

**The Oriental Insurance Company Ltd.
A-25/27,Asaf Ali Road,,
New Delhi -110002**

TENDER DOCUMENTS

**NAME OF WORK: COMPLETION OF BALANCE WORKS OF
RESIDENTIAL BUILDING**

AT

**PLOT No. E - 409, Greater Kailash-II , New Delhi
Owned by The ORIENTAL INSURANCE COMPANY LTD.**

PART – I: TECHNICAL BID

VASTU MANDAL
ARCHITECTS AND INTERIOR DESIGNERS
F328, III FLOOR, LADO SARAI,
NEW DELHI-110030
PH.- 41665455
vastumandal@gmail.com

IMPORTANT

The bidder should satisfy himself that no paper or document from this sealed document is missing while submitting this tender consisting of 1 to 131 pages.

Tender issued to: -

Vastu Mandal
Architects and Interior Designers
F-328, IIIrd Floor, Lado Sarai,
New Delhi -110030
PH.-41665455

PART – I: TECHNICAL BID

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SECTION I

- A. NOTICE INVITING TENDER
- B. INSTRUCTIONS TO TENDERERS
- C. LETTER SUBMITTING TENDER
- D. ARTICLES OF AGREEMENT

A. NOTICE INVITING TENDERERS

- 1.1 Sealed tenders in two bid system are invited from established experienced contractors by the Chief Manager (Estate), The Oriental Insurance Company Ltd. A-25/27, Asaf Ali Road, New Delhi - 110 002.

S.No.	Name of Work	Estimated Value of Work (Rs.)	Time of Completion
1.	COMPLETION OF BALANCE WORKS OF RESIDENTIAL BUILDING AT PLOT NO. 409 , BLOCK-E, GREATER KAILASH, NEW DELHI OWNED BY THE ORIENTAL INSURANCE COMPANY LTD.	49.35 LACs.	4 MONTHS

- 2 Tenders are invited from reputed contractors for above work under two bids system (Technical & Financial) from eligible and experienced contractors with sound financial position.

- 3 The tender document containing terms and conditions including Financial Bid etc. can be obtained from our office Oriental Insurance Company Ltd, at A25/27, Asaf Ali Road, New Delhi-110002 during office hours (10.00 AM to 3.00 PM) on all working days between the dates given below

Sale of tender (Date) **27th Sept, 2021 to 26th Oct 2021**

Cost of tender **Rs 2,950/- (Non refundable)**

The tender documents can also be downloaded from our website www.orientalinsurance.org.in if downloaded from website then the contractor has to attach a demand draft for **Rs 2,950/** (Rs Two thousand nine hundred fifty only) from a Scheduled Bank shall be paid in favour of **“The Oriental Insurance Co. Ltd., payable at New Delhi** as cost of Tender documents along with EMD failing which tender will be rejected The right is reserved by the officer inviting this tender to revise or amend the tender documents prior to the date notified for submission of the tender. Such revisions, amendments shall be notified in the form of addendum or corrigendum at company's Website. Bidders are advised to look at company's website regularly for any such corrigendum.

3.1 Eligibility Criteria and Submission of Tender

Tenders are invited into two bid system i.e. **“Technical bid” and “Financial bid”**. The intending contractors should submit the following details in the technical bid duly contained in closed sealed **Envelope no. 1 superscribed as “Technical bid”**:

Envelope - 1

- a. **For the tenders downloaded from website Rs 2,950 /- in the form of Demand Draft** from a Scheduled Bank shall be paid in favour of **“The Oriental Insurance Co. Ltd”** Payable At New Delhi.

- b. Demand Draft from a Scheduled Bank in support of having paid the **earnest money of Rs 2,00,000/- (Rs Two Lacs Only)** in favour of "The Oriental Insurance Co. Ltd " Payable At New Delhi.
- c. Letter Submitting Tender as per Section- I-C
- d. Organizational setup stating list of Qualified Engineers/ supervisors , equipments and plants to be deployed at site.
- e. **Latest solvency for Rs 16.45 lacs** or more with any Scheduled Bank where the contractor is maintaining his account. The Certificate should not be more than 3 month old from last date of issue of tenders
- f. Copy of Permanent account number (PAN)
- g. **Annual Report (Balance sheet and Profit and Loss Account of last 3 Years** ending March 31 of previous financial year .The average annual turnover shall be at least 30% of total estimated cost
- h. Copy of GST registration
- i. The tenderers must satisfy themselves that they have adequate experience to handle this comprehensive multi-disciplinary project within the stipulated time schedule They shall produce documentary proof, in the form of completion certificate from the client, of satisfactory completing at least **two jobs of similar nature, costing not less than Rs 24.67 lacs, each or three similar jobs of Rs 19.74 lacs each, or one job of similar nature costing not less than Rs 39.48 lacs**, for Government, Semi-Government, Public Sector organization in last seven years from the date of advertisement with complete details such as photo graphs of completed works, value of works , time of completion, name, address & phone nos. of clients along with photographs of completed etc. **The similar nature works shall mean renovation/ construction of residential building involving civil, electrical, and plumbing works.**
- j. Details of projects in hand with name of clients, addresses & phone nos.
- k. Declaration of Bidder as per Appendix – V in their Company's Letter Head and signed, stamped .
- l. Certified Copy of Partnership Deed in case the tenderer is a partnership firm
- m. An Affidavit that the firm / company have not been black listed in any Government Department / Autonomous Body/ Public Sector Undertaking under Central or any State Government.

3.2 Envelope No.-2

Financial Bid submitted in envelope marked **No.- 2** Superscribed as **Financial/Price Bid for COMPLETION OF BALANCE WORKS OF RESIDENTIAL BUILDING AT PLOT NO. 409 , BLOCK-E, GREATER KAILASH, NEW DELHI OWNED BYTHE ORIENTAL INSURANCE COMPANY LTD.** The financial bid shall contain Section-VI (Schedule of Quantities) duly filled in by the intending tenderers

3.3 Envelope No.-3

Both the above envelopes **Marked No.-1 and No.-2** shall be kept in third envelope **marked No. 3** Superscribed on top of envelope as **Tender for COMPLETION OF BALANCE WORKS OF RESIDENTIAL BUILDING AT PLOT NO. 409 , BLOCK-E, GREATER KAILASH, NEW DELHI OWNED BYTHE ORIENTAL INSURANCE COMPANY LTD** and shall be deposited / drop the tender specified tender box kept in the office of the Manager (Estate), The Oriental Insurance Company Ltd. A-25/27, Asaf Ali Road, New Delhi-110002, on or before **27.10.2021 before 2:30 PM**. The tender received in any manner other than prescribed above shall be summarily rejected. The company will not accept any responsibility for the tender lost in transit

- 3.4 At first instance technical bid shall be opened on 27.10.2021, 3:00 PM . The technical bid will then be evaluated on the basis of documents/information furnished as also if necessary, after physical examination of the tenderers office/workshop & projects successfully executed by them. The criteria followed by the company will be at its sole discretion and will not be open to question. The contractors who shall qualify in the technical bid will only be eligible for the opening of their financial bid.
- 3.5 Date of commencement of the work shall be reckoned from the 15th day of award of work.
- 3.6 The work as detailed in this tender shall be executed and completed in all respects in accordance with the Tender documents, which includes instructions to tenderers, General conditions of contract, special conditions of contract, schedule of Quantities, list of approved materials and Drawings to complete satisfaction of the Architects and the Employer.
- 3.7 Rates must be quoted for complete work at site inclusive of all costs, taxes and charges etc. All taxes and duties including Sales Tax on work contract. ESI charges etc. as applicable at New Delhi on the date of receipt of tender, Central & State Sales Tax, Octroi, Royalties , GST etc. on works and materials required for use in the execution of this project shall be entirely borne and payable by the Contractor and the Employer will not entertain any claim what so ever in this respect.
- 3.8 The tender for the works shall remain open for acceptance for a period of 90 days from the date of opening of tenders. If any tenderer withdraws his tender before the said period or makes any modifications in terms & conditions of the tender which are not acceptable by the company, then the company, shall without prejudice to any other right or remedy, be at liberty to forfeit 100% of the earnest money as aforesaid.
- 3.9 Total Security Deposited during execution of work shall comprise of
- (a) Earnest Money Deposit
 - (b) Retention Money
- 3.10 Earnest money of the successful tenderer is liable to be forfeited in the event of refusal or delay on his part in signing the agreement or starting the work as mentioned in the tender and employer will be at liberty to award it to another contractor.
- 3.11 The competent authority on behalf of the Chief Manager (Estate), The Oriental Insurance Company Ltd. A-25/27, Asaf Ali Road, New Delhi-110002 reserves to himself the right of accepting the whole or part of the tender and the tenderer shall be bound to perform the same at the rate quoted.

- 3.12 Canvassing whether directly or indirectly in connection with the tender is strictly prohibited and the tenders submitted by the contractors who resort to canvassing in any form would be liable to rejection.
- 3.13 The tendering firm, in case the tenderer is a partnership firm, shall submit the tender and must disclose that the firm is duly registered under the Indian partnership Act or not. Such partnership firm shall also ensure that it has been formed in accordance with the latest rules and regulations as applicable . If it is made by a partnership firm, it shall be signed by a member of the firm who shall sign his own name and give the name and address of each member of the firm and produce with the tender, the power of attorney authorising him to do so on their behalf.
- 3.14 The tenderer shall unconditionally accept terms & conditions of the company. Conditional offer shall be summarily rejected

CHIEF MANAGER (Estate)
for **THE ORIENTAL INSURANCE CO. LTD.**
Asaf Ali Road, New Delhi-110002

B. INSTRUCTIONS TO TENDERERS

1. Work and Site

The work is to be carried out in connection with the **COMPLETION OF BALANCE WORKS OF RESIDENTIAL BUILDING AT PLOT NO. 409 , BLOCK-E, GREATER KAILASH, NEW DELHI OWNED BY THE ORIENTAL INSURANCE COMPANY LTD.**

The site of work can be ascertained from the office of the Consultant/Architect.

The bidders are advised to inspect the site of work before tendering the rates so that they may fully acquaint themselves with the ground condition nature of the work to be done, the means of communications and availability of materials and water required for the work. To facilitate ascertain this requirement by the employer, the bidder should give an under taking to this effect in the prescribed format Appendix III.

The contractor must complete the work in accordance with the specifications and to entire satisfactions of the Consultant/Architect and the Owner, within the specific period.

The tender for the work includes the building portion and work outside the building such as internal roads, paving, landscaping, compound wall and gates etc.

2. RATES

The contract is Item rate contract based on bidder's quotation of rates of Items given in the Price Bid.

The rates tendered shall be for complete items of work covering labour, carriage, tools, plants equipment, labour, transport, material, lab tests for materials, taxes, temporary constructions, overhead charges, profits as well as general liabilities, obligations and risks arising out of the conditions of the contract or carrying the work in parts or under / across/ along drains, etc., complete and shall apply to all heights, depths, leads and lifts, without any extra charge whatsoever. Tax deductions shall be made as per prevailing rates from the contractors account bills.

3. SPECIFICATIONS

All works executed under this contract unless otherwise specified in the specifications shall comply with the description set out in the latest C.P.W.D. specifications vol. I and II read along with all amendments made till date, ISI manuals / standards, whichever is stringent of the two, for the respective items of work. This specification as they are applicable shall deemed to be incorporated in this contract.

4. MATERIALS

Materials specified in this document and supplied by the contractor from time to time and brought to site of work shall conform to the specification and shall be tested at the cost of contractor. Materials rejected by the Consultant/Architect /Employer shall be immediately removed from the site at contractor's cost.

All tests, as may be necessary shall be performed at the expense of contractor who shall make all the necessary arrangements of conducting the same at site.

5. TIME OF COMPLETION

All works specified herein shall be completed in all respect to the entire satisfaction of the Consultants/Architects and the Employer, within a period of **4 (Four Months)** from the date of issue of order to commence work, as per schedule formalised as per methodology mentioned in Clause 39 General Conditions of Contract.

6. SUBMISSION OF TENDER

- 6.1 The bidders are required to submit the tender documents under **3 Envelopes as per clause 3.1 “Instructions to tenderers” of Section I – B of Technical Bid**
- 6.2 Only the portion required to be filled, as per instruction there of to be filled and no entry by bidders by their own shall be made any where in the document.
- 6.3 The bidder should fill in the rates against each item in figures and in words in the price bid. The tender shall also contain the value of each item of work entered in the prescribed column of the Bill of Items .The rates quoted by the tender should be expressed accurately both in words and figures so that there is not discrepancy. All corrections in the tender shall be duly attested by initials of the tender. Corrections if not attested, entail rejection of tender. The rates quoted by the tender in item rate tender will be the basis (and not the amounts in case of discrepancies) in finalising the tender. In case discrepancy between rate quoted in words and in figures the rate quoted in the words shall prevail
- 6.4 For the item not quoted by the bidder the highest rate ,for such item, quoted by other bidder shall be considered for the evaluation of the bid. However in case the bid is still lowest evaluated bid and is awarded the work the lowest rate quoted by the other bidder for such unquoted item shall be considered for the making payments for executed quantities
- 6.5 All the pages shall be signed by the authorised signatory and stamped.

7. COMPETENCY

If the tender is made by an individual it shall be signed with his full name and his complete address both present and permanent shall be given. If it is made by a partnership firm, it shall be signed by a member of the firm who shall sign his own name and give the name and address of each member of the firm and produce with the tender, the power of attorney authorising him to do so on their behalf. Certified copy of the registered partnership deed shall also be submitted along with the tender. In case the tender is made or on behalf of a company incorporated under the companies act (1 of 1956) it shall be signed by it's Director/ any other person duly authorised on it's behalf and shall bear the official seal of the company.

8. EVALUATION OF TENDER

The Technical Bid will be evaluated by the employer for the responsiveness as per 6 above and subject to submission of Tender as per clause 3.1 “Instructions to **tenderers” Section I – B of Technical Bid** If the documents have any deviation in presenting the documents, the bids will be prima facie considered as non responsive. The envelope No. 2 containing Price Bids shall be opened only when the bids are brought at par & of those bidders only that have been found to be responsive and at par. The opening of price bid shall be on a predetermined date of those bidders whose Technical Bid has been

evaluated to be responsive and have been informed accordingly to them. The Price Bid will be opened in the presence of bidders who choose to remain present. The Price Bids will be evaluated subsequently and the one whose evaluated Price Bid is reasonable shall be considered for award of works. Notwithstanding above, till the award of works & in the intervening period any declaration, submission made by the bidder is found to be false, the employer reserves the right to declare the bid non responsive.

9. REJECTION OF TENDER

No alterations shall be made by the bidder in the Notice inviting tender, general rules and conditions, the agreement form, conditions of contract, the drawings, the specifications, and any tender which proposes any alterations to any of the conditions laid down or which propose any other conditions or any description, whatsoever, is liable to be rejected.

10. ACCEPTANCE OF TENDERS

The acceptance of tender shall rest with the Employer which does not bind itself to accept the lowest tender and reserves to itself the authority to reject any or all the tenders received without assigning any reasons thereto. All tenders in which any of the prescribed conditions are not fulfilled or are incomplete in any respect are liable to be rejected. The Employer also reserves the right of accepting the whole or any part of the tender and tenderer shall be bound to perform the same at the rates quoted.

11. RETURN/ FORFEITURE of EMD

Once the contract is signed with successful bidder, the Earnest Money Deposit (EMD) of all the unsuccessful bidders shall be returned.

The EMD of the successful bidder will be forfeited if he subsequently refuses to accept the contract or fails to commence operation within 21 days from the date of receipt of the letter of award of work by him without prejudice to his being liable for any further loss or damage incurred in consequence by the Employer.

If any bidder withdraws his tender before the finalization of the bid for award of work. the Employer shall, without prejudice to other right or remedy be at liberty to forfeit the entire amount of the EMD. Notwithstanding anything contrary to, stipulated in the tender document, EMD of any bidder is liable to be forfeited if that bidder at any time after submission of bid till the EMD is returned by the owner, withdraws the offer / suo-moto move to extend the date of mandatory compliance ; whatever be his status –L1,L2,L3 etc.

If it is found that two or more persons who are connected with one another either financially or as Principal and Agent or Master and Servant, have tendered under different names for the same contract without disclosing their connections, then such tenders will be rejected and the EMD will be forfeited. Any Contract entered into under such conditions is also liable to be cancelled, with liability of all consequential losses to the bidder.

12. LETTER of AWARD & SIGNING of AGREEMENT

After evaluation of tender and the employer is satisfied with all requirements the bidder may be awarded with the work.

Within 15 days, of ,letter of award , he shall meet the employer to sign the agreement. The agreement will contain the following documents: Document covered under part I & part II and any other documents, as per understanding reached between the bidder and the employer

Letter Submitting Tender (C-Section-I)

Declaration form as brought out at appendix V super scribed as '**Declaration**'.

