufacturer's Tests

The Contractor shall specifically perform all tests such as type, routine tests on all equipment's such as Medium Voltage Panels, Light Fixtures etc. The details of such tests shall be furnished by the Contractor to the Owner/Consultants and obtain their approval in the matter , All costs incidental to such tests shall be deemed to have been included in the specific them for that equipment and no extra charge shall be payable by the Owner.

3. Pre commissioning Tests

All tests underlined herein and / or called by the local Electrical Authorities, Government Officials and as laid down in relevant Indian standard Specifications and / or Rules and Regulations stated in Indian Electricity Act shall be strictly complied meager, on M.V. side the reading shall not exceed 1 ohm and for H.V. side not exceeding 0.5 ohm.

4. Commissioning

a) The Contractor shall obtain the written permission and sanction of commissioning the equipment from Chief Electrical Inspector of New Dewlhi. if required under the specific rules of the Government.

b) All costs, visit fees etc. incidental to such obtaining sanctions shall be to the Contractors Account, except statutory fees payable under relevant Indian Electricity Act or Rules.

c) Contractor shall furnish all the necessary test and tests-reports to the Electrical Supply Authorities and furnish all formalities required to comply as per the Rules and Regulations on laid down for release of

contractor shall carry out all such tests and prove the results to the entire satisfaction of the local and electric supply authorities, All costs and expenses incidental to the release of electric supply shall be to the Contractors account and no demand what so ever shall be made to the Owner, except for any security deposits that the supply authorities would deem it necessary for charging of the line etc.

All such documents forwarded and/or letters and/or correspondence exchanged to this regard shall be made available for inspection and the Contractor shall furnish 3 sets of such documents and drawings for the Owner's records.

After release of Electric Supply to Owner, the Contractor shall furnish six sets of all tests and test reports declared to the authorities and shall record the initial reading of the L.T. Meter and shall furnish all such documents, officially exchanged between the Contractor and the authorities for the record of Owners.

Contractor shall also attend and furnish the relevant completion certificate from the Electrical Inspector, I.E. & I. Department, and/or any other authority thereof , whichever may be applicable .

The Contractor shall maintain a close liaison with the Supply Authorities and keep informed to the Consultants/Owners of the entire developments and planning i.e. being done by the Supply Authorities. It is the primary responsibility of the Contractor to approach department . for obtaining Electrical loads Sanctions. All formalities connected with this work shall be to the account of the Contractor except for official fees or deposits or any other statutory obligations.

DOCUMENT,CERTIFICATES,DRAWING AND SPARE REQUIREMENTS

The intent of this specification is to give a guideline of the Contractor to furnish in reproducible all sets of relevant papers and lists of spares for the continuous performance of the Owner's Building. Nothing shall absolve the Contractor from not furnishing any information documents and/or papers that have not been specifically stated herein.

i) **Document** All relevant documents for maintenance, manuals procedures and data's of all Electrical Equipment's supplied and erected by the Contractor on the site. The documents shall be binded and furnished to the Owner.

ii) **Certificates** All relevant tests certificates etc. and as more specifically stated in clause, shall be furnished, Contract shall also furnish all such certificates issued by the original manufacturer towards guarantee of performance of all equipment's by the Contractor.

iii) **Drawings** All as built working and erection drawing of the final erected plan of all electrical installation work in reproducible of equipment's such as M.V. Panel Distribution Boards, Cable routing, sizing, connection diagrams, circuits, wiring

diagram and conductor sizes, lengths, terminations details, operational charts, recorded readings, load details etc. shall be furnished to the owner. The owner reserves the right to the mode of submission of such details being furnished by the Contractor.

iv) The Contractor shall, not withstanding anything stated otherwise, shall furnish list of recommended maintenance tools, spares, fuses, sets, codes, catalogues, appropriate pricing, original equipment manufacturer's addresses etc. to the Owner. Prior to such furnishings contractor shall make a proper assessment of all such Contractor shall also be deemed to have understood the requirements, in such a way that it ensures a continuous operation and functioning of the Electrical Equipment under the stated ratings, conditions and specifications.

LIST OF APPROVED BRANDS/MAKES OF EQUIPMENTS REQUIRED UNDER THIS TENEDR.

The make of the materials are approved subject to their meeting the tender spec requirements. The contractor however shall seek approval of specific make from the In charge before commencing the work . The decision of the Engineer -in- charge shall binding to the contractor in this respect. Makes for of any other items not covered a got approved from the Engineer -in- charge .Following are the list of approved brands/makes of equipment required under this tender. Please note that wherever there is a multiple choice of brands/makes approved, only nominated brands/makes by Owners/Consultant/Architect shall have to be supplied.

Sr. No.	Description	Approved Makes
1.	HRC SWITCHES AND FUSES	L&T,ABB,SIEMENS, SCHINEDER.
2	MOULDED CASE CIRCUIT BREAKER .	L&T-DN RANGE, MERLIN GERIN AS RANGE, SIEMENS-VL- RANGE.
3	PANEL BOARDS.	AAR, VEE CONTROLS, ISHANG LIGHTING, ELECTRO CONTROL, DEVICES, ADLEC, ADVANCE, TRICOLITE.
4	COPPER CONDUCTOR. 660/1100 VOLT GRADE FR/ FRLS/PVC WIRES ISI.	SKYTONE, L&T, RR KABLES, NATIONAL, POLYCAB, KEI, HAVELLS.
5	CO AXIAL CABLES	SKYTONE, DELTON, NATIONAL , BONTON
6.	TELEPHONE CABLES	SKYTONE, DELTON, NATIONAL, BONTON
7.	PVC CONDUIT & ACCESSORIES	POLYPACK, PRECISION, ATUL,
8	MCB/MCB-DB, /INDUSTRIAL SOCKETA AND ACCESSORIES	L&T (HAGER) MDS(LEGRAND) LEXIC SCHNIDER .
9	RCCB/ RCBO	L&T(HAGER), MDS(LEGRAND), LEXIC, SCHINDER, INDO ASIAN GOLD LINE
10.	MODULAR SWITCHES, SOCKETS, REGULATORS, PLUG TOPS, BOXES AND ALL OTHER ACCESSORIES.	MDS(LEGRAND), MOSSAIC, CRAB TREE-PICADILLI, MK WRAP AROUND.
11.	CEILING FANS	CROMPTON, USHA BAJAJ, HAVELLS
12.	EXHAUST FANS	ALMONARD, CROMPTON, HAVELLS.
13.	EXAUST FANS DECORATIVE TYPE	NUTEK, ALMONARD, BAJAJ, USHA.
14.	LIGHT FIXTURES.	PHILIPS, SURYA, WIPRO,, SIEMENS
15.	CABLE GLANDS	COMMENT, HMI,DOWELS
16.	AMETER/ VOLTMETER/ & OTHER METER C.T'S	A.E., RISHAB(L&T) KAPPA, CONSEEVE, C&S.
17.	PUSH BUTTON INDICATING LIGHTS & SELECTOR SWITCHES.	L&T, SIEMENS, SCHNIDER, RASS CONTROL.
18.	THIMBLES/ LUGS	SIEMENS/LT-LK/ CUTLER HAMMER.

19.	Miniature Circuit Breaker of 9 KV Breaking Capacity and Boards	COMMET , DOWELLS, ASIATIC
20.	LAMPS	OSRAM, PHILIPS.
21.	CONNECTORS/ TERMINALS	WAGO ELEMAX PHOENIX.

I/We hereby declare that I/We have read and understood the above instructions which have been issued as conditions of the contract. In case any of the makes for any of the materials is missed out in the above list, then the contractor shall inform the Consultants about the same and obtain the approval. Thereafter, he can proceed with the supply of the equipments.

WITNESS **(Signature of the Tenderer)**

SUMMARY

S.NO.	DESCRIPTION	AMOUNT (IN RS.)
1	CIVIL WORK	
2	PLUMBING WORK	
3	FIRE FIGHTING WORK	
4	ELECTRICAL WORK	
	TOTAL=	

SCHEDULE OF QUANTITIES FOR CONSTRUCTION OF PROPOSED GIRLS HOSTEL BLOCK FOR SRIRAM COLLEGE OF COMMERCE AT DELHI UNIVERSITY,NORTH CAMPUS,DELHI.

		AMOUNT (IN RS.)
1	EARTH WORK	
2	CEMENT CONCRETE	
3	REINFORCEMENT CEMENT CONCRETE	
4	BRICK WORK	
5	ALUMINIUM WORK	
6	WOOD WORK	
7	STEEL WORK	
8	FLOORING WORK	
9	FINISHING WORK	
10	ROOFING WORK	
11	WATERPROOFING WORK	
12	MISCELLANEOUS WORKS	
	TOTAL:	

SCHEDULE OF QUANTITIES FOR CONSTRUCTION OF PROPOSED GIRLS HOSTEL BLOCK FOR SRIRAM COLLEGE OF COMMERCE AT DELHI UNIVERSITY,NORTH CAMPUS,DELHI.

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
SUB HEAD-I	**EARTH WORK**				
1.1	Earth work in excavation by mechanical means (Hydraulic excavator)/ manual means over areas (exceeding 30cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50m and lift up to 1.5m, disposed earth to be levelled and neatly dressed.				
1.1.1	All Kinds of soil	Cum	2142		
1.2	Earth work in excavation by mechanical means (Hydraulic excavator)/ manual means in foundation trenches or drains (not exceeding 1.5m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift upto 1.5m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.				
1.2.1	All Kind of soils	Cum	104		
1.3	Extra for excavating trenches for pipes, cables etc. in all kinds of soil for depth exceeding 1.5 m, but not exceeding 3 m. (Rate is over corresponding basic item for depth upto 1.5 metre).	Metre	R.O.		
1.4	Extra for every additional lift of 1.5 m or part thereof in excavation / banking excavated or stacked materials.				
1.4.1	All Kind of soils	Cum	528		
1.5	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering (Compaction will be done at 95% of M.D.D. at OMC) , lead up to 50 m and lift upto 1.5 m.	Cum	2246		

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
1.6	Providing and injecting chemical emulsion for preconstructional antitermite treatment and creating a chemical barrier under and all round the column pit, walls, trenches basements excavation, top surface or plinth filling, injection of wall and floor along with external perimeter of building expansion joints, surroundings of pipes, wooden door, windows frames and conduit etc. complete with Chemical (Chemical Name : Premise) of Bayer india (plinth area of the building at ground floor only shall be measured) Total chemical compound as per theoretical consumption based on relevant I.S./CPWD specifications, Manufacturer specifications shall be deposited in 4 installments as per Engineer instructions before use.	Sqm	836		
1.7	Supplying and filling in plinth with Jamuna sand under floors including , watering , ramming consolidating and dressing complete.	Cum	10		
1.8	Supply and filling in plinth and other places,surroundings wherever called for with approved good earth brought from outside including cost of earth, royalty loading ,unloading and carriage to site spreading in layers not exceeding 20cm thick,watering,ramming ,rolling with roller consolidating (Compaction will be done at 95% of M.D.D. at OMC)to required grade and levels complete.	Cum	50.00		
	TOTAL CARRIED OVER TO SUMMARY OF COST				

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
SUB HEAD - II - CONCRETE WORK					
2.1	Providing and Laying in position cement concrete of specified grade including the cost of centering and shuttering – All work upto all level.				
2.1.1	1:5:10 (1 cement: 5 coarse sand : 10 graded stone aggregate 40mm nominal size)	Cum	92		
2.1.2	1:4:8(1 cement: 4 coarse sand : 8 graded stone aggregate 40mm nominal size)	Cum	92		
2.2	Extra for providing and mixing water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification.	per 50 kg cement	100		
2.3	Providing and laying in position AAC Light weight blocks in sunken portion including ramming etc.complete at all floors .	Cum	50		
2.4	Providing and laying cement concrete in retaining walls, return walls, walls (any thickness) including attached pilasters, columns, piers, abutments, pillars, posts, struts, buttresses, string or lacing courses, parapets, coping, bed blocks, anchor blocks, plain window sills, fillets etc. upto floor five level, excluding the cost of centring, shuttering and finishing :				
2.4.1	1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size).	Cum	3		
2.4.2	1:1½ :3 (1 cement :1½ coarse sand : 3 graded stone aggregate 20mm nominal size).	Cum	3		
2.5	Centring and shuttering including strutting , propping etc. and removal of form work for				
2.5.1	Retaining walls, return walls, walls (any thickness) including attached pilasters, buttresses, plinth and string courses fillets, kerbs, window sills and steps etc.	Sqm	46		
2.6	Providing and laying damp-proof course 40mm thick with cement concrete 1:2:4 (1cement : 2 coarse sand : 4 graded stone aggregate 12.5 mm nominal size).	sqm	28		

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
2.7	Applying a coat of residual petroleum bitumen of grade of VG-10 of approved quality using 1.7 kg per square metre on damp proof course after cleaning the surface with brushes and finally with a piece of cloth lightly soaked in kerosene oil.	sqm	28		
2.8	Providing and fixing upto floor five level precast cement concrete string or lacing courses,copings,bed plates,anchor blocks, plain window,sills, shelves, louvers, steps ,staircases, etc. including hoisting and setting in position with cement mortar 1:3 (1 cement: 3 coarse sand), cost of required centering, shuttering and finishing smooth with 6 mm thick cement plaster 1:3 (1 cement : 3 fine sand) on exposed surfaces complete.				
2.8.1	1:2:4 (1 cement 2 coarse sand : 4 graded stone aggregate 20mm nominal size)	Cum	2		
2.9	Making plinth protection 50 mm thick of cement concrete 1:3:6 (1 cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size) over 75mm thick bed of dry brick ballast 40 mm nominal size, well rammed and consolidated and grouted with fine sand, including finishing the top smooth.	Sqm	185		
	TOTAL CARRIED OVER TO SUMMARY OF COST				

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
SUB HEAD - III- REINFORCED CEMENT CONCRETE WORK					
3.1	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. (Note :- Cement content considered in this item is @ 330 kg/cum. Excess/less cement used as per design mix is payable/recoverable separately)				
3.1.1	All works upto plinth level	Cum	470		
3.1.2	All works above plinth level upto floor V level	Cum	625		
3.2	Extra for providing richer mixes at all floor levels. (Excess/Less cement over the specified cement used is payable/recoverable separately)				
3.2.1	Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum)	Cum	168		
3.2.2	Providing M-35 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-35 is @ 350 kg/cum)	Cum	R.O		
3.3	Centering & Shuttering for all heights levels including strutting, propping etc. and removal of form for:				
i)	Suspended floors,roofs, landings, balconies and access platform.	Sqm	1826		
ii)	Lintels,beams, plinth beams,girders bressumers and cantilevers.	Sqm	1831		
iii)	Chajjas,Canopy,etc.including edges.	Sqm	406		
iv)	Columns, pillars, posts and strut	Sqm	1639		
v)	Foundations, Footings, bases of columns etc. for Mass concrete	Sqm	250		
vi)	Stairs, (excluding landings) Except spiral staircases	Sqm	183		

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
vii)	Walls of any thickness including attached pilasters, butteresses, plinth and string courses etc.	Sqm	207		
viii)	Shelves (Cast in situ)	Sqm	31		
ix)	Vertical and horizontal fins Individually or forming box louvers band and facias.	Sqm.	5		
x)	Extra cost of shuttering for exposed concrete in beam, slab, chajja, column etc. wherever required, as per the direction of Engineer-in-charge. (Written approvel required from Owner/ Engineer-in-charge to execute this item)	Sqm	300		
3.4	Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete up to plinth level and above plinth level.				
3.4.1	Thermo-Mechanically Treated bars	Kg	147433		
3.5	Extra for additional height in centering,shuttering where ever required with adequate bracing,propping etc.including cost of de-shuttering and decentering at all levels,over a height of 3.5 m , for every additional height of 1 metre or part thereof (Plan area to be measured)				
3.5.1	Suspended floors, roofs, landing, beams and balconies (Plan area to be measured)	Sqm	R.O		
3.6	Providing and fixing in position copper plate as per design for expansion joints	Kg	50.00		
3.7	Providing and filling in position bitumen mix filler of proportion 80 kg of hot bitumen, 1 kg of cement and 0.25 cubicmetre of coarse sand for expansion joints.	per cm depth per cm width per 100 m	0.77		
3.8	Providing and fixing sheet covering over expansion joints with iron screws as per design.				
3.8.1	Non-asbestos fibre cement board 6 mm thick as per IS: 14862				
3.8.1.1	200 mm wide	Metre	3.08		
	TOTAL CARRIED OVER TO SUMMARY OF COST				

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
SUB HEAD - IV -BRICK WORK					
4.1	Brick work with common burnt clay F.P.S (non modular) bricks of class designation 7.5 in foundation and plinth in :				
	Cement mortar 1:6 (1 cement : 6 coarse sand)	Cum	29		
4.2	Brick work with common burnt clay F.P.S (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level in all shapes and sizes in:				
	Cement mortar 1:6 (1 cement : 6 coarse sand)	Cum	335		
4.3	Half brick masonry with common burnt clay F.P.S (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level.				
	Cement mortar 1:4 (1 cement : 4 coarse sand)	Sqm	1626		
4.4	Brick work 7 cm thick with common burnt clay F.P.S (non modular) brick of class designation 7.5 in cement mortar 1:3 (1 cement : 3 coarse sand) in superstructure above plinth level and up to floor five level.	Sqm	R.O.		
4.5	Extra for providing and placing in position 2 Nos 6mm dia. M.S. bars at every third course of half brick masonry.	Sqm	1626		
4.6	Brick work with common burnt clay selected F.P.S. (non modular) bricks of class designation 7.5 in exposed brick work including making horizontal and vertical grooves 10 mm wide 12 mm deep complete in cement mortar 1:6 (1cement : 6 coarse sand) , Pointing in cement mortar 1:3 (1 white cement : 3 fine sand).				
4.6.1	From ground level upto plinth level	Cum	19		
4.6.2	Above plinth level upto floor V level	Cum	224		
4.7	Extra for exposed half brick work with selected F.P.S. (non modular) bricks of class designation 7.5 in elevations including making horizontal and vertical grooves 10 mm wide 12 mm deep complete finished with cement pointing in cement mortar 1:3 (1 white cement : 3 fine sand) complete.				
		Sqm	650		

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
4.8	Providing and applying silicon coat on exposed brick work , complete in all respects and as per standard specifications of CPWD/ Architect.	Sqm	1707		
	TOTAL CARRIED OVER TO SUMMARY OF COST				

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
SUB HEAD - V ALUMINIUM WORK					
5.1	Providing & fixing anodized aluminium door glazing of frame made from 63.5 x 38.1 x 1.8mm thick (14G) rectangular tubing, shutter for door made from rectangular special sections 47.62 x 44.45 x 1.8mm with 5.5mm thick float glass for shutter is fitted with snap type screwless bead with rubber gasket in the glazing complete job as directed by the Engineer. The door shutter will be fixed with handles, tower bolts one at top and one at bottom with mortice lock of approved make complete minimum thickness of anodizing will be 15 micron conforming to I.S.I. 868 latest. The anodizing will be electro coloured finish of approved shade.	Sqm	49.00		
5.2	Providing and fixing double action hydraulic floor spring of approved brand and manufacture (conforming to IS 6315), having brand logo embossed on the body / plate with double spring mechanism and door weight upto 125 kg, for doors, including cost of cutting floors, embedding in floors as required and making good the same matching to the existing floor finishing and cover plates with brass pivot and single piece M.S. sheet outer box with slide plate etc. complete as per the direction of Engineer-in-charge.				
5.2.1	With stainless steel cover plate minimum 1.25 mm thickness.	Each	28.00		
5.3	Providing and fixing bright finished brass sliding door bolts with nuts and screws etc. complete.				
5.3.1	300 x 16 mm	Each	262		
5.4	Providing and fixing bright finished brass tower bolts (barrel type) with necessary screws etc. complete :				
5.4.1	250 x 10mm	Each	378		
5.4.2	150 x 10 mm	Each	182		
5.5	Providing and fixing bright finished brass handles with screws etc. complete:				
5.5.1	125 mm	Each	917		