TECHNICAL BID (PART- I)

PRICE BID (PART- II)

14 . PERFORMANCE BANK GUARANTEE (PBG)

The successful bidder shall within 7 days of award of work, submit a Performance Bank Guarantee (PBG) in the format as per appendix –VII of section II by Scheduled Bank guaranteed for an amount of Rs 2,00,000/- (Rs Two Lacs Only). It will be returned after virtual completion.

15. SECURITY DEPOSIT / RETENTION MONEY

Retention amount shall be calculated and deducted as follows: The retention money (i.e. deduction from interim & final bills shall **be 10% of the gross value of each bill subject to maximum of Rs 3,50,000/- (Rs Three Lacs Fifty Thousand Only)** . The retention money & earnest money shall form the total security deposit during execution of work. The retention amount including the security amount will be refunded to the contractor after the end of Defect Liability Period provided he has satisfactorily carried out all the works and attended to all defects in accordance with the condition of contract. No interest is allowed on retention money & earnest money

16. GENERAL

Canvassing in connection with the tenders is strictly prohibited and the tender submitted by the bidder who resorts to canvassing will be liable for rejection.

All the documents forwarded herewith are to be returned with the tender. The bidder must fill in all blank spaces in the form of tender and sign in long hand as and where shown. Only the principal, authorized to make the contract, should sign the tender, and execute the contract on behalf of the bidder.

The bidder shall sign a declaration under the official Secret Act for maintaining secrecy of the tender documents, drawings, or any other record connected with the work given to them.

Articles of Agreement should not be filled by the bidder. This will be done at the time when the contract is awarded, in the case of successful bidder only.

The bidder should fill in and sign the "Letter Submitting Tender".

No excuse as regards want of information on any particular point will be considered after the tender has been received. No advice of any change in rate or conditions after the submission of tender shall be entertained.

Should the tenderer find any discrepancy, omission, ambiguity or conflict in or among the documents forwarded or in doubt as to their meaning and interpretation, such matter should be called to the attention of the Consultants/Architects at their office at F-328, IIIrd, Floor Lado Sarai, Mehrauli, New Delhi-110030 not later than 7 days prior to the date of Submission. These will be clarified and those points required to be included in the tender documents will be issued as a Corrigendum at The Oriental Insurance Company's Web site,. Neither the Employer nor the Consultant/Architect will be responsible for any oral instructions.

The bidder must be very careful to deliver bonafide tender. Such a tender must satisfy each and every condition laid down in this Notice.

C. LETTER SUBMITTING THE TENDER

Item Rate Tender for Building Works

I / We hereby submit tender for the “**COMPLETION OF BALANCE WORKS OF RESIDENTIAL BUILDING AT PLOT NO. 409 , BLOCK-E, GREATER KAILASH, NEW DELHI OWNED BYTHE ORIENTAL INSURANCE COMPANY LTD.** of the work specified in the under- written memorandum within the time specified in such memorandum at the rates quoted in the attached schedule of quantities and in accordance in all respects with the specifications, design and instructions in writing and the conditions of contract and with such materials as are provided for, and in all other respects in accordance with such conditions so far as possible applicable.

MEMORANDUM

A)	GENERAL DESCRIPTION	CONSTRUCTION OF RESIDENTIAL BUILDING AT PLOT NO. 409 , BLOCK-E, GREATER KAILASH, NEW DELHI OWNED BYTHE ORIENTAL INSURANCE COMPANY LTD
B)	EARNEST MONEY	Rs 2,00,000/-(Rs Two Lacs Only)
C)	SECURITY DEPOSIT	10% of certified amount subject to Maximum Limit Rs.3,50,000/- (Rs Three lacs fifty thousand only)
D)	DEFECT LIABILITY PERIOD	Twelve months w.e.f the virtual completion as certified by the Consultant Architect
E)	TIME ALLOWED FOR THE THE COMPLETION OF WORK FROM THE DATE OF COMMENCEMENT	4 months (The work shall be completed as per schedule mentioned in clause 39 General Conditions of Contract)
F)	PERFORMANCE BANK GUARANTEE	Rs 2,00,000 /- (Rs Two Lacs Only)

Should this tender be- accepted in whole or in part, I / we hereby agree:

- (i) To abide by and fulfil all terms and provisions of the said conditions annexed hereto and all the terms and provisions contained in the notice inviting tenders so far as applicable and I or in default thereof, to forfeit and pay to **THE ORIENTAL INSURANCE COMPANY Ltd** or their successors, the sum of money mentioned in the said conditions.
- (ii) To execute all the works referred to in the tender documents upon the terms and Conditions as referred to therein.
- (iii) A sum of Rs. 2,00,000- (Rupees Two Lacs only) is hereby forwarded by demand draft vide no. Dated Issued by..... Bank, payable at New Delhi in favour of, **THE ORIENTAL INSURANCE COMPANY Ltd** as Earnest Money Deposit (EMD). If selected I/We agreed to commence the work specified in the above memorandum I/We agree that the said **THE ORIENTAL INSURANCE COMPANY Ltd**, or their successors in the office shall without prejudice to any other right or remedy be at liberty to forfeit

the said Earnest money absolutely. Otherwise the said Earnest Money shall be retained by the employer towards security as mentioned against clause 11 of the section I B of the tender document.

(ii) The validity of offer shall remain upto 90 days w.e.f. opening of Price Bid.

Dated the day of

Signature of Bidder

Witness

Address

Signature of witness

D. ARTICLES OF AGREEMENT

ARTICLES OF AGREEMENT made at _____ this
_____ day of _____ BETWEEN _____

(hereinafter referred to as the Owner which expression) shall include his heirs, Executors, Administrators and Assigns) of the first part and _____

_____ trading in the name and style of _____

(hereinafter referred to as the Contractor with expression shall include his Heirs, Executors, Administrators and Assigns) of the second part. WHEREAS party of the first part is desirous of constructing certain building at _____

_____ and has caused Drawings and Specifications describing the work to be done by to be prepared by _____

_____ (hereinafter referred to as the Consultants / Architects) and WHEREAS the said Drawings _____

_____ inclusive of the specifications and the Priced Schedule of Quantities have been signed by or on behalf of the parties hereto and WHEREAS the Contractor has agreed to execute upon and subject to the conditions set forth herein (hereinafter and subject to as "the said Conditions) the work shown upon "the said Drawings" and described in "the said specifications" and "the said Priced Bid on item rate basis "at _____ (strike out whichever is not applicable) the given items the Price Bid.

The following documents shall form part of this agreement :

Letter Submitting Tender (Section-I "C")

Declaration form as brought out at appendix V super scribed as '**Declaration**'.

Technical Bid comprising (Part -I)

Section-I	A	NOTICE INVITING TENDER
	B	INSTRUCTIONS TO THE TENDERES
	C	LETTER SUBMITTING TENDER
	D	ARTICLES OF AGREEMENT
		POWER OF ATTORNEY OTHER DOCUMENTS TO BE FURNISHED BY BIDDER (as mentioned in clause No 3.13 . of SECTION -I , A. NOTICE INVITING TENDER ,
Section-II	A	GENERAL CONDITIONS OF CONTRACT
	B	SPECIAL CONDITIONS OF CONTRACT
	C	SAFETY CONDITIONS
	D	APPENDIX (Including Documents Exchanged between Bidder and the Employer at Pre-Award Stage, if any.)
Section-III	A	TECHNICAL SPECIFICATIONS FOR CIVIL WORKS
	B	TECHNICAL SPECIFICATIONS FOR SANITARY WORKS
	C	TECHNICAL SPECIFICATIONS FOR ELECTRICAL WORKS

Financial Bid Comprising (Part –II)

Section-IV SCHEDULE OF QUANTITIES

Section-V TENDER DRAWINGS AND Approved LIST OF MAKES

NOW IT IS HEREBY AGREED AS FOLLOWS:

1) In consideration of the payments to be made to the Contractor, as hereinafter provided, he shall upon and subject to the said Conditions execute and complete the work shown upon the said Drawings and such further detailed drawings as may be furnished to him by the said Consultants Architects and described in the Specifications and the Price Bid.

2) The owner shall pay the Contractor such sums as shall become payable hereinafter at the times and in the manner specified in the said; conditions.

3) The term "the Consultant Architects" in the said Conditions shall mean M/s. VASTUMANDAL, ARCHITECTS & INTERIOR DESIGNERS

Or

in the even of his death or ceasing to be the Consultant Architect for that purpose of this contract, such other person as shall be nominated for that purpose by the Owner, not being a person to whom the Contractor shall object for reasons considered to be sufficient by the Owner. Provided always that no person subsequently appointed to be Consultant Architect under this Contract shall 'be entitled to disregard or overrule any decision or approval or direction given or expressed in writing by the Consultant Architect for the time being.

4) The within Agreement and Documents above mentioned shall form the basis of this Contract and the decision of the said Consultant for the time being as mentioned in the Conditions of Contract in reference to all matters of dispute as to the material, workmanship or account and as to the intended interpretation of the Clauses of this Agreement or any other Document attached hereto shall be final and binding on both parties and be made" a Rule of Court.

5) The said contract comprises the building above mentioned and all subsidiary works connected therewith within the same site as may be ordered to be done from time to time by the said Consultant Architect or other Consultant for the time being even though such works may not be shown on the Drawings or described in the said Specifications or the Price Bid.

6) The owner through the Consultant Architect reserves to himself the right of altering the drawings and nature of the work and of adding to or omitting any items of work or of having portions of the same carried out departmentally or adding to or omitting any quantity to any item of work or otherwise and such alterations or variations shall be carried out without prejudice to this Contract.

7) The said Conditions shall be read and construed as forming part of this Agreement, and the parties hereto will respectively abide by and submit themselves to the conditions and stipulations and perform the Agreements on their parts respectively in such conditions contained.

8) All disputes arising out of or any connected with this Agreement shall be deemed to have arisen in Delhi and only the courts in the State of Delhi shall have the jurisdiction to determine the same.

9) All the parts of the Contract have been read and fully understood by us.

As witness our hands this _____ - day of _____.

Signed by the Said

In the presence of
(witness)

OWNER
SEAL:

Signed by the said

In the presence of
(witness)

CONTRACTORS
SEAL:

Signed by the said

In the presence of
(witness)

CONSULTANTS ARCHITECTS
SEAL:

Signed by the said

NOTE : The agreement shall be made on Rs 100/- (Rupees One Hundred Only) Non
Judicial Stamp Paper

SECTION II

A. GENERAL CONDITIONS OF CONTRACT

B. SPECIAL CODNITIONS OF CONTRACT

C. SAFETY CONDITIONS

D. APPENDIX - I

APPENDIX - II Schedule of submission of bid

APPENDIX – III undertaking by bidder having visited site.

APPENDIX – IV Events in sequence to fulfil the 'Order to commence work'.

APPENDIX – V Declaration form

APPENDIX – VI Indemnity Bond

APPENDIX – VII Format of P.B.G.

SECTION – II

A. GENERAL CONDITIONS OF CONTRACT

1. **Definitions** :In construing these conditions, specifications and Contract Agreement, the following words shall have the meaning here in assigned to them except where the subject or context otherwise requires
 - a) **Employer/Owner**” means **THE ORIENTAL INSURANCE COMPANY Ltd.** on whose behalf tenders are invited and include its legal representatives, successors and permitted assigns and its authorized representatives
 - b) **“Contractor”** means the person or persons, firm and company whether incorporated or not, employed as Contractor by the Employer for undertaking the work and shall include Contractor’s representatives, successors, legal heirs and permitted assigns.
 - c) **“Consultant /Architect”** means Vastu Mandal, F-328 IIIrd Floor, Lado Sarai, New Delhi-110030 or in the event of their ceasing to be Architect for the purpose of this contract, for whatever reasons, such other person(s) or firm as the employer shall nominate for that purpose.
 - d) **“Engineer –in- Charge”** means an officer nominated by the Employer to act on his behalf for the purpose of this administration of contract.
 - e) **“Contract”** Means the documents forming the tender documents and acceptance thereof and the formal agreement executed between the competent authority on behalf of The Oriental Insurance Company Ltd., Asaf Ali Road, New Delhi and the Contractor, together with the documents referred to therein including the conditions, the specifications, designs, drawings and instructions issued from time to time by the Oriental Insurance Co. Ltd. and all these documents taken together, shall be deemed to form one contract and shall be complementary to one another.
 - f) **“Sub-Contractor”** The term sub-contractor as employed herein, include those having a direct contract with the Contractor and it includes one who furnishes material worked to a special design according to he plans or specifications of this work, but does not include one who merely furnishes materials and not the work.
 - j) **“Written Notices”**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 officer of the corporation for whom it is intended, or if delivered at and a written delivery receipt obtained or sent by registered mail to the last business address known to him who gives the notice.
 - k) **“The Works”** shall mean the works in respect of which the tender by the contractor has been accepted and which are set out in the conditions of contract, Specifications, Schedule of Quantities and Drawings and including all additions, substitutions and variations whether temporary /permanent or whether original, altered, substituted or additional ordered by the Consultant Architect.

i) **Work**

The term "Work" of the contractor or sub-contractor includes labour or materials or both.'

j) **Virtual Completion**

"Virtual Completion" shall mean that "the Works" are ready and fit for occupation in every respect in conformity with the Contract Document and to the full satisfaction of the Owner. The virtual completion certificate shall be issued by the consultant

m) **Working Day**

"Working Day" shall mean any day from Monday to Saturday (Both days inclusive) excluding all public holidays as notified by the Central Government. Contractor may be permitted to work on Sunday for which no extra payment will be allowed.

n) **Normal Working Hours**

Normal working hours shall mean eight (8) hours per working day. The specific timings would vary, depending upon the season and emergence of work.

o) **The Site**

The **site** shall mean the land/or other places on, into or through which work is to be executed under the contract or any adjacent land, path or street through which work is to be executed under the contract or any adjacent land, path or street which be allotted or used for the purpose of carrying out the contract. The site of works will be at following addresses :

PLOT NO. 409, BLOCK-E, GREATER KAILASH, NEW DELHI.

p) **Approved Equal /Equivalent**

"Approved Equal" shall mean equivalent approved by the Consultant Architect.

q) **Market Rates**

Market rates shall/be the rates as derived on the basis of Cost of materials and Labour to the Contractor at site, where the work is to be executed plus the percentage mentioned under clause 30 to cover overheads and profits.

2. **Scope and Intent**

a) **Scope**

The general character and the scope of the work is illustrated and defined by the signed Drawings and Specifications herewith attached.

1) **COMPLETION OF BALANCE WORKS OF RESIDENTIAL BUILDING AT PLOT NO. 409 , BLOCK-E, GREATER KAILASH, NEW DELHI OWNED BY THE ORIENTAL INSURANCE COMPANY LTD.**

b) Extent

The Contractor shall carry out and complete the said work in every respect in accordance with the contract and with the directions of and to the satisfaction of the Consultant Architect.

C) Intent

The contract documents are complementary, and what is called for by anyone shall be as binding as if called for by all. The intention of the documents is to include all the 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 and shall be held to refer to such recognised standards as applicable.

d) Consultant Architect's Instructions:

i) Status:

The Architects shall have general supervision and direction of the work. He has authority on behalf of the Employer to stop the work whenever such stoppage be necessary to ensure the proper execution of the work. The architect shall be the interpreter of the conditions of contract and the judge of its performance subject to the approval of the Engineer –In-Charge.

ii) Decisions:

The Consultant Architect may, from time to time, issue further supplementary drawings and/or written instructions, details and directions and explanations which are collectively referred to as Consultant Architect's Instruction in regard to:

- a) The variation or modification of the design, quantity or quality of works or the addition or omission or substitution of any work.
- b) Any discrepancy in the drawings or between the schedule of quantities and/or drawings and/or specifications.
- c) The removal from the site of any works executed by the Contractor, and (the substitution of any material thereof.
- d) The removal and/or re-execution of any works executed by the Contractor.
- e) The dismissal from the works of any person/s employed thereupon.
- f) The opening up for inspection of any work covered up.
- g) The amending and making good any defects.

The contractor shall forthwith comply with and duly execute any works comprised in such instruction issued to him by the owner/Architect in regard to any matter in respect of which the Owner/Consultant Architect is expressly empowered by these conditions to issue instructions provided always that verbal instructions, direction and explanations given to the contractor or his work. Representative by the Owner/Consultant Architect shall, if involving a variation, be confirmed in writing.

If within seven days after receipt of a written notice from the Owner/Consultant 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 debtor or may be deducted by him from any money due or to become due to the Contractor under this Contract.

Upon receipt of what purpose to be instruction issued to the Contractor by the Owner/ Consultant Architect, the Contractor may request the Consultant Architect to specify in writing the provision of these conditions, which empowers the issue of the said instruction. The Owner/ Consultant Architect shall forthwith comply with any such request, and if the Contractor shall thereafter comply with the said instruction, then the issue of the same shall be deemed empowered by the provision of these conditions specified by the Owner/ Consultant Architect in answer, to the Contractor's request.

All instructions issued by the Owner/ Consultant Architect shall be in writing. Any instruction issued orally shall be with immediate effect, but shall be confirmed in writing by the Contractor to the Owner/Architect within seven days, and if not dissented from, in writing by the Owner/Architect to the Contractor, within seven days from receipt of the Contractor's confirmation and shall take effect as from the expiration of the latter said seven days.

e) Variations

The owner reserves the right to increase or decrease the scope of the work on any or all items or change the nature of work involved in any or all items of the contract or add or delete the scope of work on any item. The contractor shall have no claim for loss of anticipated profits or for any other reason whatsoever on account of those variations.

3. Clerk of Works

The Owner will be represented at the site by the Clerk of Works who will be responsible for the day-to-day supervision of the contract. He shall act under the orders of the architect and shall supervise the work on behalf of the owner. The contractor shall afford him all necessary facilities for the performance of his duties. The clerk of works shall have power to give notice to the contractor or his engineer of no approval of any works or materials and such work shall be suspended or the use of such materials shall be discontinued until the Consultant Architect / Owner gives written instructions to recommence the work.

4. Site

a) Contractor to satisfy himself about site conditions

Before tendering, the contractor shall visit and examine the site and satisfy himself as to the nature of the existing facts or other means of communication and the character of the soil and of the excavations the correct dimensions of the work and facilities for obtaining the special articles called for in the contract documents and shall obtain generally his own information on all matters affecting the continuation and progress of the works. No extra charge made in consequence of any misunderstandings or incorrect information of 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 question to the Consultant Architect's attention, not later than 7 (seven) days before the closing of the tender.

b) Possession

The Possession of the site shall be given on the date of commencement specified in the Appendix I to these conditions. The contractor shall thereupon commence the works and regularly and diligently proceed with the same and complete the same on or before the contract date for completion.

c) **Treasures, Antiquities Property of Owner**

All fossils, antiquities and other objects of interest or value that 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 convenient, after the discovery of such articles deliver the same into the possession of the Owner, un cleaned and as excavated.

5. **Type of Contract**

The contract shall be item rate contract based on bidder's quotation of each item given in the Part II -Price Bid of the contract documents. The contractor shall be paid at the quoted rates for the actual quantity of work carried out by him as measured, in accordance with the contract documents.

The quantities given in the schedule of quantities are provisional and are meant to direct the intent of the work and provide a uniform basis for tendering. The owner reserves the right to increase or decrease any of the quantities or to totally omit any items of work and the contractor shall not claim any extra or damages on these grounds. Any error in description or in quantity or omission of item .in the Schedule of Quantities shall not vitiate this contract but shall be deemed to be a variation required by the Architect.

6. **Contract Agreement**

The selected contractor shall enter into a formal contract with the owner for the execution of works as per prescribed format , within 15 days from the date of award of contract, failing which his tender may be rejected and the earnest money deposited by him will be forfeited.

7. **Site Order book**

The contractor shall maintain an order book at site of the work. Any special orders and instructions to be issued to the contractor at site will be recorded in the book.

8. **LOADING & UNLOADING AND STORAGE OF CONSTRUCTION MATERIAL**

The contractor shall have to arrange at his own cost, unloading and storing of material at safe and secured place at the site.

9. **Licences and Permits**

Licences and permits for all materials under Government control shall be obtained by the contractor directly. The owner may assist the contractor in this respect to the extent possible. The contractor shall include in his rate all transport charges and other expenses that may be incurred in this connection.

10. **Royalties and Patent Rights**

All royalties or other sums payable in respect of the supply and use in carrying out the works as described by or referred to in the contract drawings, the contract specifications and the Contract Schedule of Quantities or any patented articles, processes or inventions shall be deemed to have been included in the contract sum, and 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, inventions.

11. **Fire & accident insurance**

a. The contractor shall insure the works against loss damages or by fire, accident, riot, civil commotion and/or all acts of God etc., progressively upto the full amount of the contract by means of Contractor's All Risk Insurance Policy. Such insurance is to be effected from time to time in the name of the owner and is to be for the amount of the full value of the work as determined by the Consultants. All expenses incurred on insuring the works as described above shall be fully borne, by the contractor. The contractor shall submit for inspection by the Architect the policies and receipts for the premiums for such insurance and shall maintain such policies in force until the possession of the works is given to the Owner.

b. If the contractor fails to comply with the above mentioned,, the owner may insure the works and may deduct the amount of the premiums paid from any money that may be or become payable to the contractor, or it may, at his options, refuse payment of any certificate to the Contractor until the contractor shall have complied with the terms of this conditions.

c. Such insurance, whether effected by the owner or the contractor, is to be no limit or bar to the liability and obligation of the contractor to deliver the works to the owner completed in all respects according to this contract. In case of loss or damage due to any of the aforesaid causes, the money payable under any such insurances shall be received and retained by the owner until the works are finally completed and shall then be credited to the contractor in final settlement of accounts, in the event of this contract not having been previously cancelled under these conditions.

12. **Separate Contracts**

The owner reserves the right to lend other contracts in connection with his work. The contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his work and theirs. If any part of the contractor work depends for proper execution or results upon the work of any other contractor, the contractor shall inspect and promptly report to the architect a defects in such work that render it unsuitable for such proper execution and results. His failure to so inspect and report shall constitute an acceptance of the other contractor's work as and proper for the reception of his work, except as to the defects which may developed in the other contractor's work after the execution of the work.

13. **Taxes**

The contractor shall include in his rates for the various items the amount of sales tax, vat, wct, octroi, duties ,service tax and any other taxes or levies legally payable on materials and equipment forming part of the works. It shall be assumed that the rates quoted by the contractor include all such taxes and levies and no extra claim on this account shall be entertained.

14. **Notices and Fees**

The contractor shall comply with all Government Acts including any byelaws or regulations of local authorities relating to the works, and shall give all notices and pay all fees and charges demandable by law there under and indemnify the Owner against the same.

15. **Water for Construction**

The owner has made no arrangements to provide water for construction at the site. The contractor shall make his own arrangements to take a connection and provide, install and

maintain at his own cost the necessary temporary service lines. All dues for the consumption of water will be to Contractor's account.

16. Power for Construction

The owner has made no arrangements to provide power connection for construction purposes. The contractor shall make his own arrangement to take temporary metered connection. He shall at his own cost provide and install the meter and all temporary service lines as required for his use on the work and remove the same on the completion of work. All dues for the consumption of power will be to contractor's account.

17. Overtime

If it is necessary for the contractor or any sub-contractor to work on other than week days or outside normal working hours in order to keep up to the time schedule, the contractor shall give due notice of his intention to do so and obtain prior approval of the Consultant Architect. The additional cost of wages and any other costs caused by the overtime or shift work shall be borne in full by the contractor.

18. Time of completion

a) All time limits stated in the contract documents shall be the essence of the contract. The contractor obligates himself to complete the work in all respects within the time schedule stipulated in the Agreement; subject to any adjustment granted by the Consultant Architect in writing under the conditions of the contract. He shall submit to the Consultant Architect periodic verified progress reports on the first and fifteenth of each and every month.

b) Should the contractor be delayed or impeded in the execution of works by reasons of :

i) Force Majeure (see Clause 47)

ii) By the works or delays of other contractors or tradesmen engaged or nominated by the owner and not referred to in the contract documents.

iii) The non-delivery or delay in the delivery to the contractor, of any materials and equipment which under the contract the owner is to supply or

iv) Any cause, whatever, arising out of the acts of defaults of the owner or the Architect, or

v) Any accident happening to the works during their progress not arising from the neglect, default of the Contractor or his workmen or sub-contractor

vi) Extras or variations being ordered by the Architect or

vii) Any other causes which in the opinion of the Consultant Architect, has caused delay, the contractor may from time to time within 14 working days of the happening of any aforesaid, apply in writing to the architect for an extension of time on account thereof setting forth the cause of such application.

c) The Consultant architect shall if he thinks the cause sufficient but not otherwise by writing within 14 days extend the time for completion of the works for such period as he shall think adequate and the time for completion of the work so extended, shall for all purposes of the contract be deemed the time specified for completion of the works.

d) Unless the contractor shall apply for an extension of time within the period and the manner aforesaid, and unless and until the Owner through Architect shall extend the time as aforesaid the contractor shall not for any delay arising from cause aforesaid be

relieved in any way or to any, extent from his obligations to proceed with, execute and complete the works within the time specified in the contract for the completion of the work.

The time allowed shall be reckoned from the day on which the order to commence the work order is issued to the contractor. No claim for compensation, whatsoever, shall be permissible to contractor for the period extended by the owner under this clause.

19. **Termination of Contract by Owner**

- A) The owner may without prejudice to his right against the contractor in respect of any delay, inferior workmanship or otherwise or to any claims for damage in respect of any breach of contract and without prejudice to any right or remedies or under any of the provision of this contract or otherwise and whether the date of completion has or has not elapsed by notice in writing absolutely determine the contract in any of the following cases:
- i) If the contractor having been given by the Consultant Architect or Clerk of work, a notice in writing to rectify, reconstruct or replace any , defective work or that the work is being performed in any inefficient or otherwise improper or unworkman like manner shall fail to comply with the requirements of such notice for a period of seven days thereafter or, if the contractor shall delay or suspend the execution of work so that either in the judgement of the Consultant Architect (which shall be final and binding) he will be unable to secure completion of the work by the date for completion or he has already failed to complete the work by the date.
 - ii) If the contractor being a company shall pass a resolution or the court shall make an order that the company shall be wound up or if a receiver or a manager on behalf of a creditor shall be appointed or if circumstances shall arise which entitle the court or creditors to appoint a receiver or a manager or which entitle the court to make a winding up order.
 - iii) If the contractor commits any breach of the terms and conditions of this contract.
 - iv) If the contractor commits any acts mentioned in Clause 19(A) hereof, and when the contractor has made himself liable for action under any of the cases aforesaid, the Owner shall have powers:
 - a) To determine or rescind the contract as aforesaid of which termination or rescission notice in writing to the contractor under the hand of the Employer or the Consultant Architect shall be conclusive evidence. Upon such determination of rescission the security deposit of the contractor shall be liable to be forfeited and shall be absolutely at the disposal of the Employer.
 - b) To employ labour paid by the Employer and to supply materials to carry out the works or any part of the work debiting the contractor with the cost of the labour and the cost and price of the materials (of the amount of which cost and price certified by the Consultant Architect shall be final, and conclusive against the contractor) and crediting him with the value of the work done in all respects in same manner and at the same rate as if it has been carried out by the contractor under terms of this contract. The certificate of the Consultant Architect as to the value of the work done shall be final and conclusive against the contractor, provided always that action under the sub-clause shall only be taken after giving notice in writing to the contractor. Provided also that if the expenses incurred by the Employer are less than the amount payable to the contractor at this agreement rates, the difference should not be paid to the contractor.
 - c) After giving notice to the contractor to measure up the work of the contractor and to take such part thereof as shall be unexecuted out of his hands and to give it to another contractor to complete, in which case, any expenses which may be incurred in excess of the sum which would have been paid to the original

contractor if the whole work had been executed by him, (of the amount of which excess the certificate in writing of the Consultant Architect shall be final and conclusive) shall borne and paid by the original contractor and may be deducted from any money due to him by Employer under this contract or any other account whatsoever or from his security deposit. .

In the event of anyone or more of the above courses being adopted by the Employer, the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any engagements or made any advances on account or with a view to the execution of the work or the performance of the contract. And in case action is taken under any of the provisions aforesaid, the contractor shall not be entitled to recover or be paid any sum for any work thereto or actually work performed under the contract unless and until the Consultant Architect has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to the paid value so certified.

In any case in which any of the powers conferred upon the Employer and the Consultant Architect by Clause 19A hereof, shall have become exercisable and if the same are not exercised, the non exercise thereof shall not constitute a waiver of any of the conditions hereof and such power shall, notwithstanding, be exercisable in the event of any future case of default by the contractor and the liability of the contractor for compensation shall remain unaffected. In the event of the Employer and the Consultant Architect putting in force all or any of the power vested in him under the preceding clause he may, if he so desires after giving a notice .in writing to the contractor, take possession of (or at the sole discretion of the Consultant Architect, which shall be final) use as on hire (the amount of the hire money / being also in the final determination of the Consultant Architect) all or any tools, plants, materials and stores, in or upon the works, or the site thereof, belonging to the contractor or procured by ,the contractor and intended , to be used for the execution of the work any part thereof paying or allowing for the same in account at the current market rates to be certified by the Consultant Architect whose certificates thereof shall be final. Otherwise the Employer by notice in writing may order the Contractor, or his Clerk-of-Works, foreman or other for authorised agent to remove such tools, plants, materials, or stores from the premises (within a time -to be specified such notice) and in the event of the contractor failing to comply with any such requisition the Employer may remove them at the Contractor's expense or sell them by auction or private sale on account of the contractor and at his risk in all respect and the certificate of the Consultant Architect as to the expense or any such removal and the amount of the proceeds and expense of any such sale shall be final conclusive against the contractor.

20. **Penalty for Delay**

The contractor shall pay the owner such sums as stipulated in Appendix I as ascertained and Penalty for delay for each day, Sundays and Holidays inclusive, that the works remain incomplete after the contract date for completion or any extended time as may be granted by the Employer, provided that the total amount payable by any way of damages shall not exceed ten per cent (10 %) of the total contract amount.

21. **Samples and Shop Drawings**

a) After the award of contract, the contractor shall furnish for the approval of the Architect/Owner with such promptness as to cause no delay of work or in that of any other Sub-Contractor, samples and shop drawings required by the specification or by the Architect.

b) Unless specifically authorised, all samples must be submitted for approval within sixty days of signing of the Contract and not less than one hundred and twenty days before the particular work involved is scheduled to begin.

c) The Consultant Architect shall check and approve such samples with reasonable promptness only for conformity with the design concept of the project and for compliance with the information in the tender documents. The work shall be in accordance with the approved samples and the Consultant Architects decision in this regard shall be final.

22. Contractor's liability regarding to, property, injury to persons

a. The owner shall not be liable or responsible for any accident, loss injury resulting in death or damage of any kind whatsoever happening or accruing during the term of performance of the work here is referred to and in connection therewith to persons and/or property materials and equipment and the contractor shall fully indemnify and protect the owner from and against the same. In addition to the liability imposed by law upon the contractor for injury (including death) to persons or damage to third party property by reason of the negligence of the contractor or his agents, which liability is not imputed or otherwise affected hereby, the contractor hereby assumes liability for and agrees to have the owner harmless and indemnify him from every expense, liability or payment by reason of a injury (including death) to person or damage of the property suffered through any act of omission of the contractor, or any of his sub-contractors, or any persons directly or indirectly employed by any of them or from the conditions of the premises or any part of the premises which in the control of the contractor or any of his sub-contractor or any one directly or indirectly employed by either of them, or arising in any way from the work called for by this Contract.

Further, the contractor hereby agrees and undertakes, to indemnify the Owner from any loss or damage or death arising out of Consultant Architects instructions by ensuring that the insurance policy taken out under this clause covers this contingency.

b. If the contractor or his employees or any other person/s working on site on his behalf shall break, deface, injure or destroy any part of the building in which they may be working, or any road, road curb, fence enclosure, water pipe, cables, drains, electric or telephone post or wire, trees, grass or grass land or cultivated ground contiguous to the premises on which the work or any part of it is being executed or if any damage shall happen to the work while in progress from any cause, the contractor shall upon a receipt of notice in writing in that behalf make the same good at his own expense.

c. The contractor shall submit certificates to the Consultant Architect/Owner giving evidence that he is fully insured against claims for death, injury and property damage in connection with his operations under this contract for any reasons whatsoever Including acts of nature.

d. The contractor shall obtain written certificates of similar insurance from all his sub-contractor and hereby assumes responsibility for and claims or losses to the owner resulting from failure of any of the sub-contractors to obtain adequate insurance protection in connection with their work on this project.

e. The contractor shall not proceed with the work until he has received in writing from the Consultant Architects approval of the certificates of insurance required by the proceeding paragraph.

f. These certificates shall be fully executed and shall state the policies that can not be cancelled until ten (10) days after written notification of such indent of cancellation has been given to the owner. All policies shall be with insurance companies acceptable to the owner and the contractor shall take prior approval from owner of the company providing the insurance.

g. The contractor shall be responsible for anything which may be excluded from the insurance policies above referred to and also for all other damages to any property arising out of and arising out of his carrying out the contract in negligent or defective manner. He shall also indemnify the Owner in respect of any costs, charges or expenses arising out of any claims or proceedings and also in respect of any award of or compensation of damage arising there from. The owner shall be at liberty to and is hereby, empowered to deduct cost, charges and expenses arising or accruing from or in respect of any such claim or damage from any sum or sums due to or become due to the contractor.

h. The contractor shall continuously maintain adequate protection of all his work, materials, and equipment from damage, destruction or loss and shall protect the Owner's property from injury arising *in* connection with this contract. He shall cover up and protect the works from weather and suspend all operations during adverse weather conditions, which, in the Architect's opinion will be detrimental to the works. In default, the contractor shall make good any such damage destruction, loss or *injury*.

i. When so ordered by the Architect the contractor shall suspended any Work that may be subjected to damage by climatic conditions.