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
5.6	Providing and fixing bright finished brass hanging type floor door stopper with necessary screws, etc. complete.	Each	260		
5.7	Providing and fixing Baby Latch	Each	27		
	TOTAL CARRIED OVER TO SUMMARY OF COST				

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
SUB HEAD - VI -WOOD WORK					
6.1	Providing wood work in frames of doors, windows, clerestory windows and other frames, wrought framed and fixed in position with hold fast lugs or with dash fasteners of required dia. & length (hold fast lugs or dash fastener shall be paid for separately).				
6.1.1	Second class teak wood	Cum	16.00		
6.2	Providing 40 x 5 mm flat iron hold fast 40 cm long including fixing to frame with 10 mm diameter bolts , nuts , and wooden plug and embedding in cement concrete block 30 x 10 x 15 cm. 1 : 3 : 6 mix (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)	Each	2211.00		
6.3	Providing and fixing ISI marked flush door shutters conforming to IS: 2202 (Part I) non- decorative type, core of block board construction with frame of 1st class hard wood and well matched commercial 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters:				
6.3.1	35 mm thick including ISI marked Stainless Steel butt hinges with necessary screws.	Sqm	70		
6.4	Providing and fixing bright finished brass 100 mm mortice latch and lock, ISI marked, with six levers and a pair of anodised (anodic coating not less than grade AC 10 as per IS : 1868) aluminium lever handles of approved quality with necessary screws etc. complete.	Each	10		
6.5	Providing and fixing aluminium extruded section body tubular type universal hydraulic door closer (having brand logo with ISI, IS : 3564, embossed on the body, door weight upto 36 kg to 80 kg and door width from 701 mm to 1000 mm), with double speed adjustment with necessary accessories and screws etc. complete.	Each	10		
6.6	Extra for providing vision panel not exceeding 0.1 sqm in all type of flush doors (cost of glass excluded) (overall area of door shutter to be measured)				
6.6.1	Square or rectangular	Sqm	8.00		

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
6.7	Extra for providing lipping with second class teak wood battens 25mm minimum depth on all edges of flush door shutters (over all area of door shutter to be measured).	Sqm	70		
6.8	Extra for cutting rebate in flush door shutters (total area of the shutter to be measured)	Sqm	21		
6.9	Providing and fixing wooden moulded beading to door and window frames with iron screws,plugs and priming coat on unexposed surface etc.complete:				
6.9.1	2nd class teak wood				
6.9.1.1	50 x12mm	Rmt	1873		
6.10	Providing and fixing panelling or panelling and glazing in panelled or panelled and glazed shutters for doors, windows and clerestory windows (Area of opening for panel inserts excluding portion inside grooves or rebates to be measured). Panelling for panelled or panelled and glazed shutters 25 mm to 40 mm thick:				
6.10.1	Second class teak wood	Sqm	211		
6.10.2	Float glass panes				
6.10.2.1	4 mm thick glass pane	Sqm	72		
6.10.2.2	5.5 mm thick glass pane	Sqm	72		
6.11	Providing and fixing decorative high pressure laminated sheet of plain / wood grain in gloss / matt / suede finish with high density protective surface layer and reverse side of adhesive bonding quality conforming to IS : 2046 Type S, including cost of adhesive of approved quality.				
6.11.1	1.5 mm thick	Sqm	140		
6.12	Providing and fixing glazed shutters for doors, windows and clerestory windows using 5.5 mm thick float glass panes, including ISI marked M.S. pressed butt hinges bright finished of required size with necessary screws.				
6.12.1	Second class teak wood				
6.12.1.1	30 mm thick	Sqm	237		
6.13	Extra for providing ISI marked Stainless Steel butt hinges instead of M.S. pressed butt hinges bright finished of required size with necessary screws. (Shutter area to be measured)	Sqm	495		

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
6.14	Providing and fixing 2nd class Teakwood handrail as per design including round bends where required with necessary screws and finished with spirit polish two or more coats complete.	Cum	0.31		
6.15	Providing and fixing panelled or panelled and glazed shutters for doors, windows and clerestory windows, including ISI marked M.S. pressed butt hinges bright finished of required size with necessary screws, excluding panelling which will be paid for separately, all complete as per architectural drawing/ Engineer-in-charge.				
6.15.1	Second class teak wood				
6.15.1.1	35 mm thick shutters	Sqm	258		
	TOTAL CARRIED OVER TO SUMMARY OF COST				

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
SUB HEAD - VII - STEEL WORK					
7.1	Providing and fixing T-iron frames for doors, windows and ventilators of mild steel Tee-sections, joints mitred and welded, including fixing of necessary butt hinges and screws and applying a priming coat of approved steel primer.				
7.1.1	Fixing with 15 x 3 mm lugs 10 cm long embedded in cement concrete block 15x10x10 cm of C.C. 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)	KG	50		
7.2	Steel work welded in built up sections/ framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.				
7.2.1	In gratings, frames, guard bars, ladders, railings, brackets, gates & similar works	KG	6081		
	TOTAL CARRIED OVER TO SUMMARY OF COST				

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
SUB HEAD - VIII- FLOORING WORK					
	Note: Variation in thickness of Kota, marble stone and Tiles etc. nothing shall be paid extra for levelling course., all skirting required to be flush with plaster. **All the items in which basic rates are mentioned, need prior written sample approval from owner before precaurment by the contractor.**				
8.1	Cement concrete flooring 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate) finished with a floating coat of neat cement including cement slurry , but excluding the cost of nosing of steps etc. complete.				
8.1.1	40 mm thick (with 20mm nominal size stone aggregate)	Sqm	10.00		
8.2	Cement Plaster skirting up to 30 cm height, with cement mortar 1:3 (1cement : 3 coarse sand) finished with a floating coat of neat cement.				
8.2.1	18mm thick	Sqm	2		
8.3	Kota stone slab flooring over 20 mm (average) thick base laid over and jointed with grey cement slurry mixed with pigment to match the shade of the slab, including rubbing and polishing complete with base of cement mortar 1:4 (1 cement : 4 coarse sand)				
8.3.1	25mm thick	Sqm	583		
8.4	Kota stone slabs 20 mm thick in risers of steps, skirting, dado and pillars laid on 12 mm (average) thick cement mortar 1:3 (1 cement : 3 coarse sand) and jointed with grey cement slurry mixed with pigment to match the shade of the slabs, including rubbing and polishing complete.	Sqm	116		
8.5	Extra for pre finished nosing in treads of steps of Kota stone/ sand stone slab.	Metre	1559		
8.6	Extra for Kota stone/ sand stone in treads of steps and risers using single length up to 2 metre.	Sqm	103		
8.7	Mirror polishing on marble work/ stone work/ Kota work etc. where ever required to give high gloss finish complete. (Prior written approval required to implement from client)	Sqm	2004		

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
8.8	Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS : 15622, of approved make, in all colours and shades, laid on 20mm thick cement mortar 1 : 4 (1 cement : 4 coarse sand), including grouting the joints with white cement and matching pigments etc., complete. (BASIC RATE: Rs. 60/sft)				
8.8.1	Size of Tile 600 x 600 mm (polished)	Sqm	245		
8.8.2	Size of Tile 600 x 600 mm (anti skid)	Sqm	139		
8.9	Providing and laying vitrified tiles in different sizes (thickness to be specified by manufacturer) with water absorption less than 0.08% and conforming to I.S. 15622, of approved make, in all colours and shade, in skirting, riser of steps, dado over 12 mm thick bed of cement mortar 1: 3 (1 cement : 3 coarse sand), including grouting the joint with white cement & matching pigments etc. complete. (BASIC RATE: RS. 60/sft)				
8.9.1	Size of Tile 600 x 600 mm	Sqm	654		
8.10	Providing and fixing 18 mm thick gang saw cut, mirror polished, premoulded and prepolished, machine cut for kitchen platforms, vanity counters, window sills, facias and similar locations of required size, approved shade, colour and texture laid over 20 mm thick base cement mortar 1:4 (1 cement : 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edges to give high gloss finish etc. complete at all levels. (BASIC RATE: RS. 150/sft)				
8.10.1	Granite of any colour and shade				
8.10.1.1	Area of slab over 0.50 sqm	Sqm	37		
8.11	Extra for fixing marble/ granite stone, over and above corresponding basic item, in facia and drops of width upto 150 mm with epoxy resin based adhesive, including cleaning etc. complete.	Metre	58		

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
8.12	Extra for providing opening of required size & shape for wash basin/ kitchen sink in kitchen platform, vanity counter and similar location in marble/ granite/ stone work, including necessary holes for pillar taps etc. including moulding, rubbing and polishing of cut edges etc. complete.	Each	32		
8.13	Providing edge moulding to 18 mm thick marble stone counters, vanities etc., including machine polishing to edge to give high gloss finish etc. complete as per design approved by Engineer-in-Charge.				
8.13.1	Granite work	Metre	58		
8.13.2	Marble work	Metre	10		
8.14	Providing and fixing 1st quality ceramic glazed wall tiles conforming to IS: 15622 (thickness to be specified by the manufacturer), of approved make, in all colours, shades of any size as approved by Engineer-in-charge, in skirting, risers of steps and dados, over 12mm thick bed of cement mortar 1 : 3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @ 3.3 kg per sqm, including pointing in white cement mixed with pigment of matching shade complete. (BASIC RATE: RS. 40/sft)	Sqm	10		
8.15	40 mm thick fine dressed stone flooring, sills etc. where ever required over 20 mm (average) thick base of cement mortar 1:5 (1 cement : 5 coarse sand), including pointing with cement mortar 1:2 (1 white cement : 2 stone dust) with an admixture of pigment to match the shade of stone.				
8.15.1	Red sand stone	Sqm	59		
8.15.2	White sand stone	Sqm	59		

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
8.16	Granite work gang saw cut (mirror polished and machine cut) of thickness 18 mm for wall lining (veneer work), backing filled with a grout of average 12 mm thick in cement mortar 1:3 (1 cement : 3 coarse sand), including pointing with white cement mortar 1:2 (1 white cement : 2 marble dust) with an admixture of pigment to match the granite shade (To be secured to the backing by means of cramps, which shall be paid for separately) (BASIC RATE : RS.150/sft)				
8.16.1	Granite of approved shade				
8.16.1.1	Area of slab over 0.50 sqm	Sqm	18		
8.17	Providing and fixing cramps of required size & shape in RCC/CC /Brick masonary backing with cement mortar 1:2 (1 cement : 2 coarse sand), including drilling necessary hole in stones and embedding the cramp in the hole (fastener to be paid separately)				
8.17.1	Stainless steel cramps	Kg	45		
8.18	Providing and fixing expansion hold fasteners on C.C./R.C.C./ Brick masonry surface backing including drilling necessary holes and the cost of bolt etc complete.				
8.18.1	Fastener with threaded dia 12 mm	Each	90		
8.19	Providing and fixing Marble stone flooring, skirting, sill, strips etc. where ever required with 18 mm thick marble stone, as per sample of marble approved by Engineer-in-charge/ owner, over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand), laid over 2mm thick white cement slurry and jointed with white cement slurry, including rubbing and polishing complete with: (BASIC RATE : RS. 60/SFT)				
8.19.1	Marble as per approved sample.	Sqm	1305		
8.20	Providing and fixing 18- 20mm thick mirror polished machine cut granite stone flooring , treads, risers, skirting, borders, strips etc. of required size ,of approved shade,colour and texture laid over 20mm thick base cement mortar 1:4 (1 cement : 4 coarse sand) with joints treated with white cement mixed with matching pigment,epoxy touch ups complete at all levels. Area of slab over 0.50 sqm (BASIC RATE: Rs. 150/sft)				
		Sqm	74		

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
8.21	Extra for providing kota stone of minimum 32mm thick in place of 25mm thick in flooring	Sqm	583		
	TOTAL CARRIED OVER TO SUMMARY OF COST				

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
SUB HEAD - IX - FINISHING WORK					
	Note:- Rates for external plaster are for height upto 10m from ground level unless otherwise stated.				
9.1	15mm cement plaster on the rough side of single or half brick wall of mix:				
9.1.1	1:6 (1 cement: 6 fine sand)	Sqm	4281		
9.2	12mm cement plaster of mix				
9.2.1	1:6 (1 cement : 6 fine sand)	Sqm	2854		
9.3	6mm cement plaster of mix				
9.3.1	1:3 (1 cement : 3 fine sand)	Sqm	2040		
9.4	12 mm cement plaster finished with a floating coat of neat cement of mix:				
9.4.1	1:4 (1 cement : 4 fine sand)	Sqm	10		
9.5	Add for plaster drip course/ groove in plastered surface or moulding to R.C.C. projections.	Rm	2674		
9.6	Providing and fixing chicken mesh (Murga Jali) in cement plaster over joints of RCC and brick work (The chicken mesh will be fixed as per instruction by the Engineer-in-Charge)	Sqm	357.00		
9.7	White washing with lime to give an even shade				
9.7.1	New work (three or more coats)	Sqm	50		
9.8	Distempering with oil bound washable distemper of approved brand, (including making surface smooth with cement based putty) manufacture to give an even shade:				
9.8.1	New work (two or more coats) over and including water thinnable priming coat with cement primer	Sqm	8543		
9.9	Finishing walls with water proofing cement paint of required shade:				
9.9.1	New work (Two or more coats applied @ 3.84 kg/10 sqm)	Sqm	50		

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
9.10	Painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade.				
9.10.1	Two or more coats on new work over an under coat of suitable shade with ordinary paint of approved brand and manufacture.	Sqm	312		
9.11	Providing and applying Apex ultima paint as per manufacturer's specifications, including making the surface smooth with cement based putty, priming coat etc. Complete in all respects.	Sqm	818		
9.12	French spirit polishing				
9.12.1	Two or more coats on new work including a coat of wood filler	Sqm	1068		
9.13	Providing and applying white cement based putty of average thickness 1mm, of approved brand and manufacturer, over the plastered wall surface to prepare the surface even and smooth complete.	Sqm	100		
9.14	Extra for plastering exterior walls of height more than 10 m from ground level for every additional height of 3 m or part thereof.	Sqm	244		
9.15	Providing and applying plaster of paris putty of 2 mm thickness over plastered surface to prepare the surface even and smooth complete.	Sqm	100		
	TOTAL CARRIED OVER TO SUMMARY OF COST				

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
SUB-HEAD X ROOFING / TERRACING					
10.1	Making khurras 45 x 45 cm with average minimum thickness of 5 cm cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate of 20 mm nominal size) over PVC sheet 1 m x 1 m x 400 micron finished with 12 mm cement plaster 1 : 3 (1 cement : 3 coarse sand) and a coat of neat cement, rounding the edges and making & finishing the outlet complete.	Each	8		
10.2	Providing gola 75 x 75 mm in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 10 mm and down gauge) including finished with cement mortar 1:3 (1 cement : 3 fine sand) and a coat of neat cement as per standard design. in 75 x 75 mm deep chase.				
10.2.1	In 75 x 75 mm deep chase.	Rmt	165		
10.3	Providing and fixing tiled false ceiling of approved materials of size 595x595 mm in true horizontal level, suspended on inter locking metal grid of hot dipped galavanized steel sections (galvanized @ 120 grmas/sqm, both side inclusive) consisting of main "T" runner with suitably spaced joints to get required length and of size 24x38 mm made from 0.30 mm thick (minimum) sheet, spaced at 1200 mm center to center and cross "T" of size 24x25 mm made of 0.30 mm thick (minimum) sheet, 1200 mm long spaced between main "T" at 600 mm center to center to from a grid of 1200x600 mm and secondary cross "T" of length 600 mm and size 24x25 mm made of 0.30 mm thick (minimum) sheet to be interlocked at middle of the 1200x600 mm panel to form grids of 600x600 mm and wall angle of size 24x24x0.3 mm and laying false ceiling tiles of approved texture in the grid including, required cutting/making, opening for services like diffusers, grills, light fittings, fixtures, smoke detectors etc.				

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
	Main "T" runners to be suspended from ceiling using GI slotted cleats of size 27x37x25x1.6 mm fixed to ceiling with 12.5 mm dia and 50 mm long dash fasteners, 4 mm GI adjustable rods with galvanised butterfly level clips of size 85x30x0.8 mm spaced at 1200 mm center to center along main T, bottom exposed width of 24 mm of all T-sections shall be pre-painted with polyester paint, all complete for all heights as per specifications, drawings and as directed by Engineer-in-charge.				
10.3.1	12.5 mm thick fully Perforated Gypsum Board tile made from plasterboard having glass fibre conforming to IS: 2095 part I, of size 595x595 mm, having perforation of 9.7x9.7 mm at 19.4 mm c/c with center borders of 48 mm and the side borders of 30 mm, backed with non woven tissue on the back side, having an NRC (Noise Reduction Coefficient) of 0.79, with 50 mm resin bonded glass wool backing.	Sqm	650		
	TOTAL CARRIED OVER TO SUMMARY OF COST				

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
SUB-HEAD- XI WATER PROOFING					
11.1	Providing and laying integral cement based water proofing treatment including preparation of surface as required for treatment of roofs, balconies, terraces etc consisting of following operations: a) Applying a slurry coat of neat cement using 2.75 kg/sqm. of cement admixed with water proofing compound conforming to IS. 2645 and approved by Engineer-in-charge over the RCC slab including adjoining walls upto 300mm height including cleaning the surface before treatment. b) Laying brick bats with mortar using broken bricks/brick bats 25 mm to 115mm size with 50% of cement mortar 1:5 (1 cement : 5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge over 20 mm thick layer of cement mortar of mix 1:5 (1 cement :5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge to required slope and treating similarly the adjoining walls upto 300 mm height including rounding of junctions of walls and slabs c) After two days of proper curing applying a second coat of cement slurry using 2.75kg/ sqm of cement admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge. d) Finishing the surface with 20 mm thick jointless cement mortar of mix 1:4 (1 cement :4 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge including laying glass fibre cloth of approved quality in top layer of plaster and finally finishing the surface with trowel with neat cement slurry and making pattern of 300x300 mm square 3mm deep. e) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Engineer-in-Charge :				
11.1.1	With average thickness of 120mm and minimum thickness at khurra as 65 mm.	Sqm	574		
11.2	Providing and laying water proofing treatment to vertical and horizontal surfaces of depressed portions of W.C., kitchen and the like consisting of :				

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
	i) Ist course of applying cement slurry @ 4.4 Kg/sqm mixed with water proofing compound conforming to IS 2645 in recommended proportions including rounding off junction of vertical and horizontal surface. ii) IInd course of 20mm cement plaster 1:3 (1 cement : 3 coarse sand) mixed with water proofing compound in recommended proportion including rounding off junction of vertical and horizontal surface. iii) IIIrd course of applying blown or residual bitumen applied hot at 1.7 Kg. per sqm of area. iv) IVth course of 400 micron thick PVC sheet. (Overlaps at joints of PVC sheet should be 100 mm wide and pasted to each other with bitumen @ 1.7 Kg/sqm.)	Sqm	627		
	TOTAL CARRIED OVER TO SUMMARY OF COST				

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
SUB-HEAD - XII MISCELLANEOUS WORK					
12.1	Providing and laying 60mm thick factory made cement concrete interlocking paver block of M-30 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per direction of Engineer-in-charge.	Sqm	33		
12.2	Demolishing Plain cement concrete manually/ by mechanical means including disposal of material within premises.	Cum	30		
12.3	Demolishing R.C.C. work manually/ by mechanical means including cutting and stacking of steel bars and disposal of unserviceable material within premises.	Cum	30		
12.4	Demolishing brick work manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within premises.				
	In cement mortar	Cum	50		
12.5	Removing mortar from bricks and cleaning bricks including stacking within a lead of 50 m (stacks of cleaned bricks shall be measured)				
	From brickwork in cement mortar	1000nos	7		
12.6	Preparation and consolidation of sub grade with power road roller of 8 to 12 tonne capacity after excavating earth to an average of 22.5 cm depth, dressing to camber and consolidating with road roller including making good the undulations etc. and re-rolling the sub grade and disposal of surplus earth with lead upto 50 metres.	Sqm	300		

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
12.7	Providing, laying, spreading and compacting stone aggregate of specified sizes to WBM specifications in uniform thickness, hand picking, rolling with 3 wheeled road / vibratory roller 8-10 tonne capacity in stages to proper grade and camber, applying and brooming requisite type of screening / binding material to fill up interstices of coarse aggregate, watering and compacting to the required density. Complete as per standard specifications of CPWD.				
		Cum	30		
12.8	Providing and laying at or near ground level factory made kerb stone of M-25 grade cement concrete in position to the required line, level and curvature, jointed with cement mortar 1:3 (1cement: 3 coarse sand), including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5mm), including making drainage opening wherever required complete etc. as per direction of Engineer-in-charge (length of finished kerb edging shall be measured for payment). Precast C.C. kerb stone shall be approved by Engineer-in-charge).				
		Cum	15		
12.9	Providing and laying R.C.C. pavement of mix M-25 with ready mixed concrete from batching plant. The ready mixed concrete shall be laid and finished with screed board vibrator, vacuum dewatering process and finally finished by floating, brooming with wire brush etc. complete as per specifications and directions of Engineer-in-charge. (The panel shuttering work and reinforcement shall be paid for separately).				
		Cum	40		
	(Note:- Cement content considered in this item is @ 330 kg/cum. Excess/ less cement used as per design mix is payable/ recoverable separately).				

S.No	DESCRIPTION	UNIT	QTY.	RATE (IN RS.)	AMOUNT (IN RS.)
12.10	Providing, laying, spreading and compacting graded stone aggregate (size range 53 mm to 0.075 mm) to wet mix macadam (WMM) specification including premixing the material with water at OMC in mechanical mix plant, carriage of mixed material by tipper to site, for all leads & lifts, laying in uniform layers with mechanical paver finisher in sub-base / base course on well prepared surface and compacting with vibratory roller of 8 to 10 tonne capacity to achieve the desired density, complete as per specifications and directions of Engineer-in-Charge.	Cum	45		
	TOTAL CARRIED OVER TO SUMMARY OF COST				

WATER SUPPLY AND SANITARY INSTALLATION TO THE PROPOSED GIRLS HOSTEL

AT SRCC, NEW DELHI

SUMMARY

S.No.	Description		Amount
1.00	SANITARY FIXTURES	Rs.	
2.00	SOIL, WASTE, VENT & RAIN WATER PIPES	Rs.	
3.00	WATER SUPPLY	Rs.	
4.00	SEWERAGE & DRAINAGE	Rs.	
	TOTAL	**Rs.**	

NOTE : The above cost does not include cost of U. G. water tanks, Water Treaatment Plant, water coolers for drinking water, Sewerage Treatment Plant/Septic tank, tubewell and hot water piping from Solar system and solar system. For external works quantities are assumed, connecting to existing services.

S.No.	Description	Qty.	Unit	Rate	Amount
1.00	**SUB HEAD 1 : SANITARY FIXTURES**				
1.01	Providing and fixing first quality white vitreous china wall mounting European type water closet similar to H.S. Cat No. 20006 with PVC low level flushing cistern with black solid plastic seat and lid, with C.P. brass hinges and rubber buffers,C.P. brass bolts, nuts, concealed hanging arrangement with clamp and rubber adapter joint with S.S screws and washers complete, including cutting holes in brick masonary and R.C.C. and making good the walls and floors wherever required:	18	Each		
1.02	Providing and Fixing first quality white vitreous china under counter oval wash basin size 550x400 mm, specially fabricated C.I./M.S. brackets painted with two or three coats of enamel paint of approved shade over a coat of primer, 32mm C.P. brass waste and C.P. brass cast bottle trap and pipe to wall with C.P. brass flange and rubber adopter for waste connection complete including cutting holes in brick masonary and R.C.C. and making good the walls and floors wherever required.				
a)	White vitreous china under counter oval wash basin with 15mm dia C.P. brass sensortronic sensor pillar tap.	26	Each		
b)	White vitreous china under counter oval wash basin with 15mm dia C.P. brass single hole mixer.	1	Each		
1.03	Providing and fixing 15mm dia C.P. brass angle valve with C.P. copper connecting pipe 375m long with nuts and washers, C.P. brass wall flange complete including cutting holes in wall and making good the wall wherever required.	74	Each		
1.04	Providing and fixing C.P. brass quarter turn body bib cock including cutting and making good the walls wherever required complete in all respects.	24	Each		
1.05	Providing and fixing C.P. brass cast twin coat hooks fixed to wall/door with wooden cleats and S.S screws including cutting holes in wall and making good the wall wherever required.	55	Each		
1.06	Providing and fixing stainless steel sink single bowl and inside bowl size 500x400x200mm with C.I./ M.S. brackets painted with two or three coats of enamel paint of approved shade over a coat of primer, 15 mm dia wall mounted sink mixer with swinging spout, 40mm C.P. brass waste C.P. brass chain and rubber plug, 40mm dia C.P. brass cast bottle trap with C.P. brass pipe to wall and flange, complete in all respects including cutting and making good the walls and floors wherever required.	3	Each		
1.07	Providing and fixing 600x450mm beveled edge mirror of superior glass (of approved quality) complete with 6 mm thick hard board ground fixed to wooden cleats with C.P. brass screws and washers complete.	27	Each		
1.08	Providing and fixing C.P. brass concealed stop cock including cutting and making good the walls wherever required complete in all respects.	36	Each		
1.09	Providing and fixing 15 mm dia C.P. brass pressure adjustable shower rose including cutting holes in wall and making good the wall wherever required.	18	Each		
1.10	Providing and fixing C.P. brass 600 mm long towel rail with S.S. screws wooden cleats including necessary fittings cutting holes in wall and making good the wall wherever required.	18	Each		

1.11	Providing and fixing testing and commissioning of storage type water heater (Geyser) (A. O. Smith make DVE series or equivalent) with automatic thermostatic control electric element, pressure release valve, M.S. nuts and bolts etc. conforming to IS: 2082, including cutting holes & making good the wall wherever required complete in all respects.			
a)	35 Litres	13	Each	
1.12	Providing and fixing S.S soap tray with PVC cleats and S.S. screws including cutting and making good the walls wherever required complete as directed by Engineer in charge.	18	Each	
1.13	Providing and fixing C.P. brass wall mixer (wall mounted model) non-telephonic shower arrangement with connecting legs & flanges including cutting holes in wall and making good the wall wherever required.	18	Each	
1.14	Providing and fixing C.P. brass bib cock auto closing system including cutting and making good the walls wherever required complete in all respects.	15	Each	
	TOTAL OF SUB HEAD I CARRIED OVER TO SUMMARY :			**Rs.**

2.00 SUB HEAD II : SOIL, WASTE, VENT AND RAIN WATER PIPES

2.01	Providing and fixing SWR (Class B) uPVC soill, waste and vent pipes conforming to IS 13592 including all fittings (plain or access door) e.g. bends, junctions, cowls, offsets, access pieces etc., jointing with rubber ring joints, fixed with M.S. clamps painted with two or three coats enamel paint of approved shade over a coat of primer fixed in cement concrete 1:2:4 blocks including cutting holes in wall/floors and making good wherever required.		
a)	110 mm dia	325	Mtr
2.02	Providing and fixing 6kg/cm2 (class-III) waste pipes and fittings conforming to IS: 4985 jointed with cement solvent joints with M.S. clamp/hook including cutting chases and holes in RCC/Brick wall/Ceilings and making good the same in cement mortar 1:3 (1 cement : 3 coarse sand) to match with the surroundings for waste from wash basins, urinals kitchen sink and sump, pump deliveries and suction etc as shown in drawings and directed by the Engineer in Charge.		
a)	40 mm OD pipe	45	Mtr
b)	50 mm OD pipe	10	Mtr
2.03	Providing and fixing SWR uPVC P or S deep seal type with self cleaning design floor/urinal trap with or without vent including setting with cement concrete 1:2:4 (1 cement : 2 coarse sand: 4 hard stone ballast 20mm nominal size) including cutting and making good the floor/RCC and Brick wall wherever required, complete in all respects.		
a)	110x110mm outlet	57	Each
2.04	Providing and laying cement concrete 1:2:4 (1 cement :2 coarse sand: 4 stone aggregate 20 mm, down gauge) 75mm in bed and alround C.I. soil and waste pipe under floor/vertical wall including centering and shuttering wherever required.		
a)	40-50 mm Dia	55	Mtr
a)	110 mm dia	250	Mtr
2.05	Providing and laying uPVC pipe 6kg/cm2 class III (IS:4985-2000) including injection moulded fittings where required e.g. tees, bends, couplings and adapters and jointing with adhesive approved by fittings manufactures including necessary MS clamps of 40mmx5mm thick flat, cutting chases holes in brick & R.C.C. walls and making good the same with cement concrete 1:2:4 (1cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) finished smooth. Earth work excavation & refilling etc.		
a)	110 mm dia pipe	180	Mtr
2.06	Providing and fixing cast iron grating to the inlet/ mouth of rain water pipe.		
a)	100 x 100 mm	60	Each
2.07	Providing and fixing heavy quality 3 mm thick C.P. brass square grating above floor traps / floor drain		
a)	125 x 125 mm	57	Each
2.08	Making khurras 45x45cm with average minimum thickness of 5 cm cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate of 20mm nominal size) over P.V.C. sheet 1mx 1mx400 micron, finished with 12mm cement plaster 1:3 (1 cement : 3 coarse sand) and a coat of neat cement rounding the edges	60	Each
2.09	Providing and fixing uPVC clean out plug with suitable open able plug as required complete in all respects.		
a)	110 mm dia	25	Each
2.10	Providing and fixing 110 mm dia uPVC extension piece forming a tee connection of 40/50/63 mm dia for connections waste from WB/sink including solvent joint extension piece with floor trap on one end complete in all respects.	35	Each

TOTAL OF SUB HEAD II CARRIED OVER TO SUMMARY :- **Rs.** _____

3.00 SUB HEAD III: WATER SUPPLY

3.01	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings This includes jointing of pipes & fittings with one step CPVC solvent cement ,trenching ,refilling & testing of joints complete as per direction of Engineer in Charge.		
	External Work		
a)	40 mm dia nominal bore	30	Mtr
3.02	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in Charge.		
a)	25mm dia nominal bore	25	Mtr
b)	32mm dia nominal bore	30	Mtr
c)	40mm dia nominal bore	30	Mtr
d)	50mm dia nominal bore	60	Mtr
e)	65mm dia nominal bore	10	Mtr
3.03	Providing and fixing embedded CPVC(Chlorinated Poly Vinyl Chloride) water supply pipes with as per CTS SDR 11 (operating pressure-7 Bar @ 82 Deg C and 28 Bar @ 23 Deg C) for pipes from 15-20mm. Pipes shall be joined using solvent welded CPVC fitting i.e. Tees, Elbows, Couplers, Unions , Reducers, brushing etc. including transition fittings (Connection between CPVC & metal pipe/GI) i.e. Brass Adaptors(Both Male & Female threaded) conforming to ASTM D-2846. ASTM F441 with only CPVC solvent cement conforming to ASTM F-493. Cost shall be inclusive of making maximum of 7.5 x 7.5 cm chasing in wall and floors of pipe, making good the same by using 1:1cement mortar over the wire mesh and providing protection to embedded pipes and fitting (In wall chase) by wrapping two layer of 4000 micron polythene sheet including proper overlaps on joints complete as required . All termination points for installation shall be to as per Technical Manual of manufacturer of pipes & fitting.		
a)	15 mm dia	300	RM
b)	20 mm dia	150	RM
c)	25 mm dia	75	RM
d)	32 mm dia	30	RM
3.04	Providing and fixing lever ball valve tested to a pressure of 21 kg/cm2 hotforged sand blasted nickel plated body and cap sealed with loctite chrome plated brass valve carbon steel handle PVC coated complete in all respects. (screw type)		
a)	for 25 mm nominal bore	2	Each
b)	for 32 mm nominal bore	2	Each
c)	for 40 mm nominal bore	3	Each
3.05	Providing and fixing cast iron body PN 16, IS: 210 FG:220 and double flange simple operation type butterfly valve conforming to IS: 13095 with SS:304 disc and shaft nitnile rubber replaceable seat of the following size complete with bolts, nuts, washers and rubber insertions as per specification.		
a)	for 50 mm nominal bore	4	Each
b)	for 65 mm nominal bore	1	Each
3.06	Supplying, installing,testing & commissioning of HDPE 3 layered insulated water storage tank including holes for inlet, outlet, overflow, drain & vent pipes, manhole cover, etc. complete on terrace.	25000	Ltr.

3.07	Constructing brick masonry chamber 60x60x75 cm, inside with brick work in ciment mortar 1:5 (1 cement :5 coarse sand) with bricks of class designation 75 for water meter, with C.I. surface box 400x200x 200mm. (inside) with locking arrangement fixed in RCC top slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) with necessary centring shuttering and reinforcement etc. excavation, refilling and disposal of surplus earth as directed foundation concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) and inside plastering 12mm thick with cement mortar 1:3 (1 cement :3 coarse sand) finished with a floating coat of neat cement and out side plastering with 12mm thick cement mortar 1:3 (1 cement : 3 coarse sand) etc. complete as per standard design.	1	Each
3.08	Providing and fixing high pressure ball cock with copper float.		
a)	40 mm dia	2	Each
3.09	Providing and fixing M.S. pipe medium duty sleeve 450mm long, threaded on both sides and 6mm thick M.S. plate 100mm wide welded alround the pipe as per detail complete in all respects.		
a)	100 mm dia	4	Each
b)	65 mm dia	1	Each
c)	50 mm dia	4	Each
d)	40 mm dia	2	Each
3.10	Providing and fixing 500 mm dia cast iron (medium duty) water tank cover with frame, double Seal with lockable arrangement complete in all respects. (Total weight of cover & frame to be not less than 116 kgs.)	4	Each
3.11	Providing and fixing 100 mm dia G.I. Vent pipe 1 mtr high with brass mosquito proof grating elbow with fittings.	4	EACH
3.12	Providing & fixing Vidolex or equivalent Thermal insulating tubing 9mm thick over pipes/fitting etc. complete.		
a)	15mm dia nominal bore	100	Mtr.
b)	20mm dia nominal bore	75	Mtr.
c)	25 mm dia nominal bore	25	Mtr.
3.13	Making connection from Existing water supply line including necessary excavation & making good the same including cutting, boring and taping the existing line by providing and installing ferrule connections with necessary fittings as required and making good the same.	1	Each
3.14	Constructing masonry chamber 600x600x750cm, inside 75 class designation brick work in cement mortar 1:5 (1 cement:5 fine sand) for control valve, with C.I. Surface box 100 mm., top diameter, 160 mm bottom diameter and 180 mm deep (inside) with chained lid and RCC top slab in M-20 mix, necessary excavation foundation concrete 1:5:10 (1 cement:5 fine sand:10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement:3 coarse sand) 12 mm thick finished with a floating coat of neat cement complete as per standard design.	1	Each
3.15	Providing and fixing Polypropylene Random (PP-R) pipes and PN-16 and fitting with brass fittings for fixing taps etc. conforming to International DIN8077/8078 standard including cutting chases, holes in walls, floors, R.C.C. slab etc. and making good the same in cement mortar 1:3 (1 cement : 3 coarse sand) and finished smooth.		
a)	15 mm dia. pipe	20	Mtr
b)	20 mm dia. pipe	10	Mtr
c)	25 mm dia. pipe	10	Mtr
d)	32 mm dia. pipe	25	Mtr

TOTAL OF SUB HEAD III CARRIED OVER TO SUMMARY :- **Rs.** _____

4.00 SUB HEAD IV : SEWERAGE & DRAINAGE

4.01	Excavating trenches of required width in hard/dense soil for pipes, cables, etc. including excavation for sockets, and dressing of sides, ramming of bottoms, depth upto 1.5m including getting out the excavated soil, and then returning the soil as required, in layers not ex-ceeding 20cm in depth including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed within a lead of 50m:		
a)	Pipes, cables etc. exceeding 80 mm dia. but not exceeding 300 mm dia.	325	Mtr.
4.02	Extra for excavating trenches for pipes, cables etc. in all kinds of soil for depth exceeding 1.5 m, but not exceeding 3 m. (Rate is over coresponding basic item for depth upto 1.5 metre.) All kind of soils		
a)	Pipes, cables etc, exceeding 80 mm dia. but not exceeding 300 mm dia.	50	Mtr.
4.03	Providing, laying and jointing glazed stoneware pipes grade “A” with stiff mixture of cement mortar 1:1 (1 cement : 1 fine sand) including testing of joints etc. complete.		
a)	100 mm dia	15	Mtr.
b)	150 mm dia	50	Mtr.
4.04	Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand :10 graded stone aggregate 40 mm nominal size) all-round S.W./NP2 RCC pipes including bed concrete, centering and shuttering as per standard design:		
a)	100 mm dia	15	Mtr.
b)	150 mm dia	50	Mtr.
c)	250 mm dia	100	Mtr.
d)	300 mm dia	150	Mtr.
4.05	Providing and laying non-pressure NP2 class S&S (light duty) RCC pipes jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete in all respects.		
a)	250 mm dia	100	Mtr.
b)	300 mm dia	150	Mtr.
4.06	Providing and fixing S.W. gully trap complete with C.I. grating, brick masonry chamber with bricks of class designation 75 in cement mortar 1:5 (1 cement : 5 coarse sand) inside plaster above trap 12mm thick in cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement outside plaster 12mm thick in cement mortar 1 :3 (1 cement : 3 coarse sand) 10 cm thick foundation concrete 1:5:10 mix (1 cement : 5 coarse sand : 10 graded stone aggregate 40mm nominal size) space between chamber and trap filled with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) and water tight C.I. cover with frame of 300x300 mm size (inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70 kg including excavation, refilling and disposal of surplus earth as directed by Engineer in Charge compete as per standard design.		
a)	100x100mm size P type	11	Each
4.07	Constructing brick masonry road gully chamber 50x45x60 cm with bricks of class designation 75 in cement mortar 1:5 (1 cement : 5 coarse sand), inside cement plastering 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement, outside plaster 12 mm thick in cement mortar 1:3 (1 cement : 3 coarse sand) 10cm thick foundation concrete 1:5:10 mix (1 cement : 5 coarse sand : 10 graded stone aggregate 40mm nominal size),including precast S.F.R.C. grating cover & frame 500x450mm fixed in cement mortar 1:3 (1 cement : 3 coarse sand) including excavation, refilling and disposal of surplus earth as directed by Engineer in Charge complete as per standard design.	2	Each

4.08 Constructing brick masonry rectangular type manhole with 75 class designation bricks in cement mortar 1:4 (1 cement : 4 coarse sand), inside cement plastering 12mm thick with cement mortar 1 : 3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement, 12 mm thick outside plastering with cement mortar 1:3 (1 cement : 3 coarse sand), foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40mm nominal size), R.C.C. top slab in M20 mix, 300 mm below finished ground level and neck for manhole in brick masonry 560 mm dia perforated/plain S.F.R.C. medium duty (MD-10 Grade) manhole cover and frame (heavy duty) having embrossing (Drainage) with necessary centring, shuttering and reinforcement etc. and making necessary channels in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement including excavation, refilling and disposal of surplus earth as directed by Engineer in Charge complete as per standard design.

a)	Inside size 900 x 800 and 600mm deep	4	Each
b)	Inside size 1200x900 and 600 mm deep	8	Each

4.09 Add/ deduct for less or extra depth for manholes of sizes.

a)	900 x 800 mm	1	Mtr.
b)	1200 x 900 mm	4	Mtr.