23. Labour Regulations

a. The contractor shall be wholly and solely responsible for full compliance with the provisions under labour laws and/or regulations such as payment of Wages. Act 1936, Minimum Wages Act 1948, Employees Liability Act 1938, Workman's Compensation Act 1923, Industrial Disputes Act 1947, the Maternity Benefit Act 1961. The contract labour (Regulation and Abolition) Act 1970 and the Factories Act 1948 or any modifications thereof or any other law relating thereto and rules there under from time to time.

The contractor shall assume liability and agree to indemnify the owner from every expense, liability or payment by reason of the application of any labour law, Act, Rules or Regulations existing or to be introduced at a future date during the currency of the contract.

ESI, PF Obligations: The contractor shall include in his rates all expenses onwards meeting obligations under the Employees state Insurance Act. He shall follow all rules and regulations required under the Act as may be in force from time to time. The contractor shall cover all his workman working at above site, under the ESI Scheme and directly deposit the required amounts with the concerned authorities. All records in connection with the above shall be properly maintained by the Contractor and produced for scrutiny by owner/authorities whenever called for.

b. The contractor shall be at his own expense comply with or cause to be compelled with Model Rules for labour welfare framed by Government or other local bodies from time to time, for the protection of health and for taking sanitary arrangements for workers employed directly or indirectly on the works hutment area. In case the contractor fails to make arrangements as aforesaid, the Owner shall be entitled to do so and recover the cost thereof from the Contractor.

c. **Safety Code:** The contractor shall at his own cost arrange for the safety provisions stipulated by Government or local authorities or as required by the Architect in respect of all labour directly or indirectly employed for performance, of the work and shall provide all facilities in connection therewith. The contractor shall provide model rules for protection of health and sanitary arrangements for the workers by providing i) First-Aid Facility ii) Drinking Water iii) Washing Facility iv) Latrines and Urinals etc In case the contractor fails to make arrangements and provide necessary facilities as aforesaid, the owner shall be, entitled to do so and recover the cost thereof from the contractor.

d. The contractor shall abide by the Child labour (prohibition and Regulations Act 1986), The contractor shall not employ any labour under 18 years of age on the job. If

female labour is engaged, the contractor shall make necessary provision at his own expense, for safeguarding and care of small children and keeping them clear of the site of operations. No labour shall reside within the site except authorised guards.

24. **Contractor's site Organisation , Representative and Equipment**

a) Contractor's Engineer: The contractor shall ensure continued effective supervision with the help of a qualified, experienced and competent Engineer assisted by adequate staff as ascertained by the Consultant Architect, for the entire duration of the works.

The Contractor shall also during the whole time the works are in progress shall employ A team experienced and qualified civil engineers consisting of one Graduate Civil Engineer having experience of 3years or more in the field and one Civil Diploma Holder with 7 years experience . Both engineers will be in constant attendance at work to supervise and coordinate works. Any directions, explanations ,instructions or notices given by the architect / engineer –in –charge to the engineers shall be held to be given to the contractor.

For non compliance an amount of Rs 20, 000/- pm /per engineer (Rs twenty thousand only) shall be deducted from the contractor's running bill payments for the period required engineer/s is/are not provided. However deduction of payment shall not exonerate the contractor for his responsibility for executing the quality work

The Contractor 's Engineer will be responsible for carrying out the work to the true meaning of the Drawings, Conditions of Contracts, and Specifications, Schedule of Quantities and Architect's instructions and directions to the satisfaction of the Consultant Architect. Any directions or instructions given to him in writing shall be held to have been given to the contractor officially.

No staff including the Engineer and Technical Supervisory staff shall be transferred from the Work without the written prior permission from the Consultant Architect.

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

c. **Office Accommodation:** The contractor shall provide, erect and maintain where directed simple water tight office accommodation, including toilet facility, for the clerk of works/engineer. The accommodation shall be well lighted and ventilated and provided 'with window, door with a lock and fans. The office of the clerk of works shall be 25 Sqm to accommodate the Clerk of works and his assistants and shall be suitably furnished with desks, chairs, drawers for drawings and tack boards on walls for displaying drawings, programmes etc. The accommodations shall not be demolished till so directed by the Architect/Owner.

d. **Security:** The contractor shall provide adequate number of watchmen to guard the premises, materials and equipment at all times at his expense.

e. **Telephone:** The contractor shall provide install and maintain at his expense a separate' telephone for the work. He shall pay all charges in connection with the same till the completion of the work.

f. **Storage of Materials:** The contractor shall provide erect and maintain at his expense proper waterproof sheds for the storage and protection of *construction materials and equipments, both his own as well as those supplied by the Owner if any from time to time.*

g. **Work Sheds:** The contractor shall at his expense, provide erect and maintain proper weatherproof work sheds for carpentry and *joinery work* and such other trades which *require* protection against weather.

h. **Sanitary Convenience:** The Contractor shall at his own expense *provide* and erect all necessary sanitary conveniences for the site staff and the workmen maintain in a clean and deodorise the ground after removal.

i. **Scaffolding, Staging, Guard-rails :** The Contractor shall provide scaffolding, staging, guardrails, temporary stairs and other temporary stairs during construction. The supports for the scaffolding, staging, guardrails and temporary stairs shall be situations tied together with horizontal pieces and braced properly. The temporary access to the various parts of the building under construction shall be rigid and strong enough to avoid any chance of mishaps. The entire scaffolding arrangements proposed shall be subject to the approval of the Architect.

j. **Temporary Roads:** The Contractor shall provide all necessary temporary access roads, hard standings and the like required for the purpose of execution of the works.

25. **Sub-Contractors**

As soon as practicable and before awarding any sub- contract to a sub-contractor, the contractor shall notify the Architect in written, the names of the sub- contractor proposed for the principal parts of the work and for such other parts as the Architect may direct for his approval. The contractor shall not employ any sub-contractor to whom the Architect may object.

26. **Assignment and Subletting**

The contractor shall not, without the written consent of the Architect assign this contractor subject any portion of the work. Any permission to sublet parts of the work shall not absolve, the contractor from any liability under this contract.

27. **Coordination of Work**

At the commence of work, and on weekly basis , the contractor shall confer their contractors, sub-contractors, persons engaged on separate contracts in connection with the work and with the Consultant Architects for the purpose of the coordination and execution of the various phases of work. The contractor shall ascertain from the other contractors, Sub-contractors and persons engaged on separate contract, in connection with the works, the extent of all chasings, cutting 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 position of all floors and wall cutlets, traps etc. in connection with the installation of plant, services and arrange for the construction of work accordingly. The breaking and cutting of completed work must not be done unless specifically authorised in writing by the Consultant Architect. All breaking shall be by the contractor for civil work and no work shall be done over broken or patched work without first ascertaining that the broken surface is adequately prepared and their forced to receive and hold the further work.

28. **Progress Payment**

(A) Unless otherwise provided in contract and subject to these conditions, the contractor shall from time to time be entitled to receive payment on the basis of the actual work executed, approved and certified by the Consultant Architect, subject to deductions as hereinafter mentioned. The contractor shall submit four copies of bills duly supported by actual measurements (four copies) and duly checked by the Consultant Architect for the minimum value specified in Appendix I. From every intermediate bill a sum of ten per cent (10%) of the value of the work done subject to the minimum amount of retention as stipulated in Appendix I shall be retained until the expiry of the defects liability period as stipulated in Appendix I. No interest shall be due to the contractor for sums retained by the owner. All intermediate payments shall be regarded as payments by the way of

advance against final payment only and not as payment for work actually done and completed. Intermediate payments do not imply acceptance of the work for which payment is made, acceptance and final payment is made being subject to all clauses of his contract. The final bill shall be submitted by the contractor within one month of the date of virtual completion of the work failing which the measurements of work taken by the Consultant Architect after due notice to each party shall be considered as final and binding on all parties.

75% against the certified running bill shall be made within 10days, and balance within 30 days, reckoned from date of certification of bill by the consultant/architect, if the amount of contract plus that of additional items is Rs 5 lakhs (Five Lakhs) or more. If there shall be any dispute about any item of the work then the undisputed item or items shall be within the paid period as the case may be. The contractor shall submit a list of the disputed items within thirty days from the disallowance thereof and if he fails to do so, his claim shall deemed to have been fully waived and absolutely extinguished.

Wherever there is likely delay 'in recording detailed measurements for making payments in the case of building work, advance payments without detailed measurements for works done {other than foundation and finishing items) upto (a) lintel level (including sunshades etc.) and (b) slab level, for each floor worked out at 65% of the tendered rates may be made in the running amount bills by the employer in his discretion on the basis of certificate from the consultant to the effect that the work has been completed up to the level in question.

The advance payments so allowed shall be adjusted in the subsequent running bill by taking detailed measurements for work/done up to the previous bill thereof. Final payment shall be made only on the, basis of detailed measurements.

- (B) 1. For each Interim Certificate named in the appendix-I to these conditions the Consultant Architect shall issue a certificate recommending the amount due to the Contractor from the Owner, and the Contractor be entitled to payment therefore within the period for honouring certificates named in the appendix-I to these conditions, interim valuations shall be made whenever the Consultant Architect/Engineer considers them to be necessary for the purpose of ascertaining the amount to be stated as due in the Interim Certificate.
2. The amount as stated in an Interim Certificate shall subject to any agreement between the parties as to stage payments, be the total of the work properly executed and of the materials and good delivered to or adjacent to the" work for use thereon upto 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 and less any instalments 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.
3. The amount retained by virtue of Sub-Clause (2) of this condition shall be subject to the following rule:
- 3a. The Owner's interest in any amounts so retained shall be fiduciary as trustee for the Contractor (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 the payment of any amount which he is entitled under the provisions of this contract to deduct from any sum due to become due to the Contractor.
- 4a. The measurement and valuation of the work shall be completed within the period of final measurement and valuation 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.

- 4b. Either before or within a reasonable time after virtual Completion of the work the Contractor shall send to the Consultant Architect/Engineer all documents necessary for the purposes of the computations required for these conditions including all documents relating to the accounts of nominated sub contractors and nominated suppliers.
5. So soon as is practicable but before the expiration of the period the length of which is stated in the appendix I to these Conditions from the end of the Defects Liability Period also stated in the said appendix I or from completion of making good defects under these conditions or from receipt by the Architect/Engineer of the Documents referred to in paragraph (b) of Sub-clause I (5) of this Condition, whichever is the latest, the Consultant Architect/Engineer shall issue the Final Certificate. The Final Certificate shall state.
 - 5a. The sum of the amount paid to the contractor under Interim certificate and the amount named in the said appendix I as limit of Retention Fund, and
 - 5b. The Contract Sum adjusted as necessary in accordance with the terms of these conditions, and the difference (if any) between 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 authorised, by these conditions, the said balance shall as from the fourteenth day after 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.
6. Unless a written request to concur in the appointment of an Arbitrator shall have been given by either party before the Final Certificate has been issued or by the Contractor within 28 days after such issue, the said certificate shall be conclusive evidence in any proceedings, arising out of this contract whether by Arbitration that the works have been properly carried out and completed in accordance with the terms of this Contract and that any necessary effect has been given to all the terms of this Contract which require an adjustment to be made to the Contract Sum, except and in so far as any sum, mentioned in the said certificate is erroneous by reason of :
 - 6a. Fraud dishonesty or fraudulent concealment relating to the works, or any part thereof, or to any matter dealt with-in the said certificate, or
 - 6b. any defect (including any omission) in the works, or any part thereof which reasonable inspect or, examination at any reasonable time during the carrying out of the works or before the issue of the said certificate would not have disclosed; or
 - 6c. any accidental inclusion or exclusion of any work, materials, goods or figure in computation or any arithmetical error if any in computation.
7. Save as aforesaid no Certificate of the Consultant Architect/Engineer shall of itself be conclusive evidence that any works materials or goods to which it relates are in accordance with the contract.

The contractor shall be paid advance on non-perishable materials, that have been brought to site and stored for incorporation in the work, to the extent of 80% of the cost of such materials as certified by the Consultants or 65% of the quoted rates (including fittings) whichever is less and recommended by the Consultant Architect, provided claims for: such payments are supported by all relevant vouchers, measurement books and receipts, and strictly confirm to specifications. Only such materials as are brought to site in reasonable time for incorporation in the work shall be recommended for payment under this sub-clause. The amount thus paid shall be treated as advance and adjustable against progress payment covered under Clause 28 (A). Such materials when paid for, become the exclusive property of the Owner and shall not be hypothecated to any party or removed from the site regardless of whether accepted or not.

The said materials shall remain in the custody of the contractor until the work is completed and handed over to the owner, and any loss or damage shall be the sole responsibility of the contractor. An insurance policy against theft, loss or damage by fire, accident and all other causes including acts of God to cover the value of all materials at site for which the contractor claims payment, shall be taken out by the contractor at his cost in the name of the owner. The policy shall be kept in force till the materials are incorporated in the work. The policy and receipts for the premiums shall be submitted to the Consultant Architect for his inspection. One copy of valid policy shall be supplied to the owner.

(D) **Contractor to be given a week to file objections, measurements to be recorded by the Engineer-in-Charge**

Before taking any measurement of any work as has been referred to in Clause 28(A) and 28(B) hereof, the Engineer-in-Charge or a subordinate deputed by him shall give reasonable notice to the contractor. If the contractor fails to attend at the measurements after such notice or: fails to countersign or to record the difference within a week from the date of measurement in the manner required by the Architect then in such case even the measurements taken by the Architect or by the subordinate deputed by him as the case may be shall be final and binding on the contractor and the contractor shall have no right to dispute the same.

29. **Variation in Prices & Escalation**

The item rates quoted by the contractor shall remain firm till completion of the entire work during the entire contract period or any extended period due to reason either of contractor or owner and no escalation is payable. The contractors are deemed to have quoted their rates based on these expressed conditions.

30. **Extras & variations**

- a. If at any time whilst the works are in hand, it shall be deemed expedient by the Consultant Architect to order material or work of a different description from specified, or to increase the dimensions or 'extent of the works or to alter their situation or vary the form or dimensions of the works, or of any part thereof, or to substitute one class of work for another, he shall have full power to do so and to order and direct any such variations and additions and the work involved in any such variations and additions shall be executed by the contractor of the class of work is provided for in the schedule of quantities and no such variations or additions shall in any way annul this contract, or extend the time of completion called for in general condition 19, but such additions in variation shall be measured and paid for or deducted from the account of the contractor, as the case may require according to the rates quoted by contractor in the Schedule of Quantities.

If any portion of the work so ordered to be done shall not be, in the opinion of the Consultant Architect of the same value of class of work provided for in the Schedule of Quantities, the same shall be executed by the Contractor at the computed in following manner. The rates for such items of work not included in the contract shall be computed on the bases of estimated quantities of materials and labour involved in the work and 15% (Fifteen percent be added towards establishment, overheads and contractor's profit) .

But if contractor and the Consultant Architect do not agree as to the rate to be paid, the Architect may order and direct the same to be done by such person or persons as he may think suitable, and such person or persons shall be permitted

by the contractor to enter upon the works for the purpose of carrying out such works as is required.

Where the work cannot be properly measured and valued the contractor shall be allowed day work rates on the prices prevailing when such work is carried out (unless otherwise provided in the contract)

Provided that in any case voucher specifying the time daily spent upon the work (and if required by the Consultant Architect/Engineer the workmen's name) and the materials employed shall be delivered for verification to the Consultant Architect/Engineer or his authorised representative not later than the end of the week following that in which the work has been executed.