4.10 Constructing brick masonry circular type manhole 0.91m internal dia at bottom and 0.56m dia at top in cement mortar 1:4 (1 cement :4 coarse sand), in side cement plaster 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement, foundation concrete 1:3:6 mix (1 cement : 3 coarse sand : 6 graded stone aggregate 40mm nominal size), and making necessary channel in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement, all complete as per standard design including excavation, refilling and disposal of surplus earth as directed by Engineer in Charge complete as per standard design. :

a) 0.91 m deep with S.F.R.C. cover and frame (heavy duty,HD-20 grade designation) 560mm internal diameterconforming to I.S. 12592, total weight of cover and frame to be not less than 182kg., fixed in cement concrete 1:2:4 (1cement : 2 coarse sand : 4 graded stone aggregate 20 mmnominal size) including centering, shuttering all complete.(Excavation, foot rests and 12mm thick cement plaster atthe external surface shall be paid for separately) :

With common burnt clay F.P.S. (non modular) bricks of class designation 7.5

6 Each

4.11 Extra depth for circular type manhole 0.91m internal dia (at bottom) beyond 0.91m to 1.67m

a) With common burnt clay F.P.S. (non modular) bricks of class designation 7.5

3 Mtr

4.12 Constructing brick masonry circular manhole 1.22m internal dia at bottom and 0.56m dia at top in cement mortar 1:4 (1 cement :4 coarse sand) inside cement plaster 12mm thick with cement mortar 1:3 (1 cement :3 coarse sand) finished with a floating coat of neat cement foundation concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40mm nominal size) and making necessary channel in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement, all complete as per standard design including excavation, refilling and disposal of surplus earth as directed by Engineer in Charge complete as per standard design.
:

a) 1.68 m deep with SFRC Cover and frame (heavy duty HD20 grade designation) 560mm internal diameter conforming to I.S. 12592, total weight of cover and frame to be not less than 182kg. fixed in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) including centering, shuttering all complete. (Excavation, foot rests and 12 mm thick cement plaster at the external surface shall be paid for separately) :

With common burnt clay F.P.S. (non modular) bricks of class designation 7.5

2 Each

4.13 Extra depth for circular type manhole 1.22m internal dia (at bottom) beyond 1.68 m to 2.29 m :

a) With common burnt clay F.P.S. (non modular) bricks of class designation 7.5

1 Mtr.

4.14 Providing and fixing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS : 1786 having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specification mark to be visible even after fixing, including fixing in manholes with cement concrete block 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20mm nominal size) blocks of size 30x20x15 cm complete as per design.

60 Each

4.15 Making connection of drain or sewer line with existing manhole including breaking into and making good the walls, floors with cement concrete 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) cement plastered on both sides with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement and making necessary channels for the drain etc. complete.

a) pipes upto 300 mm dia 3 Each

4.16 Construction of ground water re-charge pit 6x2m or 4 m internal dia, 4 m nominal depth and desilting chamber of 2.0 x 1.0 m with following specifications and including supplying, installation & execution of all jobs, complete as per drawings and directions of Engineer-in-Charge.

a) Peripheral brick masonry in cement mortar 1:4 (1cement: 4 coarse sand) with necessary 15 mm thick cement plaster 1 :3 neat finish.

b) Foundation concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) (200mm thick)

c) i) 300 mm thick find sand.
ii) 300 mm thick dry stone aggregate bed (3 to 20 mm nominal grade).
iii) 300mm thick stone aggregate 3 to 10 mm size.

d) 150 mm thick R.C.C. slab in M20 mix to cover the well at top including necessary centring, shuttering and reinforcement with required openings /cut-outs etc. supplying and fixing 500 mm dia C.I. Manhole cover and frame (total116 kg) medium duty, all complete as per drawings.

e) 200 mm dia PVC perforated solid pipe laid vertically upto sub-soil water level or 24m whichever is lower including necessary drilling/ boring in ground in all kinds of soil as directed by the Engineer-in-charge.

f) Supplying and fixing PVC coated M.S. foot rests.

g) Making all inlets & outlets in brick masonry walls including cutting holes& making good the same.

h) 10- 12 mm thick cement plaster 1 :3 (1 cement : 3 fine sand) mixed with water proofing compound on top of R.C.C slab, finished smooth.

i)

3 Nos. 500 mm dia C.I. medium duty conforming to IS 12592 manhole cover in top slab. (RIF/NECO make).

Rate to include excavation, back filling, disposal of surplus excavated soil with all leads and all other materials & operations necessary for completing the job.

1 Each

TOTAL OF SUB HEAD IV CARRIED OVER TO SUMMARY :- **Rs.** _____

FIRE FIGHTING SYSTEMS TO PROPOSED GIRLS HOSTEL AT SRCC, NEW DELHI.

S.No	Description	Qty.	Unit	Rate	Amount
1.00	Supplying, installation, testing and commissioning of electric motor driven terrace pump set consisting of the following (as per specification)				
a)	Centrifugal pump of 450 LPM capacity capable against a total head of 40m approx. complete with necessary strainer on suction side and pressure gauge on delivery side etc. including by-pass arrangement for testing of the working of the pumping set and with mechanical seal as required .				
b)	Squirrel cage A.C. induction motor suitable for operation on 415 V, 3 phase 50 Hz. A.C. supply and of minimum 12.5 HP for the above pump with flexible coupling as per specification and conforming to IS: 325.				
c)	Common bed plate fabricated of mild steel channel or cast iron type.				
d)	Suitable cement concrete pump foundation with vibration damping arrangement with anti-vibration pad mounting as required.				
e)	All coupling of pump and motor should be covered with safety guard.	1	SET		
2.00	Manufacturing, supplying, installation, testing, commissioning of common control panel for fire fighting pump systems. Comprising of electrical main pump, jockey pump, diesel engine fire pump. All the components shall be housed in 2mm thick CRCA MS sheet. The control panel shall be cubical type, dust & vermin proof, hinged & lockable doors & deed front operation type the panel shall be powder coated with siemense grey. All internal control wiring shall be 1.5mm sq. copper & CTs wiring will be 2.5mm sq. provided separate compartments for each motor / pump starter, bus bar chamber, cable alley, & incomer. All MCCB shall be door lockable type & not less than 35KA capacity. Alluminium earthing bus bar shall be provided. The panel shall have the followings.				
	Incoming Section				
	MCCB TP & N 63A with interlocking handle - 1 Set				
	Voltage measuring instrument with selector switch, control MCB SP 2A -1 Set				
	Phase indicating light led type with protection MCB SP 2A - 1 Set				
	Alluminium Bus Bar for 150A capacity (Size 25mm x 6mm).				
	Outgoing Section				

Main Fire Pump 10 HP Star Delta- 1 Set

MCCB TP & N 32A with interlocking handle - 1 Set

Current measuring instrument with selector switch, current transformer - 1 Set

Over load relay with built insingle phase relay - 1 Set

Contactor 70A 220V AC 3 Pole with 2 NO + 2 NC - 3 Nos.

Single phase preventor relay voltage sensing - 1 No.

Star Delta timer 220V AC 3 to 15 Sec. - 1 No.

Push Botton, On Off indicating light, control MCB SP 2A. Control contactor. Auto manual selector switch, terminal block etc. - 1 Set

Auto start - manual Off (Jockey Pump interlock[Off] with main fire pumps).

Jockey Fire Pump 7.5 HP Dol - 1 Set

MCCB TP & N 32A - 1 Set

Current measuring instrument with selector switch, current transformer - 1 Set

Over load relay with built in single phase realy - 1 Set

Contactor 25A 220V AC 3 pole with 2 NO + 2 NC - 1 No.

Single phase preventor relay voltage sensing - 1 No.

Push button, On Off indicating light, control MCB SP 2A. Control contactor. Auto manual selector switch. Terminal block etc. - 1 Set.

Automatically Start - Stop. 1 SET

3.00 Supplying, testing, installation & commissioning of pressure switches for pumps including necessary wiring upto the control panel. 1 EACH

4.00 Supplying and laying the PVC insulated and sheathed armoured cables of 1.1 K.V. copper conductor including supplying and making end termination with brass compression glands.

a) 6 sq.mm x 2.0 Core 20 MTR.

5.00 Earthing with GI earth plate 600mm x 600mm x6mm thick including accessories and providing masonry enclousure with cover plate having locking arrangement and watering pipe etc. (including charcoal or coke and salt) complete as required. 1 SET

6.00 Providing and fixing 25mm x 5mm G.I. Strip.

a) In 40mm dia GI pipe from earth electrode as required. 25 MTR.

7.00 Providing and fixing 25mmx5mm G.I. Strip on surface or in recess for earth connection etc. as required. 25 MTR.

8.00	Providing and fixing 8swg dia GI wire on surface or recess for loop earthing as required.	50	MTR.
	Providing and fixing 8s		
9.00	Providing, fixing, welded joints and testing of heavy class M.S. ERW black pipes as per relevant IS 1239/3580 with special accessories tees, elbows, flanged joints, rubber insertion, nuts, bolts, washers or welded joint with flange joints on bends, including fixing the pipe with suitable flat iron strip clamps/brackets structural members dash fastner,civil breakage,making good the same etc. painting with a primer coat and two coats of postal red enamel etc. complete as required.		
a)	50 mm dia 4.85mm thickness	25	Mtr.
10.00	Providing and fixing first aid hose reel full swinging type with 30 meter long 20mm dia Rubber lined Maruty pipe with shut off Nozzle of 5 mm dia. Conforming to IS:884-1969 complete/ Thermoplastic reinforced flexible hose ISI marked IS:12585 type-II Kesara Syntex Pvt. Ltd. as required. Including 25 mm dia M.S. Pipe connection from riser to hose reel with all Sockets, Nipples, Elbows and 25 mm dia Ball Valve as required.	3	EACH
11.00	Supplying and installing Cylindrical type air vessel of 300mm dia, 1.0m high fabricated out of 8mm thick MS Plate suitable for 7kg/sqcm. working pressure complete with 25mm gunmetal Air Release Valve, Safety Valve, Pressure Gauge etc as required. The Air Vessel shall be continuous welded construction and painted with two coats of Postal Red Enamel outside over a coat of primer and Epoxy paint inside.	1	EACH
12.00	Supplying and installation of Fire pressure vessel of 450mm dia and 1m high fabricated from 8-10mm thick M.S. plate suitable for 10kg/sqcm. working pressure with accessories, painted with two coats of Postal red enamel outside over a coat of primer and epoxy paint inside for automatic operation of pump.	1	EACH
13.00	Providing and fixing Cast Iron body IS: 210 FG 220 and Double Flange simple operation type Butterfly Valve conforming to IS: 13095 with SS304 disc and shaft nitnile Rubber replaceable seat of the following size complete with Bolts, Nuts, Washers and Rubber insertions as per specification.		
a)	50 mm dia	2	EACH
14.00	Providing and fixing non-return Valve C.I. Body complete with Bolts, Nuts Washer & Rubber insertions as required conforming to IS:5312.		
a)	50 mm dia	1	EACH
15.00	Providing and fixing draining arrangement to the vertical wet risers and sprinklers at different floors.		

a)	40 mm dia M.S. Pipe heavy class conforming to IS: 1239 with fittings, clamps etc.	6	MTR.
16.00	Providing and fixing 40 mm dia gunmetal full way valve heavy quality tested to 21kg/cm2	1	EACH
17.00	Providing and fixing 9 Litres capacity fire extinguisher water type Gas Pressure conforming to IS: 940 marking, fixed to wall.(ISI marked)	3	EACH
18.00	Providing and fixing Fire extinguisher of Carbon Dioxide type consisting of brand new High Pressure Steel Cylinder Bearing IS: 7285 mark and having the approval of controller of explosives Nagpur, wheel type Valve Bearing IS:3224 mark internal discharge Tube, 1 meter long High Pressure Discharge Hose, non conducting horn, suspension Bracket, fully charged Bearing IS: marking fixed to wall as desired by Engineer-in-Charge.		
a)	4.5 kg capacity Cylinder	9	EACH
19.00	Providing and fixing self glowing Exit sign board size 350x200mm single side painted made of luminescent safely, Rigid Sheet in standard colour, photo luminescent sheet made of Crystals consisting mainly sulphide in protective glass like sheet green and yellow Crystal luminescent (glass in dark) by action of light.	3	EACH
20.00	Providing 12 mm thick Rubber Mat 1000 mm wide of required length as required for med.voltage.	1	MTR.
21.00	Providing and fixing fire man axe as required with test certificate of 20000 volts.	3	EACH
22.00	Providing and fixing M.S. structure work fabricated from standard sections E.g. MS squarebars, flots, rounds, angles, channels including cutting to size drilling, welding, fixing & welding to insert plates in RCC structure members as directed by Site Incharge, including cutting and making good the walls, floors & RCC Roof (for pipe supports, clamps, M.S. ladders & manholes for tank covers etc) including painting will two or more coats of Enamel joint of approved colour over a coat of approved Steel Primer as for drawings & direction of the site Incharge.	50	KG.
	TOTAL :		**Rs.**

ELECTRIFICATION TO PROPOSED GIRLS HOSTEL BLOCK
AT
SHREE COLLEGE OF COMMERCE AT DELHI UNIVERSITY.

SUMMARY OF COSTS

INTERNAL ELECTRIFICATION

SUB HEA	DESCRIPTION	AMOUNT
I	POINT WIRING	
II	MAINS AND SUB MAIN WIRING	
III	P.V.C. CONDUITS RECESSED / SURFACE.	
IV	TELEPHONE & DATA WIRING	
V	DISTRIBUTION BOARDS .	
VI	LIGHTING FIXTURES AND FANS.	
VII	FIXING OF LIGHTING FIXTURES AND FANS.	
VIII	EARTHING CONDUCTOR / LIGHTNING PROTECTION	
IX	LIGHTING & POWER PANELS	
X	MISCELLANEOUS ITEMS	

TOTAL

BILL OF QUANTITY.
ELECTRIFICATION WORK

S.N.	DESCRIPTION	Qty.	Unit	Unit Rate	Amount

Note: Circuit wiring for all light points, light & power plugs shall be included in the undermentioned rates.

S.No.	Description	Unit	Qty.	Rate	Amount
A)	**POINT WIRING:**				
1.00	**INTERNAL WIRING:**				
1.01	Wiring for the following light point with 1.5 sq. mm FR PVC insulated copper conductor 660/1100 volts grade stranded flexible wires of approved make in concealed or surface mounted 25 mm dia. 2mm thick PVC conduit including cost of cutting & filling chases/saddle, clamps etc. and providing and fixing of 6 amps single pole modular flush mounted switch & switch plate of approved quality, colour make and fixing in 2mm thick GI box and earthing for fixtures and the outlet box with 1.5 sq.mm PVC insulated copper conductor stranded flexible wire. The cost of circuit wiring with 2 x 2.5 Sqmm + 1 x 2.5 Sqmm FR PVC insulated copper conductor 660/1100 Volts grade wires shall be included in the cost of primary point wiring. (Cost of fish wire also to be included in the same)				
a)	One light point controlled by one 6 Amps switch.	Nos.	75		
b)	Two light point controlled by one 6 Amps switch.	Nos.	90		
c)	Three light point controlled by one 16 Amps switch.	Nos.	12		
e)	Wiring with 2 Nos., 2 way switch for staircases etc. (wiring for one or more secondary points included).	Nos.	8		
1.02	Wiring for fan point with 1.5mm^2 660/1100V grade PVC insulated, copper conductor wire in recessed MS conduit including cost of cutting and filling chases as required with fixing of flush mounted switch, modular regulator, plate, GI box 2mm thick and earthing with 1.5 Sqmm 660/1100 grade PVC insulated copper conductor wire complete with all accessories as required (first point shall be used from 2.5 mm^2 660/1100V grade PVC insulated copper wires & looping with 1.5mm^2). The cost of circuit wiring with 2 x 2.5 Sqmm + 1 x 2.5 Sqmm PVC insulated copper conductor 660/1100 Volts grade wires shall be included in the cost of primary point wiring.	Point	78		
1.03	Wiring for exhaust fan plug with 1.5mm^2 660/1100V PVC insulated, copper conductor wire in recessed MS conduit including cost of cutting and filling chases as required with fixing of plate GI box, modular type switch socket (6A 240V) and earthing complete with all accessories as required (first point shall be used from 2.5 mm^2 660V grade PVC insulated copper wires & looping with 1.5mm^2).	Point	11		
	(This shall include modular & shuttered socket and plug top near ex. fan and switch shall be put near entrance).				
1.04	S/F including Wiring for 6A 5/6 pin light plug point with 2.5 mm^2 660/1100V PVC insulated, copper conductor cable in recessed PVC conduit including cost of cutting and filling chases as required with fixing of plate, GI box, 6A modular switch shuttered socket and earthing complete with all accessories as required.	Point	210		

1.06	S/F including Wiring for 32Amp power outlet with 6.0 Sqmm 660/1100V PVC insulated copper conductor wires in recessed MS conduit including cost of cutting and filling chases supply and fixing of 3 pin 32 Amp metal clad outlet with MCB with internal wiring in GI box, earthing of 3rd pin with PVC insulated, green colour 4.0 Sqmm PVC insulated copper wire, complete with all accessoreies as required (for AC).	Nos.	10		
1.07	S/F including Wiring for 16 Amp power outlet with 4.0 Sqmm 660/1100V PVC insulated copper conductor wires in recessed/surface MS conduit including cost of cutting and filling chases supply and fixing of 6 pin 16 Amps shuttered modular switch socket, switch plate with internal wiring in G.I. box, earthing of 3rd pin with PVC insulated, green colour 2.5 Sqmm copper wire, complete with all accessories as required. (Power Socket).	Nos.	17		
a)	Two 16A outlets in one circuit with switch sockets of approved make.	Nos.	6		
1.08	Supplying and fixing in R.C.C. slab before casting galvanized M.S. sheet hexagonal fan hook box of 16 gauge with galvanized MS hook of 12mm rod welded to box of approximately 150mm dia and covering with suitable size of phenolic laminated sheet cover with brass screws as required.	Each	78		
		SUB HEAD TOTAL			

2.00	**SUB-HEAD-II:,** **MAINS AND SUB MAINS WIRING**				
2.01	Supplying, laying, testing, rectification and commissioning of wiring with all the required material for following sub-mains with PVC insulated copper conductor 1100 volts grade of suitable size wires in concealed or surface mounted 25/32/40mm diameter PVC conduit either in slabs, partitions or overhead trusses terminating the conductors in respective panels, DBs, switch boxes with suitable size earth wires and associated hardwares etc. (conduit & accessories cost is also included in this				
a)	4 x 16+2 x 10 Sq.mm copper wires in conduit	RM	20		
b)	4 x 10 + 2 x 6 Sq.mm copper wires in conduit.	RM	65		
c)	2 x4+1 x 2.5 Sq.mm copper wires in conduit	RM	90		
d)	2 x 10 + 1 x6 Sq.mm copper wires in conduit	RM	35		
e)	2 x 6 + 1 x 4.0 Sq.mm copper wires in conduit	RM	120		
2.02	**ALUMINIUM CONDUCTOR ARMOURED XLPEAA CABLES**				
k	3.5Cx25 Sq mm. Al. Cond. XLPEAA Cable.	50	Mtrs.		
l	3.5Cx35 Sq mm. Al. Cond. XLPEAA Cable.	50	Mtrs.		
n	3.5Cx95 Sq mm. Al. Cond. XLPEAA Cable.	100	Mtrs.		
2.03	**CABLE TERMINATIONS WITH COPPER THIMBLE**				
q	4x25 Sq mm.	6	Sets		
r	4x35 Sq mm.	6	Sets		
t	4x95 Sq mm.	2	Sets		
2.04	Fabnricating and Installing following size of perforated Hot dipped Galvanised M.S. cable trays includingn horizontal and vertical bends, reducers, tees cross, membes, and other accessories as required and duly suspended from the ceiling with M.S. suspenders and including painting etc. as required:-				
A	**Perforated type.**				
	14 SWG Galvanised Cable trays.				
a)	300 mm wide x 50 mm depth x 1.6 mm thickness	25	Mtrs.		
b)	150 mm wide x 40 mm depth x 1.6 mm thickness	35	Mtrs.		
		SUB HEAD TOTAL			

	SUB-HEAD-III				
3.00	**HEAVY DUTY PVC CONDUITS CONDUITS RECESSED/SURFACE.**				
3.01	Supplying and laying of following sizes of PVC conduit on surface / recess including cutting/filling chases along with conduit accessories etc. complete as required.				
a)	20 mm dia	400	Mtrs.		
b)	25 mm dia	800	Mtrs.		
c)	32 mm dia	100	Mtrs.		
	IS MARK MS CONDUITS CONDUITS RECESSED/SURFACE.				
		SUB HEAD TOTAL			
4.00	**SUB-HEAD IV:,**				
	TELEPHONE, DATA, PA & CCTV WIRING.				
	(MARKET RATES)				
	Wiring for the telephone point with structured voice cable in suitable size of Heavy Duty PVC conduit i/c 14 SWG accessories in a concealed manner with RJ-45 socket as required in 75x75x50 mm MS box.				
	[A maximum of 4 UTP-pairs of voice cable are allowed in 25mm dia conduit]				
4.01	Providing ,fixing ,connecting and testing T.V,Telephone & computer sockets along with 16 SWG GI box as required.				
a	RJ 11 Voice Socket	24	Nos.		
b	RJ 45 Data Socket which has Zero-Cross termination module. Deployed by a Rapid Z-Tool Based termination process to eliminate the variability that can degrade the performance. Compliance to the ISO/IEC 11801 Class EA, TIA/EIA-568-B.2-10 and IEEE 802.3an. The Usable bandwidth should be 750 Mhz and the Design should be based on TRI-Balance Technology with Optimized Pair Balance design.Lacing channels guide correct conductor placement with 2-sided color-coding providing wiring verification before and after lacing. Slim and side-stackable for high-density applications. Supports “pass-thru” feature to mount from the front as well as rear of a faceplate.Printed icons allow designation for voice / data applications and also provide an additional color coding option. Robust Hinged Cable Retention, Clip accommodates multiple cable diameters. Single hybrid outlet should supports both angled and flat mounting orientations. Linear design of the termination module to allows conductors to be feed naturally into position without the need for pair crossing. Pair-to-pair separation from adjacent outlets.The Durability should be 750 mating cycles on modular jack and 200 termination cycles on 110 block. Compatible with both T568A & T568 wiring options and be available in minimum 10 different colours . Diagonal IDC alignment outlet to outlet pair separation and be Certified by Underwriters Laboratories.	80	Nos.		
4.02	Supply and fixing of 16 SWG GI Metal Box of of suitable size in recess and fixing of integral plate type Data/Tel/PA/ CCTV and other switch sockets as required.	104	Nos.		
4.03	Providing and fixing of Music Tag Blocks mounted in suitable sizes of 16 SWG GI Metal Box. With lockable hinged cover plate duly painted.	2	Nos.		

4.04	Providing and fixing of following sizes of Telephone Tag Blocks in suitable Size and reputable make .				
	MARKET RATES				
a	10 Pair Tel Tag Block.	3	Nos.		
b	50 Pair Tel Tag Block.	1	Nos.		
4.05	Providing and fixing of following sizes of unarmoured 0.5mm dia tinned copper conductor FR Telephone cables of reputable make in existing conduits .				
a	2 Pair Tel Cable.	300	Mtrs.		
b	4 Pair Tel Cable.	60	Mtrs.		
4.06	Providing and fixing of following sizes of unarmoured 0.6mm dia tinned copper conductor FR Telephone cables of reputable make in existing conduits .				
	MARKET RATES				
a	10 Pair Tel Cable.	40	Mtrs.		
b	20 Pair Tel Cable.	10	Mtrs.		
4.07	Providing and fixing of following sizes of armoured 0.6mm dia tinned copper conductor FR Telephone cables of reputable make in existing ducts etc.				
	MARKET RATES				
a	10 Pair Tel Cable.	90	Mtrs.		
4.08	Providing & Laying of twisted pair 24/20.copper flexible cable including connecting at both ends for Speakers. .	160	Mtrs.		
4.09	Providing laying connecting and testing of 8 Core Cat VIA Data cable which should be should be F/UTP. The Cable should be 4 pair 23 / 24 AWG Copper with pair separator for uniform characteristic impedance and should be tested to support up to a frequency 750MHz. Compliance to ISO/IEC 11801: 2002, Amendment 1 (Augmented Cat 6, draft) ,ANSI/TIA/EIA-568-B.2-10 and IEC 61156-5 Edition 2.0 (draft). The Insulation should be 0.22 ± 0.03mm thick Polyethylene/Polyolefin, Shielded with aluminum foil tape enclosing 0.51mm (24AWG) tinned copper drain wire. The Outer Jacket should be made of Flame Retardant PVC Material. The Cable diameter should 7.4mm (0.29 in.) max. The performance characteristic should include Attenuation, Pair-to-pair and Powersum NEXT, ELFEXT and PS ELFEXT, Return Loss and Delay skew tested for 100m channel as well as 90m Permanent Link. The Impedance should be 1-100MHz : 100 Ω + 15%, 100-750MHz : 100 Ω + 22 and the Delay Skew - < 45ns. Should be Certified by Underwriters Laboratories.	250	Mtrs.		
4.10	Providing , Fixing , connecting & testing of Data Switches mounted in suitable Size and reputable make 24/48-port 10/100/1000Base-T L2 Stackable Management Switch with 4 Combo SFP. Switching Capacity of 68 Gbps and a Max. Packet Forwarding Rate of 50.60 Mpps with Physical Stacking capability with a mac of 6 Physical Stacking Units and a Max of Phyysical Bandwidth of 20G.				
a	24 Points Managed Switch	6	Nos.		
4.11	Providing and laying of 200 mm dia RCC Pipe {NP-2} in ground i/c excavation and jointing of pipe with collars etc. as approved.	50	Mtrs.		
				Sub Head total Rs.	

	SUB-HEAD - V :				
5.00	**FINAL DISTRIBUTION BOARDS.**				
	(MARKET RATES)				
	Supply, Installation, testing and commissioning of cubicle type dust and vermin proof 10 kA fault level TPN MCB DB made of 16 SWG CRCA sheet steel. The DB should be suitable for wall mounting with lockable double hinged door construction and painted with stove enamel paint of desired shade. The DB to conform to latest IS Code and provided with incoming and outgoing connections and bus bars of solid electrolytic copper and 10 kA current limiting type MCB's.The DB's to be also provided with solid copper neutral & earthing links and fabricated in a manner as approved by engineer-in-charge. All the RCCB's shall have 100 mA sensitivity.				
	LIGHTING LDB'S (SEGREGATED BUS BARS)				
5.01	8-Way TPN MCB DB (segregated phase type) as above and provided with following;				
a	3-Nos. 100 A Copper Bus Bars of equal ratings.				
b	1-No. 63A, 4P, MCCB (15 KA fault level) as Incomer.				
c	1-No. 40A, DP RCBO as Incomer in each phase				
d	8-Nos.6/10/16/20/32A SP MCB as outgoing in each phase.				
e	4-Nos.14 Way copper earth/neutral links	2	Nos.		
5.02	6-Way TPN MCB DB (segregated phase type) as above and provided with following;				
a	3-Nos. 100 A Copper Bus Bars of equal ratings.				
b	1-No.63A, 4P, MCCB (15 KA fault level) as Incomer.				
c	1-No. 40A, DP RCBO as Incomer in each phase				
d	6-Nos.6/10/16/20/32A SP MCB as outgoing in each phase.				
e	4-Nos.10 Way copper earth/neutral links	1	Nos.		
5.03	6-Way VTPN MCB DB (segregated phase type) as above and provided with following;				
a	3-Nos. 100 A Copper Bus Bars of equal ratings.				
b	1-No. 100A, TP, MCCB (15 KA fault level) as Incomer.				
c	1-No. 32A, DP RCBO as Incomer in each phase				
d	6-Nos.63 A TP MCB as outgoing				
e	2-Nos.14 Way copper earth/neutral links	1	Nos.		
5.04	**SINGLE PHASE DB .**				
	8-Way SPN MCB DB as above and provided with following;				
a	1-Nos. 100 A Copper Bus Bars of equal ratings.				
b	1-No.40A, DP,RCBO as Incomer.				
c	8-Nos.6/10/16/20/32A,MCB as outgoing.				
d	12-Nos.8 Way copper neutral links				
e	12-Nos.8 Way copper earth links	2	Nos.		
		SUB HEAD TOTAL			

6.00	**SUB-HEAD -VI**				
	LIGHTING FIXTURE AND FANS				
	(MARKET RATES) {ALL FANS & FITTINGS MAY BE SUPPLLIED BY OWNERS }				
6.01	Receiving & Storing of fancy surface mounted fitting suitable for 2x9W CFL complete with brass holder, lamps, Ballast and of WIPRO-MOONLITE with 2x9W cfl Lamp.	124	Nos.		
	FOR CEILING IN CORRIDORS				
6.02	Receiving & Storing of fancy surface mounted fitting suitable for 1 x11W CFL complete with brass holder, lamps, Ballast and of Wipro Cat. No. WVP 41111 with 1X11 W CFL Lamp.	32	Nos.		
	(FOR TOILETS WC)				
6.03	Supply & Storing of Maintenance Free 24 V 30 minutes Battery back up Exit Signs constructed from 18 gauge stove enamelled MS ventilated box of suitable size with MS grooved channels for sliding of acrylic sheet. Signage frontal facias shall be of white acrylic sheet with figure and arrow in green as per following Legrand Cat. No.complete with accessories as per 61791.				
a	Cat.No. 61791/61792.+ Cat.No. 61746 + Cat No. 660865	2	Nos.		
b	Receiving, storing of maintenace free battery back up emergency light of 1 hours duration complete with maintenance free 24 V battery and lamp as approved as per Legrand Cat. No. 61730.	8	Nos.		
c	Receiving, storing of Self illuminating Exit Signs made from Self charging illuminating tapes of 25mm / 32mm wide strips as per Legrand Cat. No. 6608 65.	2	Nos.		
6.04	Supply,installation,testing and commissioning of Fluorescent Lighting Fixture complete with brass holders, HF Ballast power improvement capacitor, tube light etc. i/c internal wiring and of following make as required.				
a	Philips TMC 501/136 HF(EBW)	122	Nos.		
b	PhilipsTCH 128/2005/840 T-5,28W (MIRROR LIGHT)	8	Nos.		
c	PHILIPS MIROLTA PATTI TYPE FITTING	4	Nos.		
6.05	Supply,installation,testing and commissioning of round lamp Energy efficient fitting with Electronic ballast PHILIPS/OSRAM make complete wired upto the terminal block.and complete with 1 nos 25 watt Energy Saving Lamp. Philips make Deco Twist Cat #WW BCS 1901	2	Nos.		
	FOR WALL BRACKET				
6.06	Supply,installation,testing and commissioning of ceiling fans/wall fan complete with motor, a set of blades, down rod but without regulator i/c wiring the down rod with 2X1.5 mmsq pvc ins.copper conductor wire as reqd.				
a	Havels SS-390, 1200 mm sweep.	60	Nos.		
b	Havels SS-390, 1400 mm sweep.	18	Nos.		
6.07	Supply,installation,testing and commissioning of of 900 rpm, exhaust fans complete with motor, a set of blades, cowl, adjustable type louvres, grouting bolts, power improvement capacitors including making holes in the wall to suit the size of fan and as per Havels /crompton/bajaj make				
a	Havels Turbo Force , 300 mm dia. , 900 rpm	11	Nos.		
6.08	Supplying and fixing call bell/buzzer suitable for D.C./A.C. single phase, 230 volts, complete as required	6	Nos.		

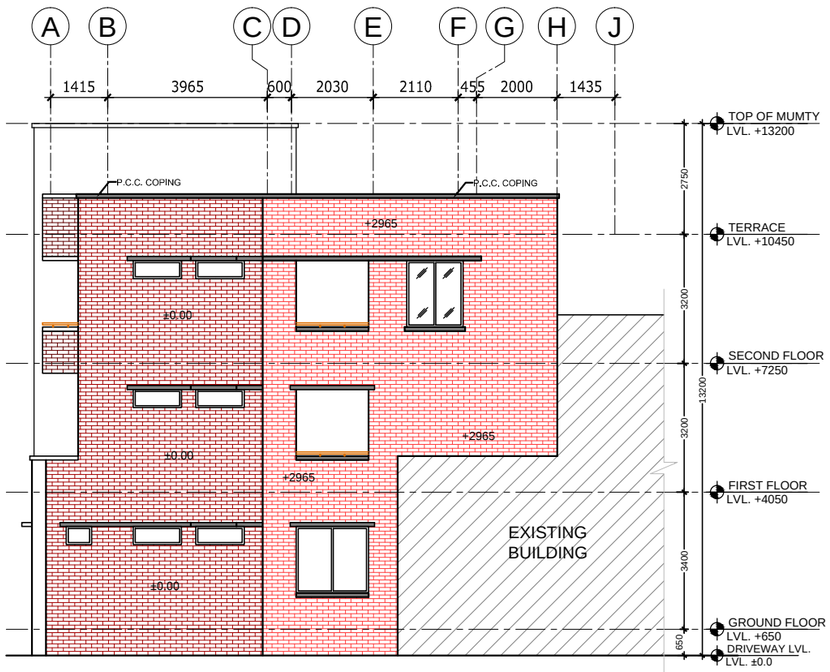
		SUB HEAD TOTAL			
7.00	**SUBHEADVII:** **FIXING OF FANS AND FIXTURES**				
	(MARKET RATES)				
7.01	Fixing connecting testing and commissioning of Fluorescent light fixture on false ceiling/surface ceiling/wall complete with petty material as required.	134	Nos.		
7.02	Fixing connecting and testing commissioning of CFL down light fixture on false ceiling/ceiling complete with petty material as required.	168	Nos.		
7.03	Fixing connecting testing and commissioning of bracket light fixture/ fluorscent light wall complete with petty material as required.	2	Nos.		
7.04	Fixing connecting testing and commissioning of ceiling/bracket fan complete with regulator and petty material as required.	78	Nos.		
7.05	Fixing connecting testing and commissioning of 300mm/380 mm/ 450mm sweep exhaust fan i/c making a hole in the wall and fixing of the cowl and louvers as approved by the engineer- in-charge.	11	Nos.		
7.06	Supplying and fixing stepped type electronic fan regulator on the existing modular plate switch box including connection but excluding modular plate ect. as required.	4	Nos.		
7.07	Supplying and fixing modular blanking plate on existing modular plate & switch box excluding modular plate as required	40	Nos.		
7.08	Supplying and fixing call bell/buzzer suitable for D.C./A.C. single phase, 230 volts, complete as required	2	Nos.		
		SUB HEAD TOTAL			

	SUB-HEADVIII EARTHING CONDUCTOR.				
8.01	Earthing with G.I. earth plate 600 mm x 600 mm x 6 mm thick including accessories, and providing masonary enclosure with cover plate having locking arrangement and watering pipe etc. with charcoal or Coke and salt as required.	2	Set		
8.02	Supplying and laying 6 SWG G.I. wire at 0.50 m. below ground level as strip earth electrode, including soldering etc. as required.	50	Mtrs.		
8.03	Providing and fixing 25 mm x 5 mm G.I. stripin 40 mm dia. G.I. pipe from earth electrodeas required.	60	Mtrs.		
8.04	Providing and laying earth connection from earth electrode with 6 SWG dia G.I. Wire in 15mm dia G.I. pipe from earth electrode, as required.	50	Mtrs.		
8.05	Providing and fixing 25 mm x 5 mm G.I. strip on surface or in recess for connections etc. as required.	50	Mtrs.		
	LIGHTNING CONDUCTORS.				
8.06	Providing and fixing of lightning conductor finial, made of 25 mm dia 300 mm long, copper tube,having single prong at top, with 85mm dia 3mm thick copper base plate including holes etc. complete asrequired.	1	Nos.		
8.07	Providing and fixing GI tape 20 mm X 3 mm thick on parapet or surface of wall for lightning conductor complete as required. (For horizontal run)	135	Each		
8.08	Providing and fixing G.I. tape 20 mm X 3 mm thick on parapet or surface of wall for lightning conductor complete as required. (For vertical run)	32	Mtrs.		
8.09	Providing and fixing testing joint,made of 20 mm x 3 mm thick copper strip, 125 mm. long, with 4 Nos. of tinned brass bolts, nuts, check nuts and spring washers etc. complete as required.	1	Each		
8.1	Providing and laying G.I. tape 32mm X 6mm from earth electrodedirectly in ground as required.	60	Mtrs.		
		SUB HEAD TOTAL			