- c. Before any extra work, or work of an altered value or class is undertaken by the contractor, he shall procure an order in writing from the Consultant Architect for carrying out such extra or variation of work, and the contractor shall not be entitled to any payment of such extras or variations unless he, produces if required to do so, the written order for the same, as aforesaid, and he shall not be entitled to plead that the Consultant Architect omitted to provide such written order, as it is to be distinctly understood that the responsibility for obtaining such order shall be with the contractor.
- d. The contractor shall not be entitled to any other rates than set out in the Schedule of Quantities, on any plea that the work was in a different position, or of a different class from, or in a more difficult position than that shown on the plan or described in the specification or Schedule of Quantities, or carried out under circumstances not contemplated in the specifications or Schedule of Quantities.
- e. In case the quantity of any item of the work executed increases by more than 25% from the quantity given in the tender document, the rate of such item would be settled as under:
 - a) Rate of the item worked out as per market rate
 - b) Rate of the item quoted by the contractor.

The rate of such item would be lower of the two rates mentioned above.

31. **Withholding of Payments**

The Architect may withhold or on account of subsequently discovered evidence, nullify the whole or a part of any certificate to such extent as may be necessary to protect, the Owner from loss on account of:

- a. Defective work not remedied.
- b. Failure of the contractor to make payments properly to sub-contractors or for materials or labour of equipments.
- c. Damage to another contractor or sub-contractor.
- d. A reasonable doubts that the contract can be completed for the balance unpaid.
- e. A reasonable doubts that the contractor intends to leave work items incomplete.

32. **Materials & Workmanship**

- a. All materials and equipment to be incorporated in the works shall be new materials; equipment and workmanship are to be of the best quality of the specified type and to the entire satisfaction of the Consultant Architect. The contractor shall immediately remove from the premises any materials equipment, and /or workmanship which, in the opinion of the Consultant Architect, are defective or unsuitable and shall substitute proper materials equipment and/or workmanship for the rejected materials equipment and workmanship at his own cost. The term approval used in connection with this contract will mean the approval of the Consultant Architect.
- b. The contractor shall, if required, submit satisfactory evidence as to the kind and quality of materials and equipment.
- c. Where special makes or brands are called for, they are mentioned as a standard. Others of equivalent quality may be used, provided that the Consultant Architect considers the substituted materials as equivalent to the brand specified and approval is first obtained in writing from the Consultant Architect. Unless substitutions are approved by the Consultant Architect. no deviation from the Specifications will be permitted
- d. . The contractor shall indicate and submit written evidence of these materials or equipment called for in the Specifications that are not obtainable for installation in the building within 3 months after the signing of the contract, will be deemed sufficient cause for the denial of request for the extension of the contract, time because of the same.
- e. All materials, and equipment shall be delivered so as to ensure a speedy and uninterrupted progress of the work. The same 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 to the materials, by weather or other causes.
- f. Within one month after signing the contract, the contractor shall submit for approval of the Consultant Architect a complete list of all materials and equipment he and his sub-contractor propose to use in the work, of definite brand or make, which differs in any respect from those specified brand and also the particular brand of any article where more than one is specified as a standard. He shall also list items not specifically mentioned in Specifications but which are reasonably inferred and necessary for the completion of the work.
- g. The contractor shall employ the right kind of workmen jigs, tools and equipment to fabricate and install all materials and equipment, whether locally purchased or imported and whether provided by the owner or contractor himself. They shall be fabricated and installed without any damage and in accordance with the manufacturer's instructions and manuals. Unless specifically shown otherwise, all items such as doors/windows frames suspended and other coiling, equipments etc. shall be securely fixed to their supports through expansion machine bolts, rowel bolts or wooden plug shall not be permitted.
- h. **Inspection:** All materials, equipment & workmanship shall be subject to inspection, examination and test by the Consultant Architect at any/ and

all times during manufacture and/or construction. The Architect shall have the right to reject defective material, equipment and workmanship or require its correction. Rejected workmanship shall be satisfactorily corrected and rejected materials and equipment shall be satisfactorily replaced with the proper material and equipment without charge therefore and the Contractor shall promptly segregate and remove the rejected materials and/or the correction of defective workmanship, the Owner may by contract or otherwise, replace such materials and equipment and/or correct 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, materials & equipment necessary for the safe and convenient inspection and test that may be required by the Consultant Architect.

- j. **Testing:** All tests shall be conducted in a manner and through an organisation selected by the Consultant Architect. The contractor shall arrange for such tests at his own expenses in connection therewith. If the Consultant 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.

33. Correction of work before final Payment

The Consultant Architect shall conduct a final inspection just before the virtual completion of the work and prepare a list of materials, equipment and items of work, which fail to conform to the contract specifications. The contractor shall promptly replace and re-execute such items in accordance with the instruction of the Consultant Architect. The contractor shall bear all expenses of making good all work and the cost of all work of other contractors destroyed or damaged by such replacement or removal. If the contractor fails to remove and replace above rejected materials, equipment and/or workmanship within a reasonable time, fixed by written notice, the Owner may employ and pay other persons to amend and make good such defects at the expense of the contractor. All the expenses incurred by the Owner in rectifying the defects including all damages, loss and expenses consequent on the defect shall be recoverable from any amount due or may become due to the contractor.

34. Virtual Completion

The work shall be considered as virtually completed only when the Consultant Architect has certified in writing that the work has been virtually completed. The defects liability period shall commence from the date of such certificate. Should the Owner decide to occupy any portion of a building or use any part of any equipment, before the contract is completed, same shall not constitute an acceptance of any part of the work unless stated in writing by the Consultant Architect.

35. Defects

- a. If the Consultant Architect deems it inexpedient to correct damaged or not done in accordance with the price, it shall be made good therefore and the Consultant Architect's decision in this respect shall be final.

- b. The contractor shall make good at his own cost and to the satisfaction of the Consultant Architect, all defects, shrinkages, settlement of other faults, arising in the opinion of the Consultant Architect from work or materials not being in accordance with the Drawings or specifications or Architect, which may appear within one year after completion of work.
- c. Such defects, shrinkage, settlement & other faults shall upon directions in writing of the Consultant 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 another party and pay other party for correcting settlement and other faults and all costs, damages, loss and expenses consequent thereon or incidental thereto shall be made good and borne by the contractor and such cost, damage, loss or expenses, shall be recoverable from him by the owner or may be deducted by the Owner upon the Consultant Architect's certificate in writing from any amount due to the contractor or the owner may in lieu of such amending and making good by the contractor deducted from any moneys due to the contractor, a sum to be determined by the architect equivalent to the cost of amending such work and in the event of the retention amount being insufficient to recover the balance from the contractor, with any expenses the owner may have incurred in connection therewith.
- d. **Maintenance during defects liability Period:** The contractor shall provide and maintain adequate, staff and labour at his own expense to attend to defects arising in the works during the defects liability period. He shall attend to the defects pointed out to him expeditiously.

36. **Guarantee**

- a. Besides guarantees required else where, the contractor shall guarantee the work in general for one year.
- b. All required guarantees shall be submitted to the consultant/architect .by the Contractor when requesting certification of accounts for payments by the owner.
- c. All required guarantees shall be submitted to the consultant /architect as a prerequisite for acceptance and payments.

37. **Setting Out**

Site surveys: The contractor shall establish, maintain and assume responsibility for grades, lines, levels and bench marks. He shall report and errors or inconsistencies regarding grades, lines, levels and dimensions to the consultant/architect before commencing work. Commencement of work will be regarded as the Contractor's acceptance of such grades, lines, levels and dimensions and no claim will be entertained at a late date for any errors found. If at any time, any error in this respect shall appear during the progress of the work, the contractor shall, at his own expense rectify such error if so required to the satisfaction of the consultant/architect.

Such surveys shall be carried out by a qualified Surveyor. All Bench Marks to be erected by the contractor in connection with the work shall be correlated to the permanent Bench Marks established it the site.

38. **Drawings specifications etc. :**

- a. After the contract is signed, the contractor will be furnished with one copy of the Conditions of Contract, Specifications and Schedule of Quantities and two sets of the drawings without cost to the contractor. Additional copies of drawings and other documents will be supplied on payment to the Consultant Architect at actual cost.
- b. In general, the drawings shall indicate dimensions, positions and type of construction the specifications shall indicate the qualities and the methods; and the Schedule of quantities shall indicate the quantity and rate for each item of work. However, the above documents being complementary, what is called for by anyone shall be as binding as if called for by all. In case of any discrepancies in or among the documents, the most stringent of all shall apply.
- c. Any work indicated in the Drawings & not mentioned in the Schedule of Quantities or specifically detailed, called for marked or specified, shall be the same as similar parts that are detailed, marked or specified.
- d. No deviations from the Drawings, specifications shall be made. The Consultant Architect's interpretation of these documents shall be final and without appeal.
- e. Errors or inconsistencies discovered in the plans and Specifications shall be promptly called to the attention of the Consultant/ Architect through the Clerk of works for interpretation or correction. Local conditions which may effect the work shall likewise be brought to the Consultant Architects attention at once. If, at any time, it is discovered that work is being done which is not in accordance with the approved plans and Specifications, the Contractor shall correct the work immediately. Correction of defective work shall not be a basis for any claim for extension of time. The Contractor shall not carry on work except with the knowledge of the clerk of works.
- f. Figured dimensions on the scale drawings and large scale details shall govern. Large scale 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 as directed, without expense to the Owner.
- g. All Drawings, Schedule of Quantities and specifications and copies thereof furnished by the Consultant Architect are his property. They shall not be used on any other work and shall be returned to him at request or at the completion of the contract.

39. **Programme Chart**

The contractor shall work towards Completing the entire building works within stipulated time period of 4 months.

The contractor's responsibility shall however, not end until the defect liabilities period of 12 months from the date of virtual completion of entire work is over, all though and take over complete . The contractor shall Prepare integrated

CPM charts for the execution of work including detailed chart for individual buildings showing clearly all

Activities from start of work to completion, with details of manpower and equipment required for the fulfilment of the programme and submit the same for approval to the Consultant Architect within one month or the award of the contract. The chart shall also indicate the scheduling of samples, shop drawings and approval, thereafter of the first day of each month, for purposes of comparison, the contractor shall submit an identical chart showing the actual rate of progress to date.

In the event the actual rate of progress falls behind the scheduled progress as indicated in the charts, the contractor shall accelerate the works to the satisfaction of the Consultant Architect.

Weekly Reports:

Contractors shall submit every week, a detailed report of the following:

1. Materials procured, consumed and balance at site for previous week as well as expected deliveries during next fortnight.
2. List of equipments and machinery working at site standby as well as those under repair and equipments scheduled to arrive during next fortnight.
3. Skilled, unskilled, labour and engineers working at site during past week and expected increase in next fortnight.
4. Steps proposed for speeding up the progress of work in the next fortnight.

40. Covering Up

The contractor must give at least three working days clear notice to the Consultant Architect and the clerk of works before covering up any of the work on foundation and drains in order that proper measurement may be taken of the work as executed, and in the event of the contractor failing to provide such notice he is, at his own expense, to uncover as required to allow the measurements to be taken and afterward to reinstate.

41. Completion Drawings

Upon completion of the whole work the contractor shall furnish the Consultant Architect, in triplicate, copies of the final "as built" drawings showing position of all services, pipe lines and details giving the sizes etc, all as mentioned in specific conditions.

42. Method of Measurement

For measuring all work, the standard method of measurement in accordance with the standards laid down by the Indian standard Institution shall be adopted unless otherwise specified. In the event of any dispute with regard to mode of measurement of the work executed the decision of the Architect shall be final and binding.

43. Tolerances

The contractor shall exercise every care to ensure that all pipe lines/fittings are true to dimensions/location called for on the drawings.

44. **Consultant Architect's status & Decisions**

- a. **Status:** The Consultant Architect shall do general supervision and direction of the work. He has authority to stop the work whenever such stoppage may be necessary to ensure the proper execution of the work. As the Consultant Architect is 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 power under the contract to insure its faithful performance by both.
- b. **Decisions:** The Consultant Architect shall, within a reasonable time, make decisions on all other matters relating to the execution and progress of the work or the interpretation of the contract Documents. The decision, opinion, Direction of the Consultant Architect with respect to all or any of the following matters shall be final and without appeal.
 - a) Variations or modifications of the design.
 - b) The equality of quantity of works or the additions or omissions or substitution of any work.
 - c) Any discrepancy in the drawings or 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 person 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) Materials and workmanship.
 - i) The contractor to provide everything necessary for the proper execution of the work.
 - j) Assignment and subletting.
 - k) Delay and extension of time.
 - l) Termination of the contract by the owner.
- c. **Dismissal:** The contractor shall on the request of the Consultant Architect immediately dismiss from the works any person employed thereon by him, who may, in the opinion of the Consultant Architect, be incompetent or misconducts himself and such persons shall not be, re-employed on the works without the permission of the Consultant Architect.

- d. **Access for Consultant Architect to the Works:** The Consultant Architect and his representative shall at all reasonable times have access to the works and to the workshops or other places of the contractor where work is being prepared for the contract and when work is to be so prepared in workshops or other places of sub-contractor, the contractor shall by a term in the sub- contract so far as possible secure a similar right to access to those workshops or places for the Architect and his representative and shall do all things reasonably necessary to make such right effective.

45. **Indian standards**

A reference made to any Indian Standard Specifications in these documents, shall imply reference to the latest revision of that standard, including such revision/amendment as may be issued by the Indian Standards Institution during the currency of the contract and the corresponding clause/5 therein shall hold valid in place of those referred to.

46. **Protection and Cleaning**

- a. The contractor shall protect and preserve the works from all damage or accident by providing temporary roofs windows, and door covering, boxing or other construction as required by the Consultant Architect. This protection shall be provided for all property adjacent to the site as well as on the site.
- b. The contractor shall properly clean the work as it progress 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, surplus materials, debris, sheds etc. removed areas under floor cleaned of rubbish, gutters & drains cleared, doors and sashes eased, of works so that the whole is loft fit for immediate occupation or use and to the satisfaction of the Consultant Architect.

47. **Force Majeure**

- a. The right of the contractor to proceed with the work shall not be terminated because of any delay in the completion of the work due to unforeseeable causes beyond the control and without the fault or negligence of the contractor including and not limited to acts of God, or of the public enemy, restraints of a Governing state, fires, floods, unusually severe weather.
- b. If the contractor is wholly prevented from performance of the contract for a period in excess of thirty (30) consecutive days because of a Force Majeure, the Owner may terminate this Contract by fifteen (15) days written notice delivered to the contractor & if the period of" the Force Majeure exceeds ninety (90) consecutive days, the contractor may terminate this contract by fifteen (15) days written notice to the Owner. In the event of this contract is so terminated, the contractor shall be paid all

costs actually incurred (which costs shall not include any other, expenses of the contractor such as loss of profits, salaries of contractors Employees, Expenses of contractor towards maintenance of his establishment etc) for the work executed up to the date of termination. Failure to agree on an equitable adjustment shall be deemed to be a dispute.

48. **Change in constitution**

Where the Contractor is a partnership firm the previous approval in writing of the employer shall be obtained before any change is made in the constitution of the undivided family business concern such approval as a foresaid shall likewise be obtained before the contractor enters into any partnership agreement where under the partnership firm would have the right to carry out the work hereby undertaken by the contractor.

49. **Entry to Site**

It is hereby expressly declared that the entry of the contractor (s) on the site will be merely as a licensee for carrying out the construction of works under this agreement, and they shall not, by his/their being allowed such entry on the premises, acquire any right, lien or interest in the works carried out by them under the Agreement\ or anything appurtenant or attached thereto and their claim will only be in the nature of money claim found due to and payable to them in accordance with the certificates issued by the Consultant Architect under the provisions contained hereafter.

50. **Indemnity**

The contractor shall indemnify the owner against all actions, suits, claims and demands brought or made against the Owner in respect of any matter or thing done or omitted to be done by the Contractor in the execution of or in connection with the work of this contract and against any loss or damage to the Owner in consequences of any action or suit being brought- against the contractor for anything done or omitted to be done in the execution of the work in this contract. Such indemnity shall be made within seven days of issue of Work Order in the form of an indemnity bond as per the format given in appendix VI.

51. **Settlement of Disputes**

All disputes 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 their completion, and whether before or after the determination, abandonment or breach of the contract) shall be referred to the sole arbitrator appointed by THE **ORIENTAL INSURANCE COMPANY Ltd** ,whose decision shall be final and binding on both the parties. If the arbitrator so appointed resigns or dies before publishing the award, the vacancy shall be filled by another member appointed by THE **ORIENTAL INSURANCE**

COMPANY Ltd. All provision of Indian Arbitration and Conciliation Act, of 1997 and ammended from time to time shall be applicable.

52. **Jurisdiction**

All matters arising out of or in any way connected with this Agreement shall be deemed to have arisen in and only the courts in State of Delhi have jurisdiction to determine the same.

B. SPECIAL CONDITIONS

1. General

These special conditions are intended to amplify the general conditions of the contract and shall be read in, conjunction with the same.

2. Order of Precedence

If any discrepancy is noticed between these special conditions and general conditions of the contract, the special conditions shall take precedence.