9.00	**SUB-HEAD-IX**				
	LT PANEL'S				
	Supply, Erection, Testing and commissioning of indoor type cubicle pattern LT Switch-Board with a rupturing capacity of 25 KA at 433V or as called for in individual items,openable in front and back suitable for 3-phase, 4 wire, 50Hz AC supply at an ambient temperature of 50°C. The cubicle should be rust proof, dust proof, vermin proof, well ventilated and enclosure protection shall be IP-42 as per IS 2147- 1962.The cubicle should be front operated, floor mounted, free standing with compartments in tier formation, extensible on both sides. The panel to be provided with PVC Sleeved 4-P Electrolytic Aluminium Bus Bars and PVC insulated solid interconnections and also provided with 50x6mm horizontal tinned copper Earth Bus Bars in each section .				
	The Panels shall comprise of ACB's / MCCB's as detailed in various B.O.Q Items. below and conforming to IS 4237, IS 4047, IS 2208,IS 2516 and other relevant IEC/ BSS/ DIN standards/code as applicable.The MCCBs shall be provided with extended operating handle. Ammeters, Voltmeters etc. shall be of Taut Band with 240 degree deflection.				
	The Panels/Switchboards shall be fabricated out of 14-SWG CRCA sheet steel and provided with 16 SWG hinged doors. A clear space of 300 mm or as approved shall be left at the bottom.The operating handle of the topmost switch shall not be higher than 1900mm from the finished floor and maximum height of Panels shall not more than 2200mm. The Panel shall be Powder coated to paint of desired shade nd in an approved manner. (Powder coating process desired)				
	All panels shall be provided with MCCB's (with long extended operating handles), Voltmeter, Ammeter (Taut Band with 240 degrees deflection) Selector Switches, cluster (LED/LCD) indicating lights with fuses etc.The various Panels/Switch Boards are described as per follows;				
	All specified Fault current are Service Current (RMS) and to be borne by equipment for 1.0 Sec.)				
	All Incomer MCCB's rated 250A & above shall be Microprocessor based.				
9.01	**BLDG MAIN LT PANEL LIGHTING**				
a	1 Nos.160A, 25KA,FP MCCB				
	MULTI FUNCTION METER (KWH,MAX DEMAND, KW, AMP, VOLTAGE, P.F.)				
d	1Set of ON/OFF/ Trip and Phase Indicating Lights with HRC fuses .				
II	**Busbars :**				
a	4 x250A, Electrolytic Copper Bus-Bars of equal cross section.				
III	**Outgoings :**				
a	5Nos. 63A, FP, MCCB's as outgoing for upper floors	**1**	**Set**		
		SUB HEAD TOTAL			

10.00	**SUB HEAD X:**				
	MISCELLANEOUS ITEMS				
	(MARKET RATES)				
10.01	Supplying & Placing of non-skid rubber mat 12 mm thick and 900mm width as required including cutting to required lengths of approved make with Test Certificates for L.T.Panels.	1	Mtrs.		
10.02	Supplying of fire bucket painted red and duly filled with sand comforming to IS :2546-1974.	2	Nos.		
10.03	Supplying of MS Stand suitable for supporting two buckets (Pedestal type)	1	Nos.		
10.04	Supplying of MS Stand suitable for supporting four buckets (Pedestal type)	1	Nos.		
10.05	Supplying and fixing cable route marker with route indication on 150 mm dia cast iron disc bolted to 40x40x3mm angle iron grouted in 1:3:6 concrete block 150x150x300 mm deep including two coats of aluminium paint on the metal work.	12	Nos.		
10.06	Supplying and fixing of shock restoration chart written in Hindi and English duly framed in glass as required.	1	Nos.		
10.07	Supplying and fixing of Carbon dioxide fire extinguisher type 4.5 Kgs. capacity of approved make with wall mounting bracket as required conforming to IS: 2878 /1976.	3	Nos.		
10.08	Supplying of first aid box as approved complete with standard kit as prescribed by Red Cross.	1	No.		
10.09	Providing and fixing MV danger plate of 200x150mm of mild steel at least 2mm thick and vitreous enamelled white paint on both side and with inscription in signal red colour on front side as required.	4	Nos.		
		SUB-HEAD TOTAL =			

ELEVATION - A



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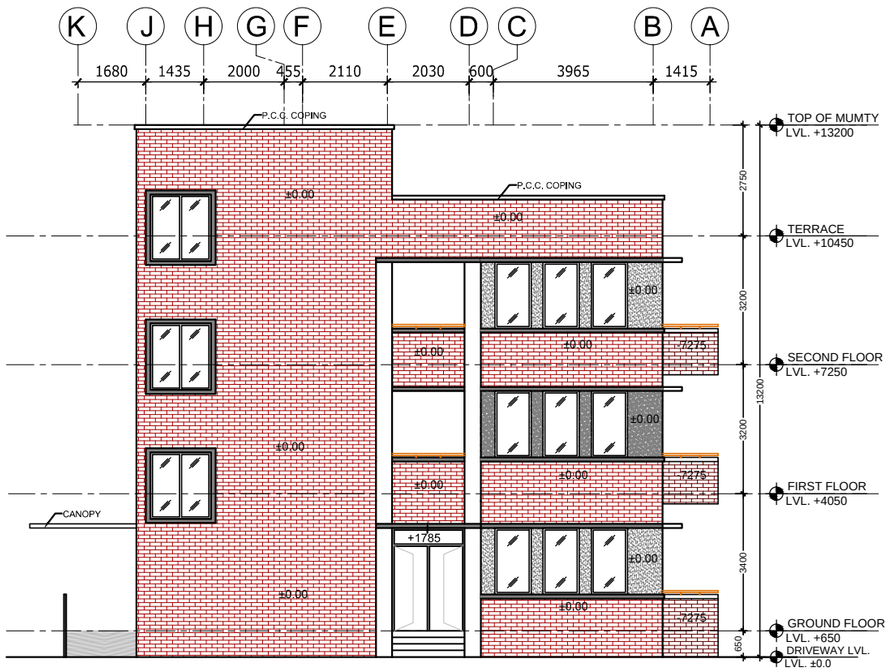

ELEVATION - D

REV.	DATE	AMENDMENTS	REMARKS

PROJECT

PROPOSED BUILDING FOR CONSTRUCTION OF GIRLS HOSTEL
SHRIRAM COLLEGE OF COMMERCE, DELHI UNIVERSITY

ARCHITECTS
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STRUCTURE CONSULTANT

DRAWING TITLE

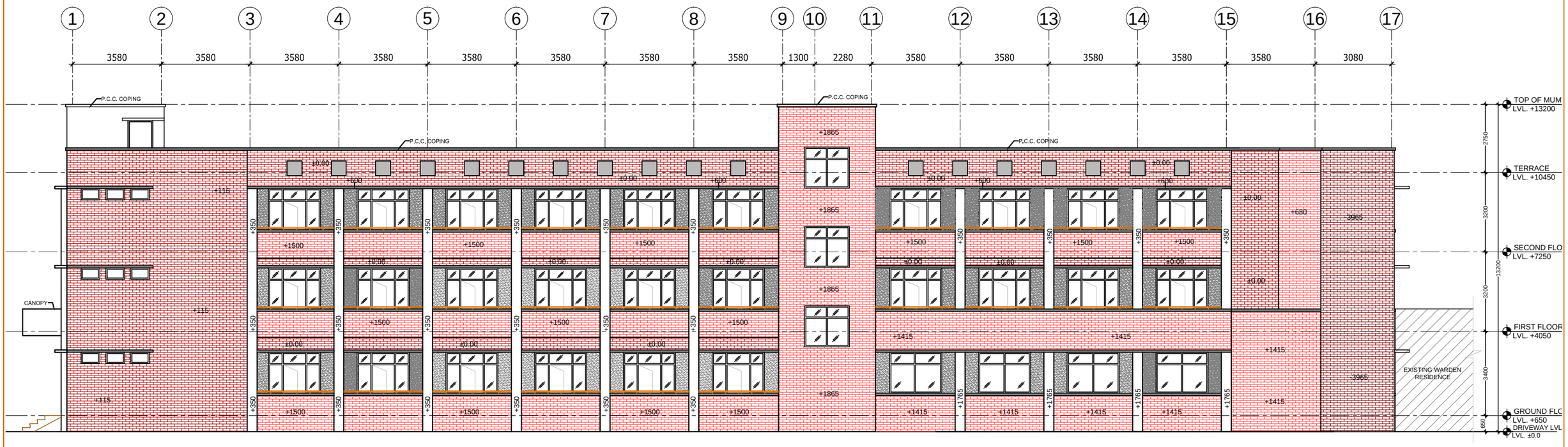
GIRLS HOSTEL
ELEVATION - A, B & D

DATE	DRAWN	SCALE
04.09.2013	VIKRAM	NTS

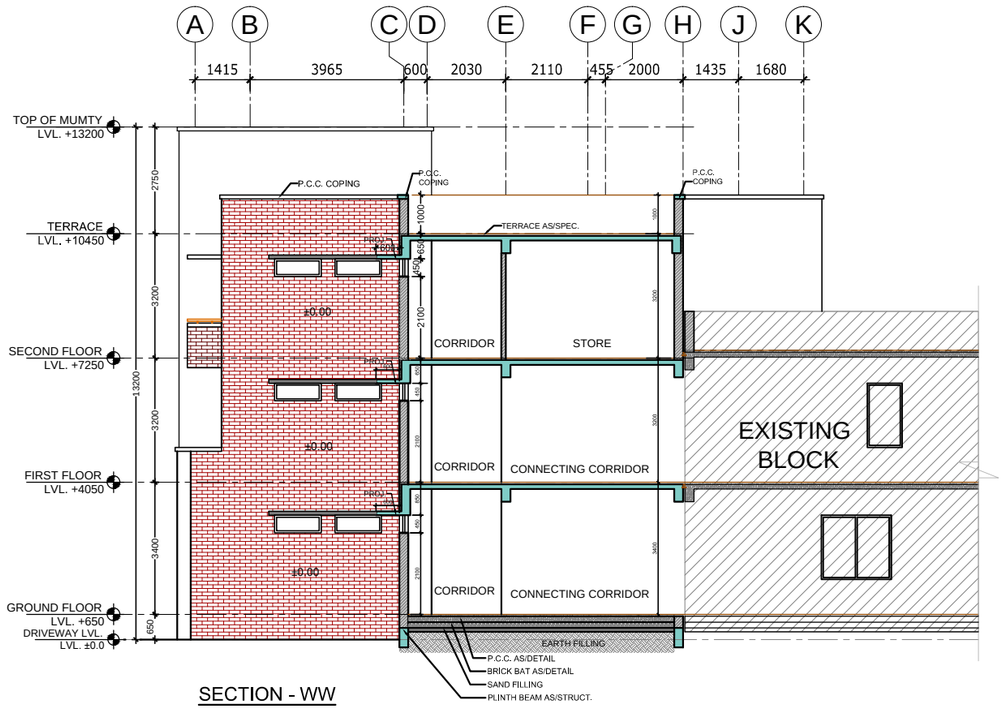
DRG. NO.
SRCC/GH-A/05

NORTH

STATUS



ELEVATION - C



SECTION - WW

REV.	DATE	AMENDMENTS	REMARKS

PROJECT

PROPOSED BUILDING FOR CONSTRUCTION OF GIRLS HOSTEL
SHRIRAM COLLEGE OF COMMERCE, DELHI UNIVERSITY

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DRAWING TITLE GIRLS HOSTEL

ELEVATION - C & SECTION - WW

DATE	DRAWN	SCALE
04.09.2013	VIKRAM	NTS

DRG. NO. SRCC/GH-A/06

NORTH

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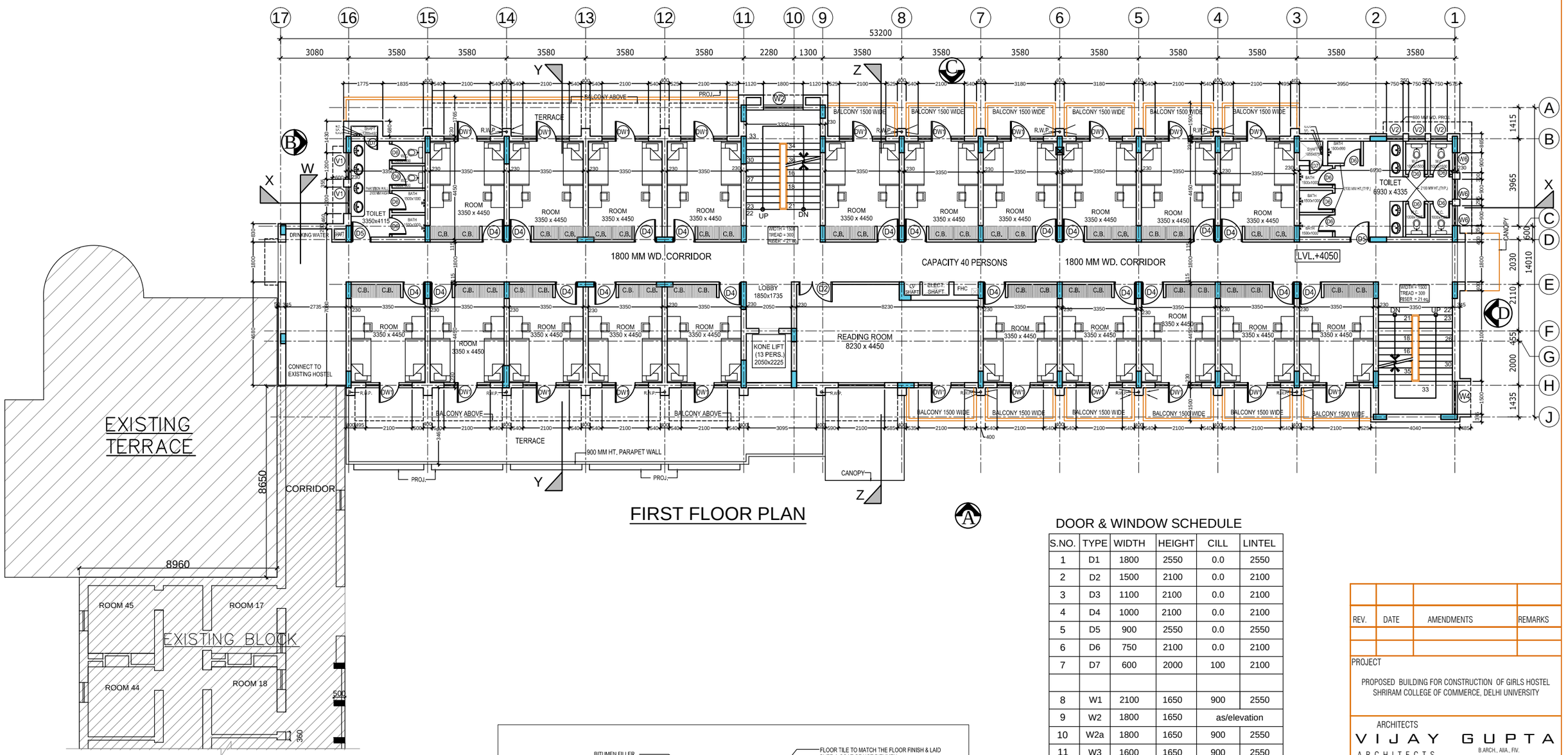
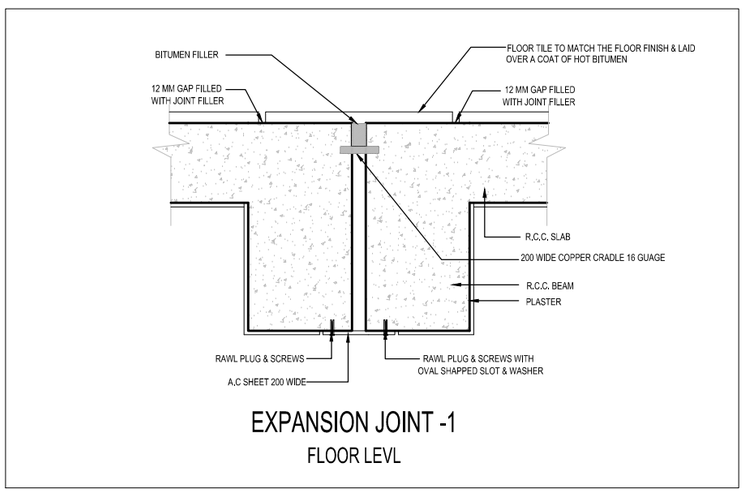


FIRST FLOOR PLAN



EXPANSION JOINT -1

FLOOR LEVL

DOOR & WINDOW SCHEDULE

S.NO.	TYPE	WIDTH	HEIGHT	CILL	LINTEL
1	D1	1800	2550	0.0	2550
2	D2	1500	2100	0.0	2100
3	D3	1100	2100	0.0	2100
4	D4	1000	2100	0.0	2100
5	D5	900	2550	0.0	2550
6	D6	750	2100	0.0	2100
7	D7	600	2000	100	2100
8	W1	2100	1650	900	2550
9	W2	1800	1650	as/elevation	
10	W2a	1800	1650	900	2550
11	W3	1600	1650	900	2550
12	W4	1500	1650	as/elevation	
13	W5	1400	1650	900	2550
14	W6	900	1650	900	2550
15	V1	1200	450	2100	2550
16	V2	750	450	2100	2550
17	V3	630	450	2100	2550
18	DW1	2100	2550	0.0 & 900	2550
19	DW1a	2100	2550	0.0 & 900	2550
20	DW2	1800	2550	0.0 & 900	2550
21	GL1	3275	2550	0.0	2550