3. Owner & Architects

The name and address of the owner and the architect responsible for the preparation of the contract agreement documents are as follows:

OWNER	"THE ORIENTAL INSURANCE COMPANY Ltd" having its Registered office at A-25/27, ASAF ALI ROAD , NEW DELHI-110002
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CONSULTANTS/ARCHITECTS	VASTU MANDAL ARCHITECTS AND INTERIOR DESIGNERS, F-328, IIIrd FLOOR, LADO SARAI NEW DELHI- 110030
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4. SITE

The site is situated at **PLOT No. -409 ,BLOCK-E ,GREATER KAILASH, New Delhi.**

5. Contract Drawings

Drawings forming part of the contract other drawings and details issued during the currency of the contract shall also form as part of contract.

The contractor shall. Keep at least one copy of each drawing, Condition of contract, specifications Instructions and. Schedule of Quantities at the site of Works, available for references by any authorised representative of the owner at all times during the progress of the works, the Drawings shall be displayed and arranged as directed by the Architect.

6. Schedule & Manner of operations

Time being a very important consideration in the execution of this contract. The contractor will be expected to furnish all labour and materials in sufficient quantities and at appropriate time expedite and schedule the work as required and so manage the operation) that the work will be completed within the time stated in the contract. In addition to providing a detailed Time and progress Schedule the contractor shall submit an outlined and graphic schedule of proposed procedure to the Architect for approval.

The contractor shall exercise extreme care at all times to maintain cleanliness in all operations, avoid fire and accident hazards and remove all inflammable debris promptly.

The site shall be kept clean of construction dirt, and debris and shall be maintained in a condition reasonable acceptable to the owner to all times. The contractor in consultation with other agencies engaged in the work shall so schedule and perform his work as to conform to the established progress schedule and the contract completion date approved by the Architect.

7. Adjacent properties

From the point of-view of working space, it may be necessary for the contractor to work in the adjoining Plot (s) Necessary permission from the owners of adjacent Plots will; be arranged for by the owner. But it shall be the sole responsibility of the contractor to ensure that perfect discipline is maintained while working in the above areas: The workers or staff shall not trespass into other areas and shall not create any nuisance or inconvenience to the people in adjacent Plots. Any loss or damage caused to adjacent property or people working in adjacent property due to default/neglect of the contractor or his sub-contractor(s) or by his workmen shall be made good by the contractor at his expense. All precautions including temporary fencing barricading, lighting etc. in this regard shall be the responsibility of the contractor including all expenses thereof, on completion of work the contractor shall leave the premises including the adjacent areas used by him in a clean condition as approved by the Architect.

8. Maintenance of Public & private Roads

The contractor shall make good at his own cost all damage to private and public road, kerbs and footpath occasioned by the heavy traffic, delivery of materials and building operations generally to the complete satisfaction of the Architect and the local authority.

9. Trespass

The contractor is to take all necessary measures to prevent his workmen from trespassing upon buildings and other areas adjacent to the construction site and will be held entirely responsible for any loss or damage resulting from such trespass.

10. Temporary Buildings.

Contractor shall provide all temporary offices, weather tight sheds for storage, mess rooms, sanitary accommodations and all other temporary buildings required for the proper execution of the works to the satisfaction of the architect public and local authorities. All temporary buildings shall be constructed only at the location approved by the Architect. Any taxes payable on account of such accommodation shall be borne by the contractor. No part of the buildings under construction may be used for messing or

latrine purposes. No materials or plant are to be stored inside the new buildings without the prior written consent of the Architect and no concrete, mortar, plaster or other similar materials may be mixed on any finished floor covering paving or screed.

11. Removal of Sheds etc.

On completion of the work the contractor shall remove and cart away from the site all stores, offices and other sheds. The retention money due for payment on virtual completion of work shall be released to the contractor only after he complies with the above requirements regarding removal of stores, sheds, etc. to the satisfaction of the Architect.

12. Bye-Laws Regulations

The installation shall be in conformity with the Bye-laws and Regulations of the local authority concerned in so far as these become applicable to the installation but if the specifications and drawings call for a higher standard of materials and or workmanship then those required by any of the above regulations and standard then these specifications and drawings shall take precedence over the said regulations and standards. However if the drawings or specifications require something, which violates the byelaws and regulations, the bye-laws and regulations shall govern the requirement of this installation.

13. Manufacturers Installations

Where manufacturers have furnished specific instructions relating to the materials used in this job covering points not specifically mentioned in these documents such instructions shall be followed in all cases subject to approval of the Architect.

14. Completion certificate

On completion of the 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 authority.

15. Testing commissioning

The entire installation shall be tested at the cost of the contractor as called for in the specifications relevant I, Indian standard specifications. The contractor shall arrange for all necessary testing equipment instructions materials and accessories and the requisite labour. Each test shall be carried out in the presence of the Consultant Architect and shall be recorded in an approved form. The completed installation shall be commissioned by the contractor after satisfactory testing and approval of the installation by the Consultant Architect. Any defects (in material and/or workmanship) detected in the course of testing shall be rectified to the satisfaction of the Consultant Architect, by the Contractor at his own cost, the installation shall be tested again after removal: of defects to ascertain that the installation conforms to the requirements called for. The Consultant Architect shall have full power to require the material or work to be tested by an independent agency at the contractor's expenses in order to ascertain their soundness and adequacy.

16. Completion Drawings

On completion of work and before issue of certificate of virtual completion the contractor shall submit to the Architect layout drawings on cloth mounted paper drawn in approved scale indicating the complete system as installed. The drawing shall in particular give the following information:

- a. Number and description of all sanitary fittings.
- b. Location and sizes of all control valves, access panels.
- c. Location and details of storage tanks.
- d. Run and sizes of all water supply lines.
- e. Sizes and run of soil pipes, waste pipes and vent pipes.
- f. Location size and invert levels of all manholes, inspection chambers, gully traps, catch basins etc and connection of Municipal sewer.

The contractor shall procure and bring materials/equipment to the site only on the basis of Drawings approved for construction on not on the basis of quantities given in the Schedule, which are provisional only.

C. SAFETY CONDITIONS FOR UNDERTAKING SITE WORK

- 1.0 All the Contractor's workmen shall be covered under the Employee's State Insurance Scheme/Janata Policy/any other scheme, which may be specified by the statutory Authorities from time to time.
- 2.0 All precautions necessary not only for the site working of the contractor's workmen at site shall be taken by the contractor but he shall also deploy all precautions to safeguard existing structure, equipments and workmen of other agencies in and around job site.
- 3.0 The contractor shall produce test certificates from Government approved certifying authorities for all of his lifting gear and hoists (slings, chists, cranes etc.) before allowed to start work.
- 3.1 These certificates shall be retained at site with Contractor' s supervisor for subsequent spot checks also.
- 4.0 Following rules shall be followed in use of welding sets.
- 4.1 As far as possible D.C. generator sets shall be used instead of A.C. transformer sets.
- 4.2 Contractor shall get his welding sets certified by Buyer's Electrical Section before starting work.
- 4.2.1 These certificates shall have to be renewed every three months from Govt approved agencies and shall be available at site during course of use of such sets.
- 4.2.2 A copy of the certificate shall be rehabilitated near the respective welding sets.
- 4.3.0 Only cables in good condition and insulated holders shall be used.
- 4.3.1 The welder shall wear good quality insulated welding gloves while at work.
- 4.4.0 The length of supply cable to welding set shall not exceed 25 ft. and the welding set body shall be properly earthed.
- 4.5.0 A charged fire extinguisher shall be carried with each welding set.
- 5.0.0 The Contractor shall ensure that portable power tools used by his workmen are rated for 50 or less volts only.
- 5.1.1 The transformer shall be fed through an armoured cable with a 3 pin key roll type plug, properly earthed.
- 6.0.0 For carrying out work at heights exceeding 6-0" or over and near opening in floors, roofs etc., the following precaution shall be taken:
- 6.1.0 All workers engaged on overhead work shall be men experienced in work.

- 6.2.0 Wherever possible timber staging or platforms shall be erected with planks of minimum thickness 2" and minimum width 12". When the nature of the work demands staging of a greater width than, one plank, additional planks shall be added and lashed securely together. "
- 6.3.0 Staging shall be provided with simple safety rails or ropes throughout its length, at waist height and on each open side.
- 6.4.0 Staging supports shall be of standard timber or steel scaffolding safety secured and supporting on firm level footings or slung from overhead beams. The supports shall be situated a maximum distance of 8' apart and the staging shall be secured to each support.
- 6.5.0 In case the site or the nature of work is unsuitable for erection of a proper staging all the workers shall wear safety belts around their waists and secure their lifelines to strong scaffolding or structural members.
- 6.6.0 wherever it is not possible to put up staging and/or use safety belts, safety nets or sheets shall be slung beneath the place of work.
- 6.7.0 When working over open process vessels or tanks, safety belts or safety nets shall always be used whatever or note staging and scaffolding is provided also.
- 6.8.0 Safe access to all points of work should be provided in the form of suitable ladders stairways etc.
- 7.0.0 Contractor's employee of at least status of foreman shall examine all arrangement before such work is commenced and shall satisfy himself that all reasonable safety precautions have been taken.
- 8.0.0 The contractor shall remove all waste materials and rubbish from and about the work site and leave the job thoroughly cleaned up, ready *for* use.
- 9.0.0 The contractor shall ensure that at no time during the erection and commissioning his workmen operate any of the existing plant and equipment in and around the site allotted to them.
- 10.0.0 The contractor shall be responsible *for* and shall indemnify the Owner against all injury to persons both his own workmen and others, and *for* all damage to structural and/or decorative part of the Owner's proper during erection and commissioning of the equipment. The contractor shall repair/reinstate all such damage.
- 11.0.0 These safety conditions should not be regarded as exhaustive. These have been issued *for* the guidance of the contractor and will not in any way absolve the contractor from any obligations or liabilities he might incur or transfer such obligations or liabilities to the owner.

D. APPENDIX

Appendix-I

1. Date of Commencement :
2. Date of Completion :
3. Retention %age for Interim Certificate : 10% of each bill Subject to maximum of Rs 3.50 Lacs (It will be released after the Defects liability period) EMD shall be merged with retention amount.
4. Defects Liability Period : Till twelve months after the virtual completion of work.
5. Penalty delay : 1% of the contract Value per fort night .subject to a maximum of 10% of the contract value.
6. Minimum value of Interim Certificate (Gross) : Rs.15,00,000/- (Rs Fifteen Lacs)
7. Period of honouring the interim payments : 75% within 15 days, balance within 30days reckoning from Interim certificate date
8. Period of final measurement : Two month after the virtual completion of the building and certified so by the Consultants Architects.

Appendix-II Schedule of submission of bid

Date of issue of tender documents **27th Sept 21 To 26th Oct.21**

Date of submission of tender documents in 3 envelope system : **27TH Oct 21 upto 2:30 P.M**

Date of opening of envelope-1& envelope 3: **27th Oct 2021 at 3:00 P.M**

Opening of envelope No.2

***** To be informed separately

Appendix –III Undertaking by bidder having visited site

That I have submitted the tenders for the **COMPLETION OF BALANCE WORKS OF RESIDENTIAL BUILDING AT PLOT NO. 409 , BLOCK-E, GREATER KAILASH, NEW DELHI OWNED BYTHE ORIENTAL INSURANCE COMPANY LTD.** That I hereby give an undertaking that I have visited the Site of Work.

That I have made myself acquainted with the nature of work to be done and the present site conditions - to filling the tender documents

For & an behalf of -----

Authorised Signatory

Appendix –IV Events in sequence to fulfil for “The Order to commence work”

“The order to commence work” shall be issued by the owner by fulfilling the following events and is satisfied by the owner about its fulfilment.

1. Letter of award issued to the successful bidder (hereinafter termed as contractor) with one spare copy.
2. The contractor submits the spare copy to owner, duly signed and accepted.
3. Signing of agreement between owner & the contractor takes place within the stipulated time.
4. In case any delay in fulfilling above events, the effective date shall be deemed to have been reckoned after Twenty One days from the award of work. In that case the intervening period of the effective date and fulfilment of all above events are at the account of the contractor.

Appendix –v Declaration*

We, M/s ----- (full address)

Bidders of the work **COMPLETION OF BALANCE WORKS OF RESIDENTIAL BUILDING AT PLOT NO. 409 , BLOCK-E, GREATER KAILASH, NEW DELHI OWNED BYTHE ORIENTAL INSURANCE COMPANY LTD.** , declare & affirm that-

1. We have gone through all the pages of tender documents viz.
2. We have filled and signed in the pages wherever date is to be filled by ourselves. We have signed, stamped all the pages of the documents.
3. We have gone through the details of Part II - Section –V Price Bid and filled, signed the portion where the rates are to be entered into.
4. We have not made any entry or presented our own sheets than anything called for against. We also declare that we understand that if any entry contrary to the above in our tender document is found by the owner, our document is liable to be declared non responsive and liable to be rejected .

For & an behalf of -----

Authorised Signatory

* Bidders to copy it in their Company's Letter Head and signed, stamped and put at Envelope I while submitting Tender.

Appendix –VI Indemnity Bond

In consideration of THE **ORIENTAL INSURANCE COMPANY Ltd** (hereinafter called the “Owner”) having employed M/s..... (Hereinafter called the “contractor”) FOR the **COMPLETION OF BALANCE WORKS OF RESIDENTIAL BUILDING AT PLOT NO. 409 , BLOCK-E, GREATER KAILASH, NEW DELHI OWNED BYTHE ORIENTAL INSURANCE COMPANY LTD** for Owner at THE **ORIENTAL INSURANCE COMPANY Ltd.** the contractor hereby agrees to execute this bond of Indemnity.

Now Therefore This Deed Witnessed As Follows:

In consideration of the Owner having employed “contractor” M/s... for the **COMPLETION OF BALANCE WORKS OF RESIDENTIAL BUILDING AT PLOT NO. 409 , BLOCK-E, GREATER KAILASH, NEW DELHI OWNED BYTHE ORIENTAL INSURANCE COMPANY LTD** , the contractor agrees to indemnify the Owner against all actions, suits, claims and demands brought or made against the Owner in respect of any matter or thing done or omitted to be done by the Contractor in the execution of or in connection with the work of this contract and against any loss or damage to the Owner in consequences of any action or suit being brought- against the contractor for anything done or omitted to be done in the execution of the work in this contract and at all times holds himself liable for all damages and losses caused to the adjoining building (s) on account of the construction of the building referred to above and further undertakes to indemnify the owner any such amount to the full extent which the owner may have or be required to pay to any person (s) having rights by way of compensation or otherwise and further to pay all costs and expenses which the owner may have to expend in defending any action in the Court of Law regarding thereto.

In witness whereof the promisor has executed this Bond of indemnity at _____ district, _____
On _____ day of _____.

Signed by

Witness

(CONTRACTOR)

- 1.
- 2.

APPENDIX-VII
Performance Bank Guarantee

(To be stamped in accordance with Stamp Act if any, of the Country of the issuing Bank)

Bank Gaurantee No. -----

Date -----

To,

THE ORIENTAL INSURANCE COMPANY Ltd.

In consideration of **THE ORIENTAL INSURANCE COMPANY Ltd.** (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators and assigns) having awarded to M/s With its registered/Head Office at(hereinafter referred to as the 'Contractor', which expression shall unless repugnant to the context or meaning thereof, include its successors administrators, executors and assigns), a Contract by issue of Employer's Notification of Award No. dated and the same having been unequivocally accepted by the contractor, resulting into a Contract bearing No dated Valued at Rs * for **COMPLETION OF BALANCE WORKS OF RESIDENTIAL BUILDING AT PLOT NO. 409 , BLOCK-E, GREATER KAILASH, NEW DELHI OWNED BYTHE ORIENTAL INSURANCE COMPANY LTD.** And the Contractor have agreed to provide a Contract Performance Guarantee for the faithful performance of the entire Contract amounting to

We ----- having its Head Office at ----- (hereinafter referred to as the 'Bank', which expression shall, unless repugnant to the context of meaning thereof, include its successors, administrators executors and assigns) do hereby guarantee and undertake to pay the Employer, on demand any and all money payable by the Contractor to the extent of Rs* aforesaid at any time during entire construction period and **upto virtual completion ****..... without any demur, reservation, contest, recourse or protest and/or without any reference to the Contractor. Any such demand made by the Employer on the Bank shall be conclusive and binding notwithstanding any difference between the Employer and the Contractor or any dispute before any Court, Tribunal, Arbitrator or any other authority. The Bank undertakes not to revoke this guarantee during its currency without previous consent of the Employer and further agrees that the guarantees herein contained shall continue to be enforceable till the Employer discharges this guarantee.