REV.	DATE	AMENDMENTS	REMARKS

PROJECT

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STRUCTURE CONSULTANT

DRAWING TITLE

GIRLS HOSTEL

FIRST FLOOR PLAN

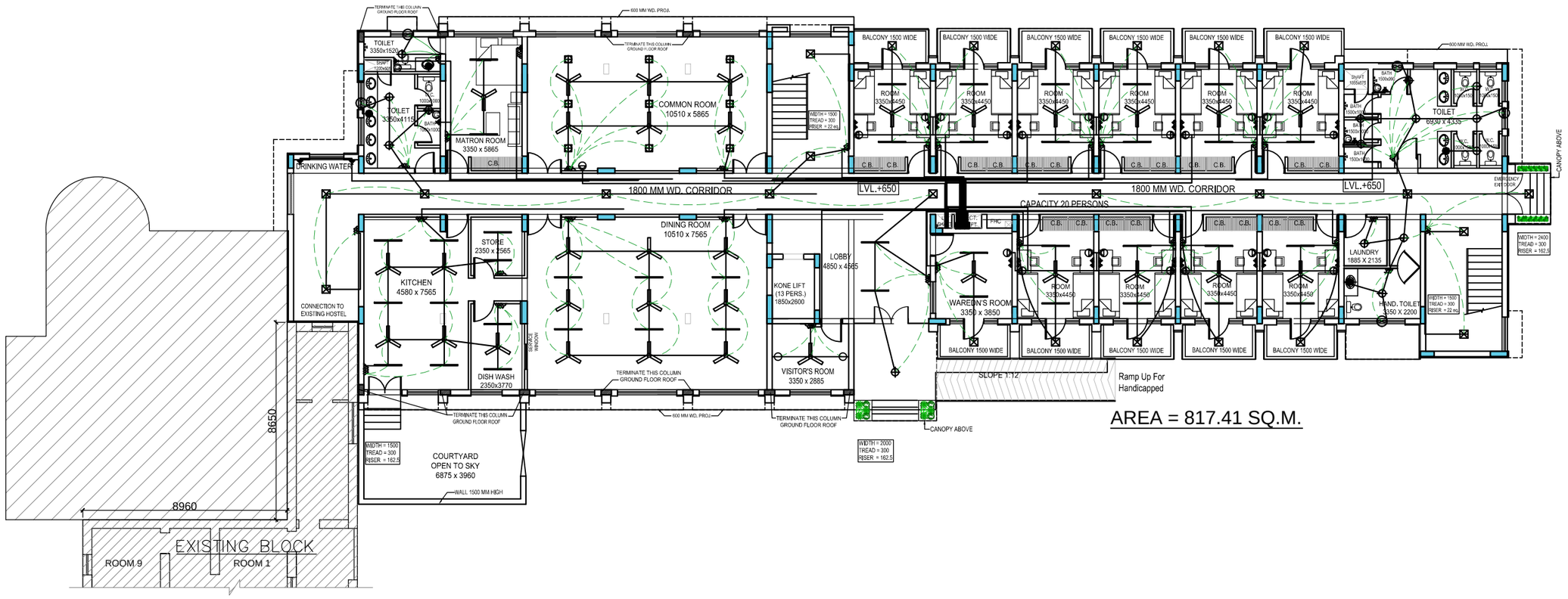
DATE	DRAWN	SCALE
04.09.2013	VIKRAM	NTS

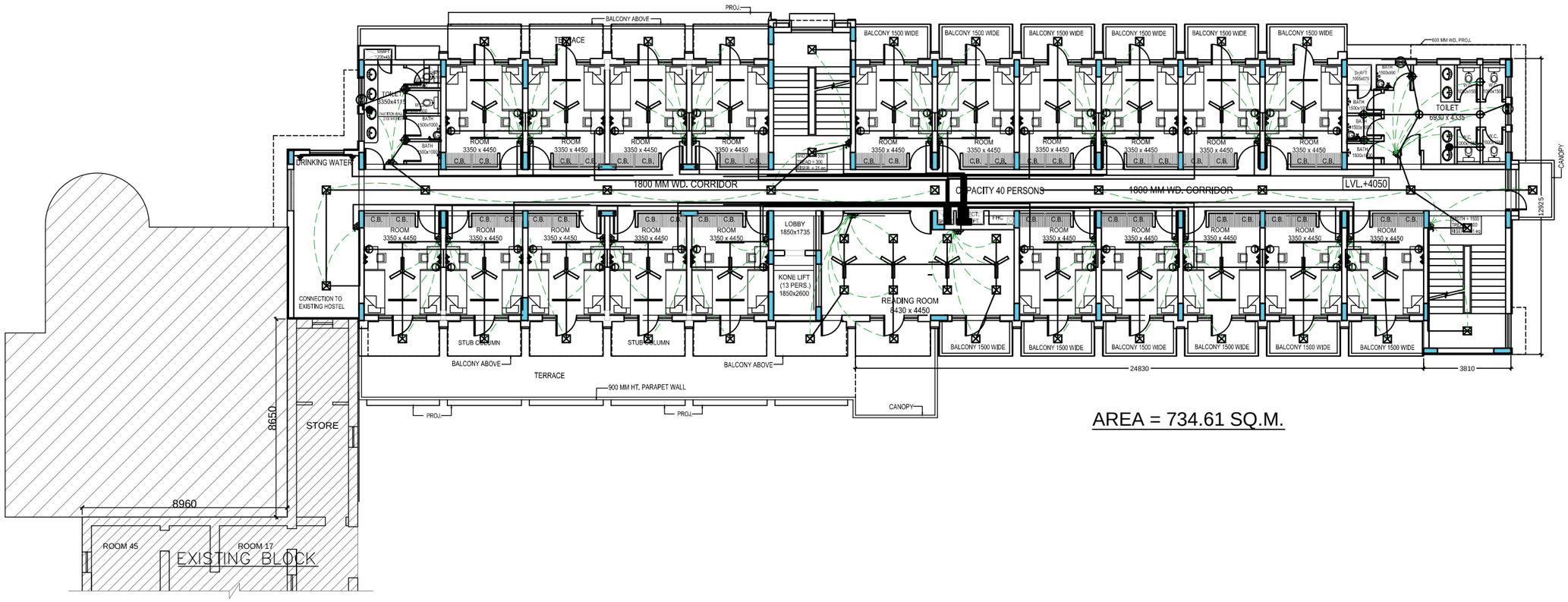
DRG. NO.

SRCC/GH-A/02

NORTH

STATUS





LEGEND :-

1		1x28W WALL WASHER LIGHT
2		1x28W CELING LIGHT .
3		CEILING LIGHT
4		2x13 WATT CFL TYPE CEILING LIGHT
5		CEILING FAN
6		EXHAUST FAN
7		WALL LIGHT FIXTURE
8		MIRROR LIGHT
9		6\16 AMP. POWER POINT .
10		6 AMP. PLUG POINT .
11		LIGHT POINT SWITCH BOARD .
12		TELEPHONE POINT.
13		LAN POINT
14		DISTRIBUTION BOARD.
15		25 MM 2.0MM PVC . CONDUIT PIPE.
16		25 MM 2.0MM PVC . CONDUIT PIPE.
17		25 MM 2.0MM PVC . CONDUIT PIPE. FOR COMPUTOR LAN POINTS.
18		32 MM 2.0MM PVC . CONDUIT PIPE. FOR SUBMAIN WIRING
19	G	GEYSER

REV.	DATE	AMENDMENTS	REMARKS

PROJECT

PROPOSED BUILDING FOR CONSTRUCTION OF GIRLS HOSTEL
SHRIRAM COLLEGE OF COMMERCE, DELHI UNIVERSITY

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STRUCTURE CONSULTANT

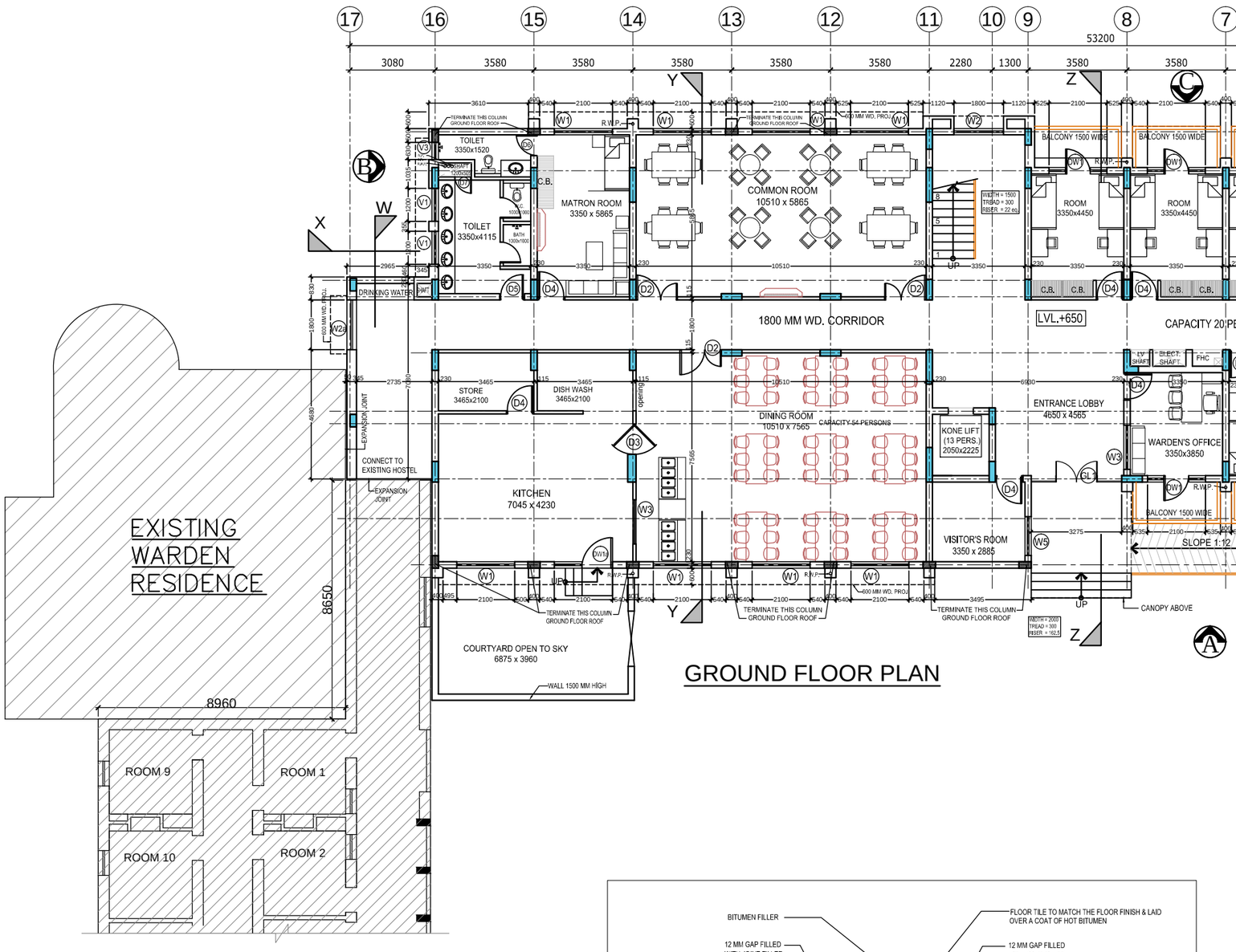
DRAWING TITLE
GIRLS HOSTEL
GROUND & FIRST FLOOR
ELECTRICAL LAYOUT

DATE	DRAWN	SCALE
04.09.2013	VIKRAM	NTS

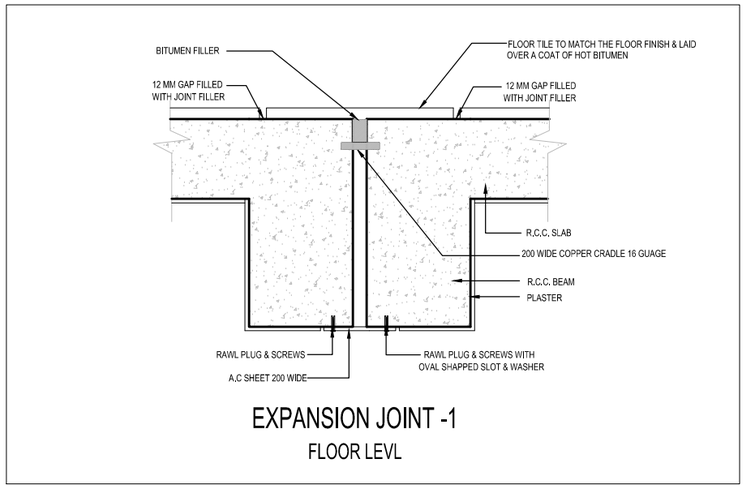
DRG. NO.
SRCC/GH-A/01

NORTH

STATUS



GROUND FLOOR PLAN



EXPANSION JOINT -1
FLOOR LEVL

DOOR & WINDOW SCHEDULE

S.NO.	TYPE	WIDTH	HEIGHT	CILL	LINTEL
1	D1	1800	2550	0.0	2550
2	D2	1500	2100	0.0	2100
3	D3	1100	2100	0.0	2100
4	D4	1000	2100	0.0	2100
5	D5	900	2550	0.0	2550
6	D6	750	2100	0.0	2100
7	D7	600	2000	100	2100
8	W1	2100	1650	900	2550
9	W2	1800	1650	as/elevation	
10	W2a	1800	1650	900	2550
11	W3	1600	1650	900	2550
12	W4	1500	1650	as/elevation	
13	W5	1400	1650	900	2550
14	W6	900	1650	900	2550
15	V1	1200	450	2100	2550
16	V2	750	450	2100	2550
17	V3	630	450	2100	2550
18	DW1	2100	2550	0.0 & 900	2550
19	DW1a	2100	2550	0.0 & 900	2550
20	DW2	1800	2550	0.0 & 900	2550
21	GL1	3275	2550	0.0	2550

REV.	DATE	AMENDMENTS	REMARKS

PROJECT

PROPOSED BUILDING FOR CONSTRUCTION OF GIRLS HOSTEL
SHRIRAM COLLEGE OF COMMERCE, DELHI UNIVERSITY

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STRUCTURE CONSULTANT

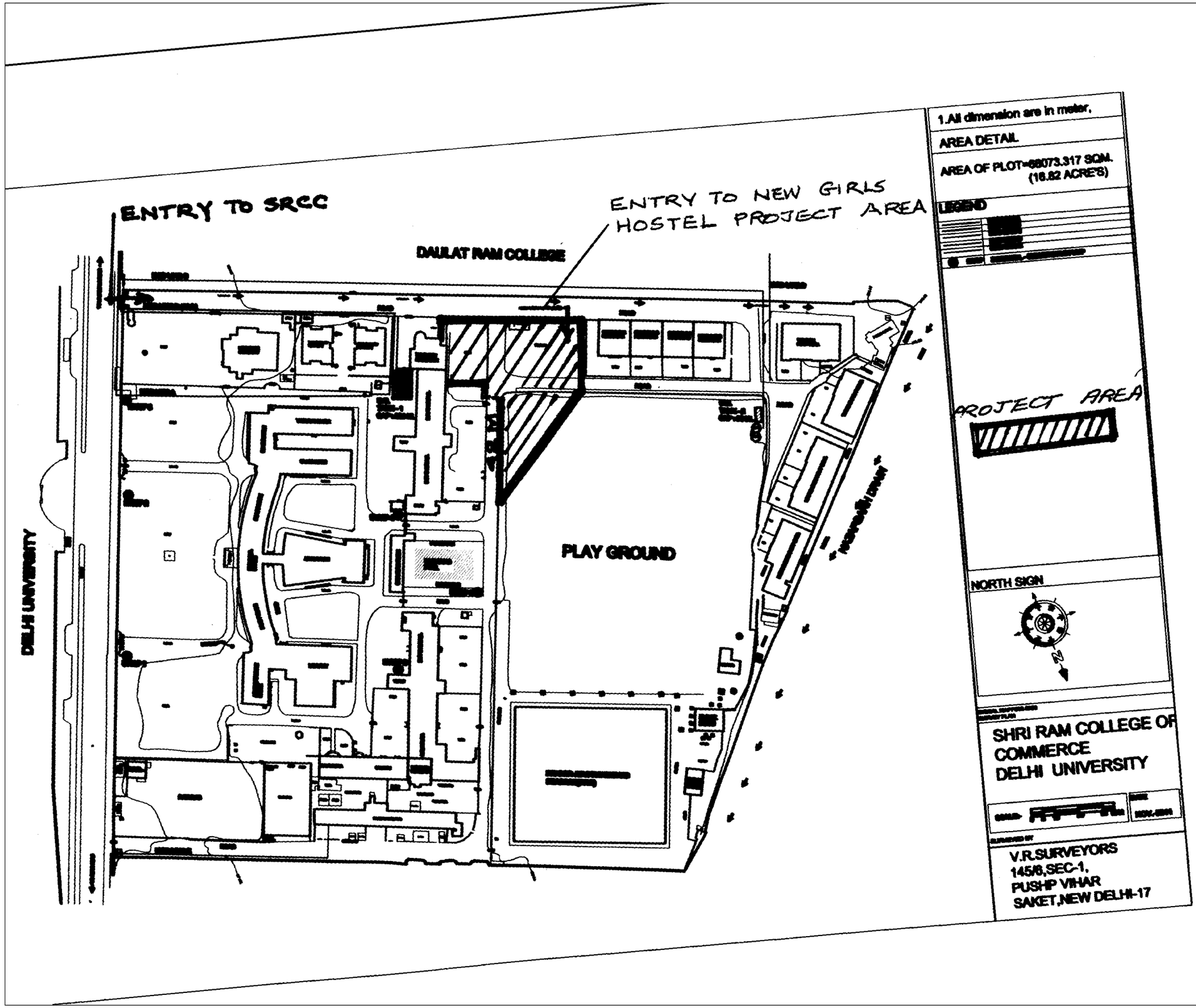
DRAWING TITLE
GIRLS HOSTEL
GROUND FLOOR PLAN

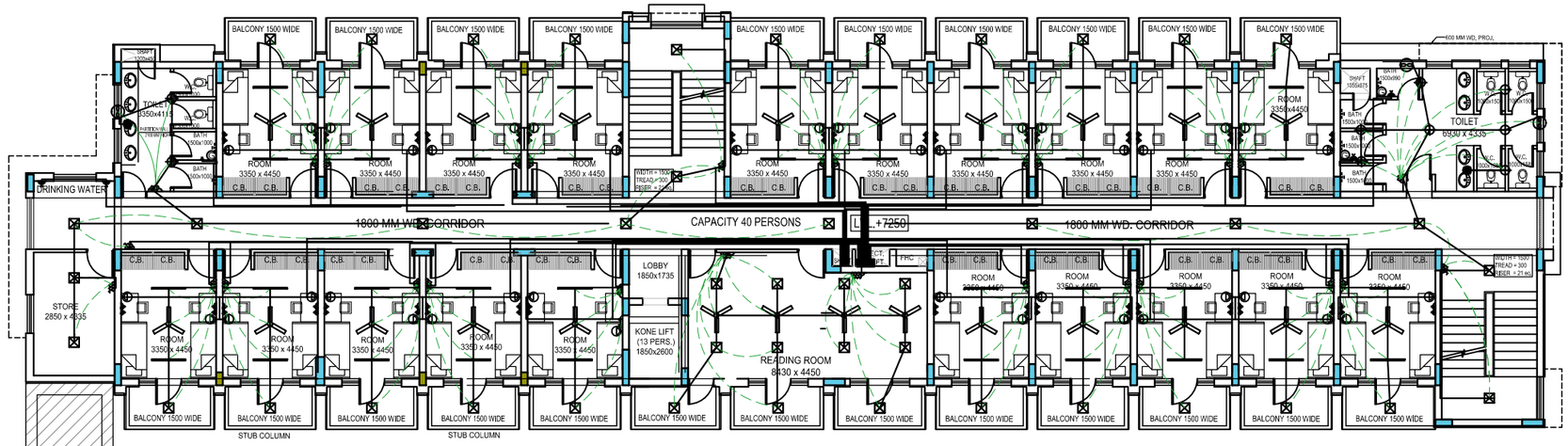
DATE	DRAWN	SCALE
04.09.2013	VIKRAM	NTS

DRG. NO.
SRCC/GH-A/01

NORTH

STATUS


ENTRY TO SRCC
ENTRY TO NEW GIRLS HOSTEL PROJECT AREA
DAULAT RAM COLLEGE
DELHI UNIVERSITY
PLAY GROUND
1.All dimension are in meter.
AREA DETAIL
AREA OF PLOT=68073.317 SQM.
(16.82 ACRE'S)
LEGEND
PROJECT AREA
NORTH SIGN
SHRI RAM COLLEGE OF COMMERCE
DELHI UNIVERSITY
V.R.SURVEYORS
145/6,SEC-1,
PUSHP VIHAR
SAKET,NEW DELHI-17



AREA = 712.76 SQ.M.