The Employer shall have the fullest liberty, without affecting in any way the liability of the Bank under this guarantee, from time to time to extend the time for performance of the Contract by the Contractor. The Employer shall have the fullest liberty, without affecting this Guarantee to postpone from time to time the exercise of any powers vested in them or of any right which they have against the Contractor, and to exercise the same at any time in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Employer and the Contractor or any other course or remedy or security available to the Employer.

The Bank shall not released of its obligations under these presents by any exercise by the Employer of its liberty with reference to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Employer or any other indulgence shown by the Employer or by any other matter or thing whatsoever which under law would, but for this provision have the effect of relieving the Bank.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee the Employer may have in relation to the Contractor's liabilities.

Notwithstanding anything contains herein above our liability under this guarantee restricted to Rs and it shall remain in force during entire and shall be extended from time to time for such period (not exceeding one year), as may be desired by M/s ----- on whose behalf this guarantee has been given.

WITNESS

(Designation with Bank Stamp)

Attorney as per Power of Attorney No. -----

Dated-----

Notes. (*) This sum shall be Rs 2,00,000/- (Rs Two Lacs)

(**) This date will be date of virtual completion certicate

2. The stamp papers of appropriate value shall be purchased in the name guarantee-issuing Bank.

SECTION III

- A. TECHNICAL SPECIFICATIONS FOR CIVIL WORK
- B. TECHNICAL SPECIFICATIONS FOR SANITARY/PLUMBING WORK
- C. TECHNICAL SPECIFICATIONS FOR ELECTRICAL WORK

TECHNICAL SPECIFICATIONS & PREAMBLES

1. General

The specifications form part of the general rules and conditions. The contractor shall carefully acquaint himself with these specifications to determine his contractual obligations for the work. The conditions of these specifications will be binding on the Contractor. Wherever clauses are specifically written they shall prevail over CPWD specifications or relevant IS Codes and the clause given in these specifications will govern. No deviation shall be permissible unless specifically approved by the Consultant Architect in writing.

1.1 Drawings/Dimensions

The specifications shall supersede dimension. All dimensions shall be checked on site. The dimension where stated do not allow for wastage, laps, joints b t the contractor shall provide at his own cost sufficient labour and materials to cover such wastage laps, joints etc. The levels, measurements and other information concerning the existing site as shown on the drawings are believed to be correct, but the contractor shall verify them for himself and also examine the nature of the ground as no claim or allowance whatsoever shall be entertained hereinafter on account of any error or omissions in the levels or the descriptions of the ground turning out to be different from what was expected or shown on the drawings.

1.2 Co-ordination of Drawings

Before commencement of work, the Contractor shall correlate all relevant Structural Architectural and Services drawings and satisfy himself that the information available there from is complete and unambiguous. The Contractor shall be responsible for any error / difficulty in execution/damage incurred owing to any discrepancy in the drawings which has been overlooked by him and has not been brought to the notice of the Engineer-in-Charge.

1.3 Levels

All works below and up to Ground floor Level shall taken to be work upto plinth or Floor one level. For all works above Floor one level shall be taken as work superstructure.

1.4 Excavation

The rates shall be deemed to include are cost of pumping or bailing out water as may be necessary from time to time for execution of the project and nothing extra shall be payable on this account. Pumping out water caused by spring, seepage river seepage or coffer dams, drains water mains and like shall be deemed to be included, and nothing extra shall be payable over the quoted rates for this.

Contractor should carefully study lift of material as he will have to carry out the work at any level at the quoted rates and lift will not for the criterion for any extra amount on that cause. The item rates by the contractors to include for this condition as a specific preamble to every section/individual trades of the schedule of quantities.

1.5 For all finishing items such as flooring, plastering, painting, external finishes and exposed work, the contractor shall have to make panels/samples for approval of the Consultant Architect as directed by the Consultant Architect. Nothing extra shall be paid for making such samples or approval, irrespective of number of such samples.

- 1.6 The General specifications shall be those known as specification published by CPWD New Delhi. Where they are silent relevant publication of B.I.S. shall be followed. All corrections issued to specification and to B.I.S. codes/standard as up to date shall be binding.

Nevertheless the following are detailed out for few major items. Description given in the BOQ shall supersede the general specifications above.

In case of ambiguity or conflicts, the Consultant Architect's decision shall be binding.

SECTION III

A. TECHNICAL SPECIFICATIONS FOR CIVIL WORK

GROUP A: EARTH WORK

A.1 Earth work in excavation:

Excavation in foundation, trenches and other areas shall be carried out to the widths, lengths and depths indicated on the drawings or as directed by the consultant. Any excavation executed more than the depth indicated in the drawing or instructed, shall be made good by the Contractor, at his cost by filling with M-10 concrete, duly compacted, to the satisfaction of the Consultant. Rate for earthwork shall include:

- i) excavation and depositing earth as specified.
- ii) setting out works, profiles etc.
- iii) site clearance including removal and disposal of shrubs, rank vegetation, brush wood, saplings etc.
- iv) forming 'Deadman' or 'Tell tales' and their removal after measurements.
- v) protection and supporting of existing services like water mains, sewer lines, cables etc.
- vi) Shoring, timbering or other approved support to the sides of excavation.
- vii) bailing out or pumping out water in excavation pits from rains, sub-soil water, running water or sewer lines etc.
- viii) trimming and levelling bottom of excavation and compacting to the satisfaction of the Consultant.
- ix) Soft Rock: Generally, excavation which cannot be carried out by the close application of pickaxe or jumpers, (like sand stone, hard laterite etc) shall be classified as excavation in soft rock. Light blasting shall have to be resorted to for loosening the materials. The disintegrated stratifications will as hard soil and not as soft rock.
- x) Hard Rock: which requires blasting or chiselling.

A.2.0 Blasting:

Where blasting has to be resorted to for rock cutting, it shall be the responsibility of the contractor to arrange for the following at his entire risk, cost and responsibility⁶.

A.2.2 Fees, royalties and any other levies attendant on such blasting / excavations etc work shall be entirely borne by the Contractor.

A.2.3 All precautionary measures such as Notices to adjoining property and other agencies working in and around the plot, signalling and watch etc. shall strictly adhere to according to the various regulations in force.

A.2.4 All Risk Insurance in respect of the blasting hazards to men and materials within and in the vicinity of the plot. This insurance shall be apart from the Contractor's All risk insurance Policy stipulated under General Conditions.

A.2.5. Storing of blasting materials shall be strictly as per Explosive Regulations.

The tenderer must acquaint himself with the site conditions in regard to blasting, nature of rock likely to be met with, timing and other restrictions in regard to blasting etc. No claims whatsoever in this regard shall be entertained. Regulations regarding signals / siren etc. should be strictly adhered to.

A.3.0 Disposal of Surplus excavated materials:

All materials considered surplus shall be removed to destinations and disposed off as directed. The disposal of the material can be in any of the following ways as directed by the Architects.

1. Filling in low lying areas.
2. Filling in at places of filling such as under floors, in roads etc.
3. Stacking of material in pre-designated stacking yard.

A.4.0 Filling:

Filling under floors or other places indicated shall be done with approved material obtained from excavations or approved materials brought from outside by the contractor. The material should generally be good quality soft or hard murrum or other approved material. Filling shall be done in layers not exceeding 30 cms thick and each layer shall be watered adequately and consolidated properly by rollers or pneumatic rammers 8 to 10 tonnes wherever conditions permit. If it is not possible, the consolidation shall be done by hand rollers and heavy pneumatic/hand rammers of 5 tonnes capacity. At places where it is not possible to use mechanical equipment for consolidation, with approval of the Engineer-in-charge, the layer of the earth must be compacted/consolidated by pouring sufficient quantity of water and compacting/consolidating the layer of earth thereafter by heavy cast-iron rammers and or Durmuts made out of trunk of trees. The weight of the consolidated material shall not be less than 15 Kg. The compacted/consolidated surface of each layer must be approved by the Engineer-in-charge before laying the next layer. The surface of the filling shall be finished to lines and levels as required. The filling shall be compacted in such a manner as to guarantee full stability. The compaction shall be such that minimum relative density obtained on testing is 90. In general, one test shall be performed for every 1000 M² of compacted area.

A.5.0 Measurements:

Measurements for all excavation, filling, carting away and earthwork shall be in solid measure. The rates quoted by the tenderers are thus for solid measured units. The following factors shall be applied to obtain quantities of solid measure.

- Excavation : No reduction in volume
- Filling watered and consolidated in layer : Volume shall be determined by levels taken before and after compacted filling and be measuring the length and breadth as required.
- Loose measure (as in trucks or dumping) : volume of loose measure less 25%
- Stock measure as in rubble etc. : volume of stock less 40%

The mode of measurement for various types of excavation shall be as under:

- A.5.1 In case of trenches, pits and areas, measurements shall be on the basis of the width of foundation and the depth to bottom of foundation (bottom of bed concrete if provided) formation surface dressing shall be measured in plan projection only.
- A.5.2 In case of pipe trenches and drains; measurement of width of trench shall be diameter of the pipe plus an allowance of 50 cms to allow for collars, flanges etc.
- A.5.3 Excavation in rock shall be measured upto level indicated or required. No undulations as physically appearing after excavation shall be taken into consideration while arriving at the quantities. The rates quoted shall be deemed to include for is admissible.

A.6 Sand filling under floors:

Sand used for filling inside plinth under floor, shall be free from dust, organic and foreign matter and shall have to be got approved by the consultant. Sand shall be filled to the required level and consolidated by flooding with clean water. Concreting of floor shall not be started till the Engineer has inspected and approved sand filling-.

A.7 Pre-construction Pest Control Treatment:

Chloropyriphos concentrate, of manufacture approved by the consultant and of percent concentration shall be used. Chemicals of specified concentration shall be mixed with water in the required quantity to achieve the desired concentration. Hand operated pressure pump shall be used for spraying the chemical.

Soil treatment shall be done when the foundation trench is ready for receiving the foundation concrete. The spraying shall be done on the bottom surface of trenches and upto 300 mm, vertically on both sides of trench, at the rate of 5 litres of chemical per sqm of surface area. The back fill in immediate contact with the foundation structure shall be treated at the rate of 15 litres per sq. of vertical area, on each side of the foundation. The top surface of filled earth shall also be treated with chemicals at the rate of 5 litres per sqm of the surface area, before the sand sub-grade is laid.

GROUP B CONCRETE WORK

1.0 CAST IN SITU CONCRETE:

1.1 General

In order to exercise the required degree of constant control over the concrete materials and their proportions, the Contractor shall set up and maintain at his own expenses at the site.

a) A set of standard Sieves

Measuring cylinders

Slumps Cones.

Adequate number of Standard Moulds

Weighing balance

f) Curing Tank for Cubes

Any other apparatus deemed necessary by the Engineer-in-Charge for proper control shall be provided by the Contractor at his own expense. The testing at Site shall be done by qualified technicians, as approved by Consultants.

B.2.0 MATERIALS

2.1 Cement

Cement to be used on the works shall comply with the relevant Indian Standard Specification IS:269 for Ordinary Portland Cement and shall be obtained from approved sources. If asked for by the Consultants certificates of tests from an approved laboratory shall also have to be obtained at the Contractor's own cost. Samples for testing shall be extracted as specified in the relevant IS: 269 within one week of delivery and the test shall be made within four weeks of delivery. All cement shall be stored in suitable weatherproof structures so that it does not come in contact with the ground and is prevented from being damaged by moisture. These buildings shall be provided by the Contractor at his own cost and placed in locations approved by the Engineer-in-charge. Provisions for storage shall be ample and the consignments of cement as received shall be separately stored in such a manner as to provide easy access for the identification and inspection of each consignment. Storage buildings shall have capacity for the storage of sufficient quantity of cement to allow sampling at least 12 days before the cement is to be used. Stored cement shall meet the test requirements at any time after storage when a retest is ordered by the Consultant.

The Contractor shall keep accurate records of the deliveries of cement and of its use in the work. Copies of these records shall be supplied to the Consultant in such forms as may be required. Cement shall be used in the sequence in which it arrives in order that no cement shall be unnecessarily stored for a long period. If cement becomes lumpy due to partial hydration it shall be removed from the site immediately by the contractor.

Any material which has deteriorated or which has been damaged or contaminated, whether during transit to the site, at the site or otherwise, shall not be used in the work and shall be immediately removed from the site and replaced at the expense of the contractor.

The cement to be used shall be of Ultratech, ACC, J.P. Rewa, Shree brands or as approved by Architect

B.2.2 AGGREGATES:

All aggregates shall generally conform to the requirements of relevant IS: 383. Materials shall be taken from sources of supply approved by the Consultant. Any material which has deteriorated or which has been contaminated shall not be used for concrete. All aspects of aggregate handling and storage are subject to the approval of the consultant and shall be such as to minimise segregation and prevent contamination by grass, soil, wood, sawdust, oil or other foreign materials. Adequate supplies shall be catered for in advance of the requirements. Every size of aggregate shall be stored on a separate platform or stockpile at locations to be approved by the Engineer-in-charge and such platforms or stockpiles shall be sufficiently away from each other to prevent the materials at the edges of the piles from becoming intermixed. If aggregates are stockpiled on the ground, the bottom portion of the aggregate within 150 mm of the ground shall not be used.

For both, fine and coarse aggregates, tests shall be carried out for physical characteristics, limits of deleterious substances, soundness, etc prior to construction and also when the source of procurement is changed. All tests will be conducted at the Contractor's expense.

Coarse aggregate: This shall be crushed from hard stone, obtained from approved quarry. It shall be hard, strong, dense, durable, clean and free from soft, pliable thin, flat elongated, laminated flaky pieces. It shall be clean and free from dirt and any other foreign matter. Graded aggregate shall be used and this shall conform to the requirements of table given below.

TABLE 1 GRADED AGGREGATE

I.S. Sieve designation percentage passing for normal size of

mm	40mm	20mm	16mm	12.5mm
80	100	--		
40	95-100	100	--	--
20	30-70	95-100	100	100
16	-	-	-	90-100
12.5	-	-	-	90-100
10	10-35	25-55	30-70	40-85
4.75	0-5	0-10	0-10	0-10
2.36	-	-	-	-

Sand shall be of an approved quality, clean, sharp and free from injurious amount of dust, mica, shells, soft and flaky particles, shale, alkali, organic matter, loam or other deleterious substances. The sand shall be taken from a source approved by the Engineer-in-Charge and if required by him it shall be thoroughly washed, screened and graded by the Contractor at no extra cost and to the satisfaction of the Consultant. The maximum permissible silt content shall not exceed 8% (eight per cent).

The whole of the ingredients of the coarse aggregate shall consist of hard stones and shall contain no soft or elongated pieces.

B.2.3 MIXING WATER:

Water, where necessary shall be got tested at the contractor's expenses for its suitability in use for making concrete by a laboratory approved by the Consultant. It is usually required to be fit for drinking and shall be taken from an approved source. This is to ensure that the water is reasonably free from such impurities as suspended solids, organic matter and dissolved salts which are frequently contained in natural waters and which adversely affect the properties of the concrete, especially the setting and hardening.

If the quality of water to be used for concrete is not fit for use as per IS -456, the contractor shall make the arrangement of water through R.O. plant at site at his cost.

B 2.4 R.M.C

The contractor shall test the samples of each grade of RMC and submit the results to the owner before supplying the concrete from RMC plants.

Computer print outs showing the mix proportions of each batch shall be submitted along with each T.M. supplied at site.

RMC shall be supplied from following approved suppliers

Ultratech , RMC India, ACC , Ahlcon

B.2.4 STEEL:

The steel to be used in reinforced concrete work shall comply with the requirements of the relevant Indian standards IS: 266,432, 1139, or 1786 steel bars made by re-rolling old rails, bars etc. will not be used on any account and the contractor shall produce proof in respect of the source of his procurement, whenever steel is procured by him. The final decision on the quality of steel shall be that of the Consultant.

If the results of tests conducted in an approved laboratory as per provisions of relevant Indian Standard Specifications, show that the steel obtained by contractor, if any, does not comply with these specifications, the Engineer-in-charge, may at his discretion reject the lot or lots from which the sample or samples were taken and the same shall not be used in the works but shall be removed at once from the site of works. The work already executed with such bars may be ordered to be demolished at the Contractor's cost and no payment shall be effected for redoing the same. The completion time limit shall not be extended on account of such demolition and redoing. Testing of steel shall not be paid extra.

All steel used for reinforcement shall be free from loose scales or rust which must be removed with a stiff wire brush and coated with neat cement wash as directed, bars must also be free oil or paint.

All bending shall be done cold, gradually evenly and without jerks. All protruding bars to which other bars are to be spliced later, must be protected from rusting by a coat of thin neat cement paste and the contractor's rates shall be inclusive of this item.