EXISTING TERRACE

LEGEND :-

1		1x28W WALL WASHER LIGHT
2		1x28W CELING LIGHT .
3		CEILING LIGHT
4		2x13 WATT CFL TYPE CEILING LIGHT
5		CEILING FAN
6		EXHAUST FAN
7		WALL LIGHT FIXTURE
8		MIRROR LIGHT
9		6\16 AMP. POWER POINT .
10		6 AMP. PLUG POINT .
11		LIGHT POINT SWITCH BOARD .
12		TELEPHONE POINT.
13		LAN POINT
14		DISTRIBUTION BOARD.
15		25 MM 2.0MM PVC . CONDUIT PIPE.
16		25 MM 2.0MM PVC . CONDUIT PIPE.
17		25 MM 2.0MM PVC . CONDUIT PIPE. FOR COMPUTOR LAN POINTS.
18		32 MM 2.0MM PVC . CONDUIT PIPE. FOR SUBMAIN WIRING
19		GEYSER

REV.	DATE	AMENDMENTS	REMARKS

PROJECT

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SHRIRAM COLLEGE OF COMMERCE, DELHI UNIVERSITY

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STRUCTURE CONSULTANT

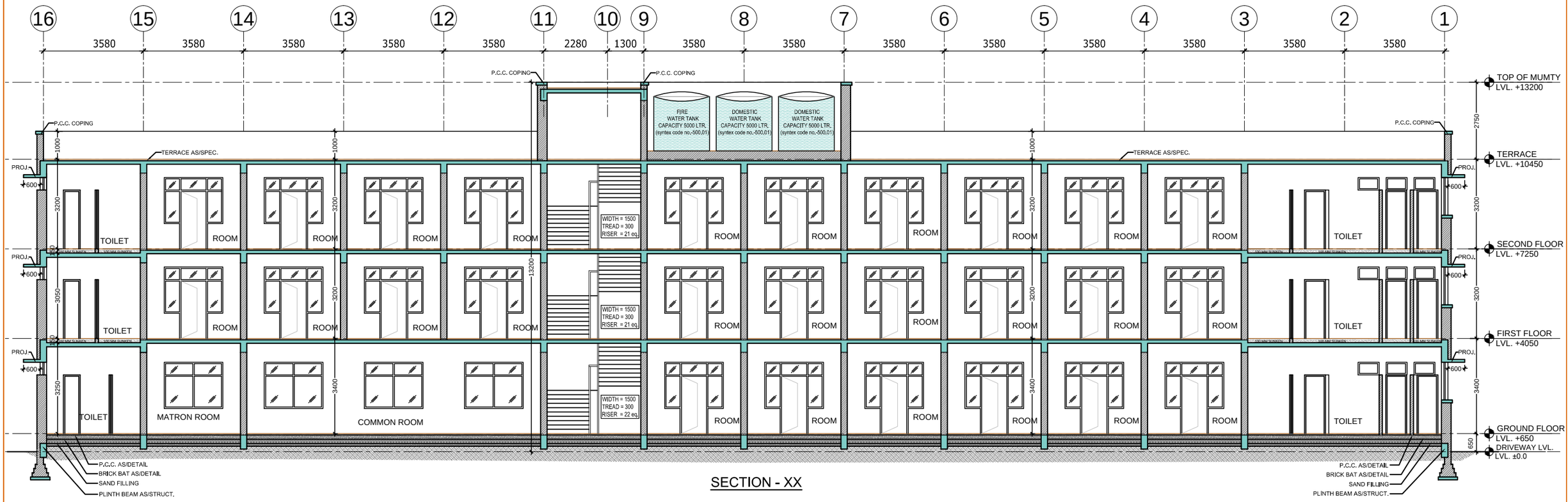
DRAWING TITLE
GIRLS HOSTEL
SECOND & TERRACE FLOOR PLAN

DATE	DRAWN	SCALE
04.09.2013	VIKRAM	NTS

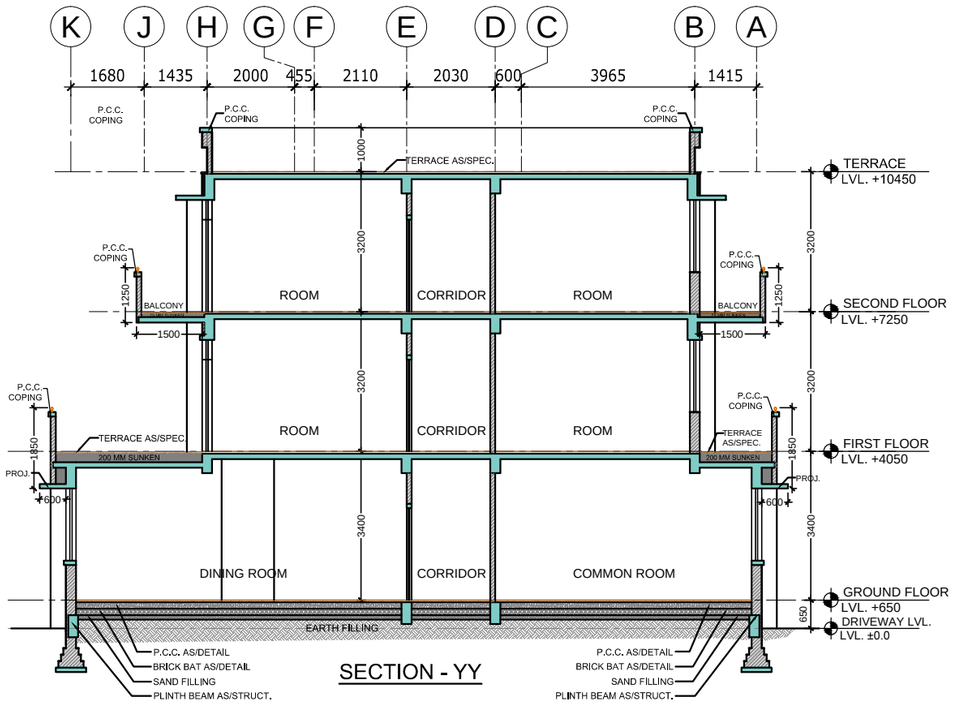
DRG. NO.
SRCC/GH-A/02

NORTH

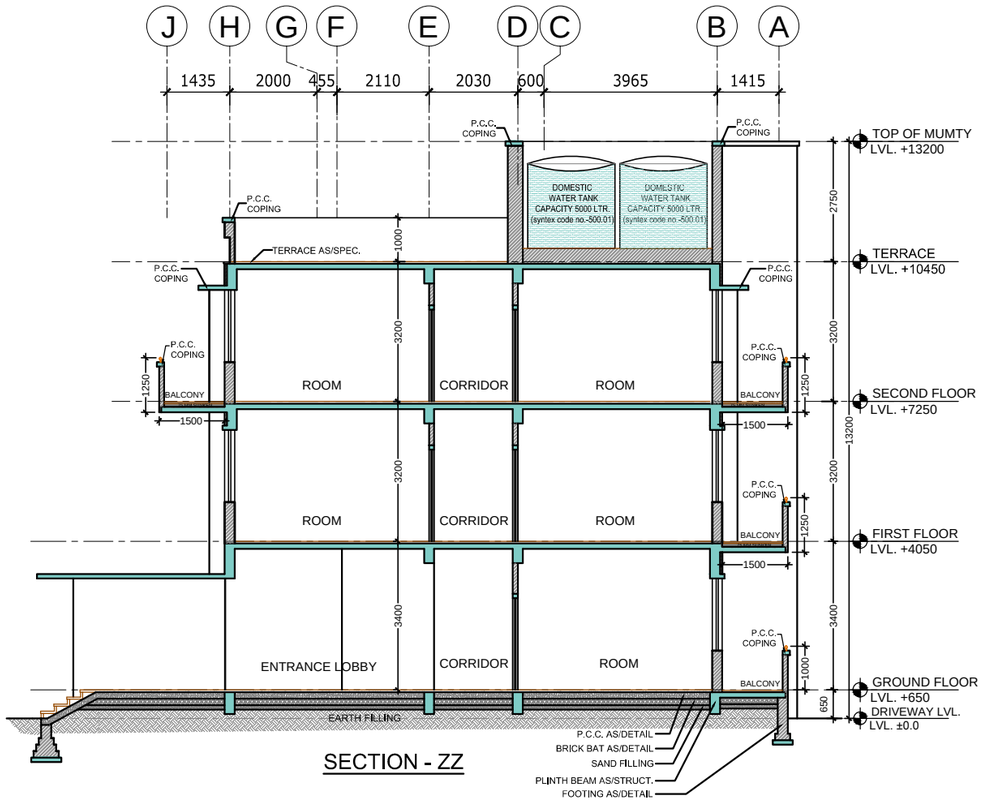
STATUS



SECTION - XX



SECTION - YY



SECTION - ZZ

REV.	DATE	AMENDMENTS	REMARKS

PROJECT

PROPOSED BUILDING FOR CONSTRUCTION OF GIRLS HOSTEL
SHRIRAM COLLEGE OF COMMERCE, DELHI UNIVERSITY

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STRUCTURE CONSULTANT

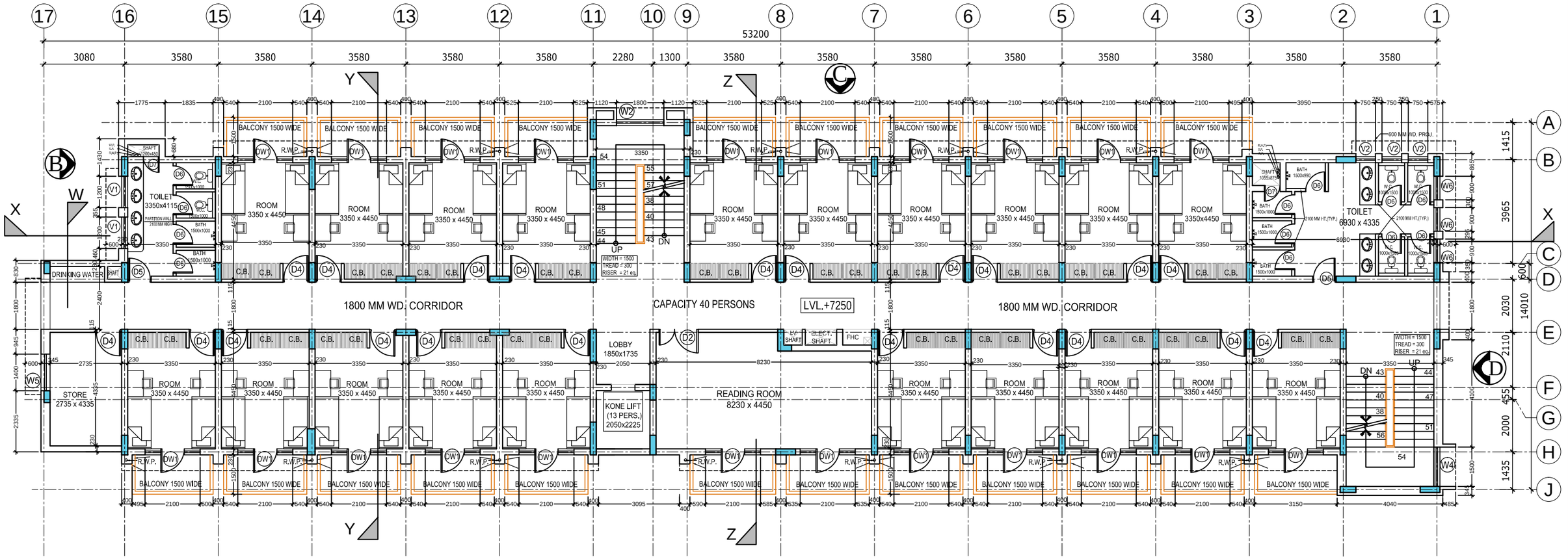
DRAWING TITLE
GIRLS HOSTEL
SECTIONS

DATE	DRAWN	SCALE
18.09.2013	VIKRAM	NTS

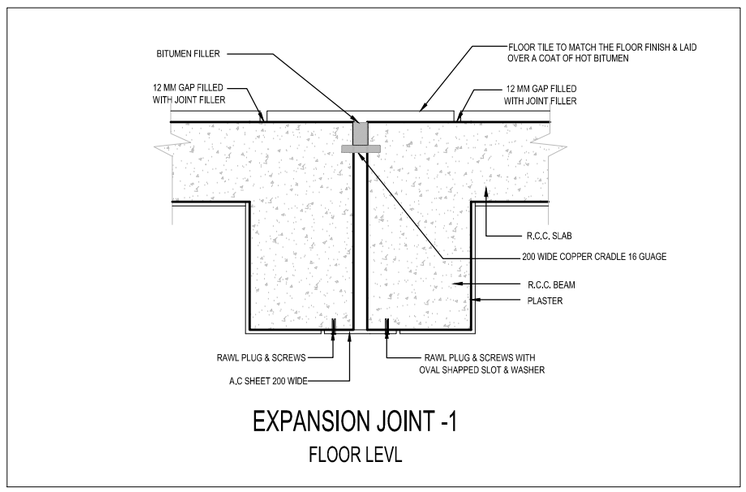
DRG. NO.
SRCC/GH-A/07

NORTH

STATUS



SECOND FLOOR PLAN



EXPANSION JOINT -1

FLOOR LEVL

DOOR & WINDOW SCHEDULE

S.NO.	TYPE	WIDTH	HEIGHT	CILL	LINTEL
1	D1	1800	2550	0.0	2550
2	D2	1500	2100	0.0	2100
3	D3	1100	2100	0.0	2100
4	D4	1000	2100	0.0	2100
5	D5	900	2550	0.0	2550
6	D6	750	2100	0.0	2100
7	D7	600	2000	100	2100
8	W1	2100	1650	900	2550
9	W2	1800	1650	as/elevation	
10	W2a	1800	1650	900	2550
11	W3	1600	1650	900	2550
12	W4	1500	1650	as/elevation	
13	W5	1400	1650	900	2550
14	W6	900	1650	900	2550
15	V1	1200	450	2100	2550
16	V2	750	450	2100	2550
17	V3	630	450	2100	2550
18	DW1	2100	2550	0.0 & 900	2550
19	DW1a	2100	2550	0.0 & 900	2550
20	DW2	1800	2550	0.0 & 900	2550
21	GL1	3275	2550	0.0	2550

REV.	DATE	AMENDMENTS	REMARKS

PROJECT

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STRUCTURE CONSULTANT

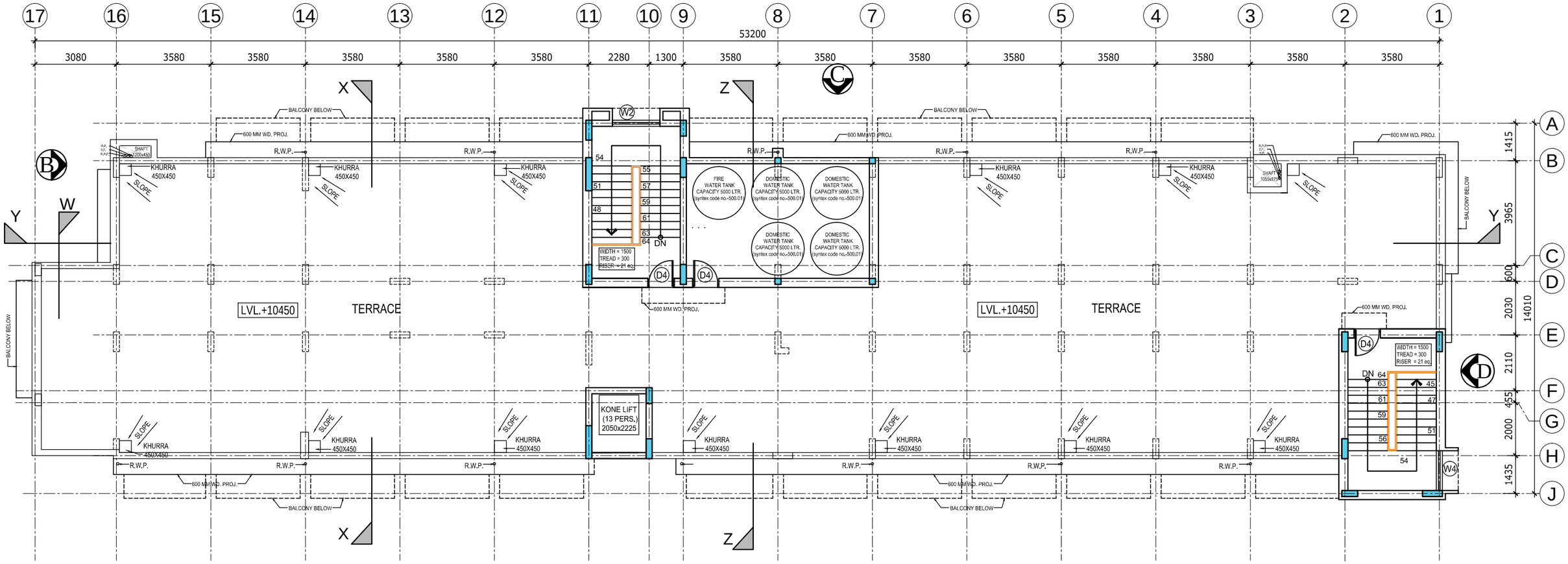
DRAWING TITLE
GIRLS HOSTEL
SECOND FLOOR PLAN

DATE	DRAWN	SCALE
04.09.2013	VIKRAM	NTS

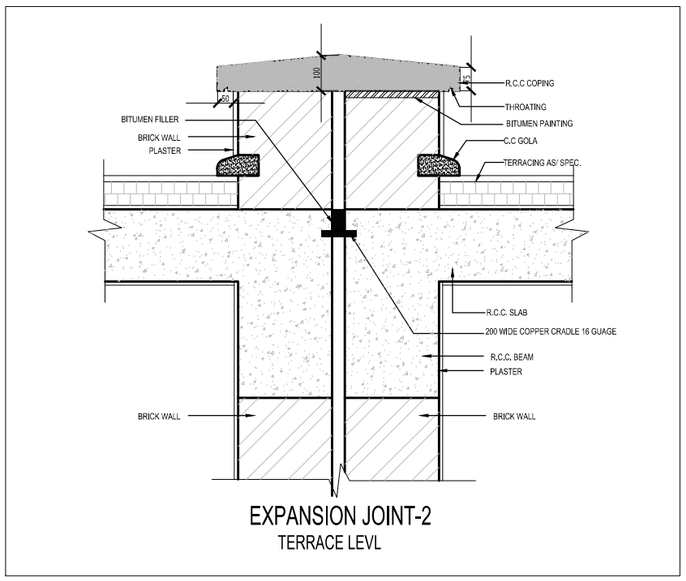
DRG. NO.
SRCC/GH-A/03

NORTH

STATUS



TERRACE PLAN



EXPANSION JOINT-2
TERRACE LEVL

REV.	DATE	AMENDMENTS	REMARKS

PROJECT

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SHRIRAM COLLEGE OF COMMERCE, DELHI UNIVERSITY

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STRUCTURE CONSULTANT

DRAWING TITLE
GIRLS HOSTEL
TERRACE PLAN

DATE	DRAWN	SCALE
04.09.2013	VIKRAM	NTS

DRG. NO.
SRCC/GH-A/04

NORTH

STATUS