As far as possible, bars of proper length shall be used but where this can not be done, overlapping has to be resorted with a lap length as specified in relevant structural drawings and the two bars shall be bound with No.20 S.W.G. annealed steel wire twisted tight along the overlap, jointing shall be staggered. Welding of bars shall be done if so directed and each weld shall be tested.

The steel shall be properly braced, supported and other wise held in position by concrete or plastic spacer blocks and steel chairs so as to prevent displacement while concreting. Present spacing block of 1:2 cement mortars about 1-1/2 inches wide: and of necessary thickness shall be used to keep reinforcement bars off the forms and in proper position. Tiles, lades or stone chips will not be used as spacer blocks. The correct number size of reinforcement bars, stirrups and binders shall be provided and placed in position strictly according to the drawings and instructions. This must be supervised with proper care and checked finally by a competent foreman of the contractor before concreting. A steel fixer should be in full time attendance, while concreting, to adjust and fix the reinforcement.

Reinforcement shall be measured according to the weight of steel actually used. Wire required for keeping or supporting the reinforcement shall not be measured, but its cost as well as that of bending, hooking and all other work in providing and fixing the reinforcement shall be covered by the rates. I.S.I standard weight table shall be followed to arrive at weight of reinforcement.

Steel supplied by contractor shall be from main producers with integrated plant such as TATA, SAIL, RINL, Jindal and Essar.

B.3.1 CONCRETE MIX DESIGN:

3.1 Concrete mixes for various specified design strengths, unless otherwise instructed, shall be worked out by the contractor.

3.2 The mix proportions shall be selected to ensure that the workability of the fresh concrete is suitable for the conditions of handling and placing, so that after compaction it surrounds all reinforcement or tendons and duties and completely fills the formwork. When the

concrete is hardened, its quality shall be such as to comply with the strength, durability and other requirements taking into account the conditions to which it will be exposed.

- 3.3 Mix Design shall be as per the relevant IS: 456
- 3.4 The mix designed by the contractor shall be used on works only after obtaining a written approval /of the Engineer-in-charge. It is to be understood that the mix design shall be entirely the responsibility of the contractor and such approval by the Engineer-in-charge shall not relieve him of his responsibility in respect thereof.
- 3.5 The contractor shall prepare all calculations, tabulations, graphs etc. Pertaining to concrete mix designs and/or test results and supply copies of such calculations, tabulations, graphs etc. as required by the Architect.
- 3.6 The minimum cement contents for various design mixes shall be 330 Kg /Cum max shall be 450Kg /cum
- 3.7 Fly ash if used in the mix design its content shall be restricted to maximum 35% of cement content . The fly ash shall conform to IS codes 3812(part –I)

B.4.0 **BATCHING:**

The aggregate all be generally measured by weigh-batching making due allowance for the water contained in aggregate so proportional volume batching with weight control of aggregates may be permitted when the Consultant is satisfied that adequate control can be exercised by the Contractor and densities of the aggregates are fairly uniform.

The water shall be controlled by the direct measurement and due allowance shall be made for water in the aggregates and shall be determined by a method approved by the Engineer in charge.

The cement shall be measured by weight. In addition to the accurate control of water/cement ratio, slumps tests shall be adopted to check that, there is *no* significant variation in the workability of the mix.

All tests shall be carried out at regular intervals and records of the results shall be kept at site. Copies of the records shall be sent to the Consultant for reference.

Bulking of fine aggregates shall be determined before laying concrete. Boxes of suitable sizes shall be used for measuring coarse and fine aggregates. Volume of one bag of cement of 50 kg be taken as 0.0347 cum. while measuring the aggregates in box, shaking, ramming heaping etc shall not be allowed proportioning of fine aggregates shall be based on dry volume.

B.5.0 **MIXING**

Through mixing of the concrete is essential. Mixers shall always be operated at the speed recommended by the makers. A mixing time of not less than two minutes after all materials including water have entered the mixing drum, is often recognised as a satisfactory period for mixers up to 1 cu.m. Capacity. A slightly longer mixing time may be required for mixers exceeding cu.m. Capacity and for dry concrete mixes. Mixing time, however, vary according to the type of mixer and the above may be reduced in case of some modern mixers. When the concrete is mixed, the complete contents of the drum should be discharged in one operation, into the hopper or container, since the mixing time is lost and the risk of segregation occurs if the batch is discharged into a number of separate barrows or prams.

At the start of the day's work the first few batches of the concrete may be harsh and stony because of some mortar sticking to the inside of the drum and around the blades. The proportion of coarse aggregate shall therefore be reduced on the first mix or two.

The mixer should be thoroughly washed out and the blades cleaned after used, otherwise the mixing drum will soon become caked with hardened concrete. This is not only difficult to remove but impairs the efficiency of the machine.

B.5.1 Hand Mixing

Hand mixing will be only permitted under special circumstances by the Architect in the interest of work. concrete shall be mixed only in such quantities which 'can be readily placed *in* position.

Mixing shall be done on clean watertight masonry platforms, with raised sides to prevent materials from being shovelled off during mixing. The sand shall be levelled and the cement bags emptied on the top. The cement and sand shall be thoroughly incorporated with each other in a dry state by being turned over, backwards and forwards, several times until the mixture is of a uniform colour.

The coarse aggregate shall be wetted before use. The mixture of cement and sand shall be placed on the coarse aggregate and thoroughly incorporated with it by being turned over and over backwards and forwards, several times until every part of the ballast is surrounded with dry mortar.

The minimum quantity of water necessary to ensure workability shall be slowly added and the mixture turned over and over again until it is uniformly mixed. The mass shall be of the required consistency and the mortar should show no inclination to separate from the coarse aggregate.

Mixing shall be so timed that the concrete will be placed in position in the work within 15 minutes after adding the water.

B.6.0 PLACING

It is important that the concrete be placed in its final position before the cement reaches its initial set. The concrete should normally be compacted in its final position within 30 min. of leaving the mixer and once compacted, it should not be disturbed. Before the reinforcement is actually placed in position, the insides of the forms should be inspected to see that they have: been cleaned and oiled. Temporary openings should be provided to facilitate inspection, especially at the bottom of columns, to permit the removal of all sawdust, wood shaving and dirt openings should be placed so that the water used to flush the forms will drain away. No water should be left in the forms.

The concrete should be spread evenly in the forms to avoid segregation and should completely fill all corners of the formwork and the space between and around the reinforcement vibrator should be used for compaction only and not for spreading the concrete. Concreting should be carried on without interruption between predetermined construction joints.

B.7.0 COMPACTING:

The object of compacting is to achieve maximum density. The concrete should, therefore be placed a little in excess of its specified depth, so that after proper compaction its final desired depth is obtained. Rodding the concrete manually and tapping the formwork on its external face shall be continuously carried out at and near the actual pouring point compacting the concrete with mechanical vibrators shall be done at sufficient distance away from the pouring head, so that the vibrator is utilised only to compact the concrete and not to spread it. Beams and columns shall be vibrated using immersion vibrators as per the relevant IS: 2505 and IS: 3558. Thin sections like water tank shall be vibrated with surface, vibrators. The contractor shall at all times have in reserve sufficient vibrators of each variety i.e. electrical, diesel and petrol to guard against shut down of the work occasioned by the failure of the equipment in operation and to permit the equipment to be

serviced and over hauler in rotation. No concreting will be permitted in the event of power failure or vibrator failure. The consultant may, however, at his absolute discretion, permit concreting by increasing the slump and correspondingly increasing the cement contents at Contractor's cost, Except: for shallow inaccessible concrete, the vibrator shall be penetrated vertically and at regular distance intervals, but not at an angle nor at haphazard, intervals, It is better to vibrate at smaller intervals for shorter periods of time, rather than at wider intervals for longer periods of time. The time and intervals shall be subject to the approval of consultants. At corners, construction, embedded fixtures and congested reinforcement locations, the vibrators, shall be operated with the utmost care and handled only by the most experienced workmen.

When placing of concrete is suspended, removal of laitance and roughing of surface for future jointing shall be done before concrete sets. When concreting is resumed, the joints shall be cleaned, water and grout of eat cement slurry shall be poured.

Fresh concrete shall e protected from damage and rain, during and after construction, with suitable covering.

8.0 **CURING:**

All freshly placed concrete surfaces shall be protected from the elements and from defacement during and further construction activities. The contractor shall provide as directed by the consultants Architect enough tarpaulins/ plastic/pvc sheets or other suitable materials to cover all freshly finished concrete. As soon as the concrete has hardened sufficiently to prevent damage, it shall be cured by maintaining the concrete in a damp condition by the application of wet sacking or other moisture retaining covering for a period of 21 days after placing the concrete.

Extreme care shall be taken to ensure that all surfaces are kept in a moist condition and no local areas shall be allowed to dry out intermittently.

9.0 **TESTING AND CRITERIA OF ACCEPTANCE:**

9.1 Method of sampling and testing shall be as per the relevant 1S: 1199 and 1S: 516 but the evaluation of test results shall be as per item (4) hereinafter.

9.2 Test shall be conducted on sets of three companion cubes or specimens companion specimens shall be cast from sample concrete taken from a single batch of concrete and shall be of the same age at the time of testing. The average strength of the three companion specimens shall constitute the result of that test. The size of cube shall be 150 mm usually.

9.3 The frequency of taking cubes shall be as follows:
From each such sample of concrete six companion cubes shall be taken. Three of these shall be tested at seven days and the remaining three at 28 days. Two such samples giving 12 cubes shall be obtained per mix per day or *for* every 50 cu. m. or fraction thereof laid concrete of each grade whichever gives more number of cubes. All these cubes shall be tested at site approved by the consultant. If the contractor wishes to set up a compression testing machine at site, he may test the cubes on his machine. However, as a check on the testing equipment, an additional six companion cube shall be taken from ten (10%) of the samples and these shall be tested at the corresponding ages in a laboratory approved by the consultant.

If a significant difference is found between the two corresponding results, all further test shall be carried out in the approved laboratory till the testing equipment is properly repaired. The cost of all this testing shall be borne by the contractor.

The consultant may, at his absolute discretion, reduce the frequency of tests when the extent of control is ascertained and reaches an acceptable.

The criteria of acceptance of site concrete shall be as per the relevant IS: 456.

GROUP: C REINFORCED CEMENT CONCRETE WORK

C.1 **Reinforced Cement Concrete:**

Water, coarse and fine aggregate shall be, as specified under the group concrete work concrete shall start only after approval and clearance is obtained from consultants labour shall not be allowed to walk over the reinforcement in slabs and beams and suitable cat walks, supported directly from shutter in , shall be provided.

In columns and wall, the vertical drop of concrete shall not exceed 1.5 meters. When concreting cannot be completed in a single operation and when construction joints are required in slabs and beams approved slots board with slots for reinforcement bars shall be provided.

In case of roof slabs, top surface shall be finished even and smooth with wooden trowel, before concrete begins to set.

All exposed surface of RCC work shall be properly roughened immediate after the removal of shuttering, by hacking. Before plastering the surface shall be cleaned and wetted. The plastering of exposed surface of all RCC work shall be done in cement mortar 1:3 (1 cement: 3 find sand) of thickness not exceeding 6mm to give a smooth and even surface.

The surface of R.C. slab or beam on which cement concrete or mosaic floor is to be laid shall be roughened with brushes, while concrete is green, The strength of concrete of different mix, on work tests, shall be as per acceptance criteria of CPWD specifications

All other specifications like concrete testing mixing, laying, protection of concrete while and after laying, treatment of construction joints, curing etc. shall be the same as stipulated under the group "Concrete works"

C.2 **Centering and shuttering:**

These shall be fabricated with timber, plywood or steel. They shall be true to shape and dimensions in the drawings shall be provided to make up any settlement in form work either before or during concreting.

The timber used shall be easily workable with nails without splitting and shall be stiff and strong enough to avoid and deflection, should be stable and not liable to warp.

Props used shall be steel, Spacing of props shall be appropriately worked out.

The shuttering shall have smooth and even surface and joints shall not permit leakage of cement grout. Opening for fan clamps or any other purpose shall be provided in the shuttering, where, required. The surface of shuttering shall be painted with approved shuttering oil, before reinforcement is placed in position. Suitable camber shall be provided in the shuttering as required.

The formwork shall be so removed, as not to cause any shock or vibrations. The farm work shall not be struck, unless clearance is obtained from the Engineer-in-Charge or Consultant.

The form work shall consist of plat forms of planking minimum 1-1/2 thick or steel plates at required level supported of runner or beams propped with vertical steel pipes, ballies, etc. properly crossed braced together to be rigid.

Clamps and wedges shall be used to hold the forms together since steel shuttering shall be generally required. Where nails must be used, these shall be left projecting so that they can be easily withdrawn.

The shuttering shall be substantial and unyielding and so constructed that the concrete conforms to the designed dimensions. It shall be truly vertical and horizontal and the joints shall be closed so that no mortar can escape. For beams, a camber of 1/480th of the span or as directed by the Architect shall be given in the forms.

Surfaces which come next to the concrete shall be smooth. Use of mud plastering on shuttering shall not be allowed under any circumstances.

The shuttering shall be so arranged that the slab forms and the sides of the beams, girders and for columns can be removed first, allowing the bottom boards of the beams to remain in place for a longer time.

Before concrete is laid, inside faces of shuttering for lintels, walls, etc. shall be free from defects and shall be cleaned.

REMOVAL OF FORMS:

All the centering and forms shall be kept in position until the expiry of the requisite number of days for the respective item of works as specified below:

Minimum period of Centering Should be kept in position		
1.	Foundations, columns, sides of walls	3 days
2.	Beams and lintels sides	3 days
3.	Bottom of slabs upto 15'0" span	14 days
5.	Soffits of beams lintels and arches below 20'0" span	14 days
6.	Soffits of beam and lintels, arches, ribs above 20'0" span upto 30'0" span	21days
7.	Bottom of beams, arches and ribs over 30'0" span	28 days

Note: The form work in special case, shall be kept in position for a longer time than that specified above, as directed by the Architect.

The measurement will in all cases be taken along the finished surfaces of the concrete core, at the surface of shuttering.

For cantilever slabs and beams the centering shall remain till structures for counter-acting or anchoring down have attained sufficient strength.

Steel shuttering:

Steel shuttering for exposed concrete shall be made of shuttering plates of standard sizes and as per the pattern of exposed concrete indicated in Architects drawings. The shuttering plates used will be made of steel strengthened at the edges and in middle to prevent sagging or any deflection when concrete is laid. These plates will be free from any deformity or dents and should fit with each other /properly without any space or groove being left between adjacent plates to avoid any leakage of concrete slurry. If any concrete projects out between plates this will be neatly cut away.

The contractor shall be required to produce working drawings showing the general construction of formwork and panels with details such as nail positions and holes for supports that may be required. Nail heads shall be positioned as instructed by the architects. Grooves and chamfers shall be formed as shown on the drawings without any extra cost.

Any holes for the supports, which the contractor may need, shall be approved by the Architect. All such holes shall be subsequently filled in, carefully so as to match with the other surface. Walls, columns etc shall generally be cast to the full height in one operation and the formwork. Whsll put in accordingly. If permitted by the Architects, these may be completed in two or more heights when the form work shall be carefully and correctly raised for further height so as to ensure a neat joint without disturbing the pattern. Any groove desired by the Architects at the joint shall be provided by the contractor at no extra cost.

COATING FOR SHUTTERING

Burmah-Shell shuttering oil, colour less and emulsifiable in water shall be used *for* oiling the wood work when only a thin film shall be neatly applied avoiding collection at one place. Any mark left by the shuttering oil shall be washed clean.

REUSE OF FORMS:

The contractor shall not be permitted reuse of timber fating formwork brought new on the works more than 5 times *for* exposed concrete formwork and 8 times *for* ordinary formwork. 5 or 8 uses shall be permitted only if forms are properly cared *for*, stored and repaired after each use. The Engineer-in-Charge or Consultant may in this absolute discretion order removal of any form he considers unfit *for* use in the works, and order rejection of any form he consider unfit for use. Used form brought on the site will be all wed proportionately fewer uses as decided by the Consultant. Use of different quality boards or the use of old and new boards in the same formwork shall not be allowed.

HACKING OUT

Immediately after removal of forms, the concrete surfaces to be plastered shall be roughened with bush hammer or with chisel and hammer as directed by the consultant to make the surfaces sufficiently coarse and rough to provide a key *for plaster*. *Nothing extra will be paid this operation and rates shall be included*

POCKETS:

Where boxes or pockets are required to be formed in the concrete, they will be paid *for* separately at the contract rates by measuring the area of concrete, surface shuttered. No deduction will be made in concrete for the area of box packet. However, in measuring the concrete quantity if the area of the box or pocket in plan exceeds 0.1- sqm, deduction shall be made for the volume of the pocket.

No payment shall be made for holes to be made in formwork for inserting electrical conduits, hooks for fans, etc.

Group D **FORMWORK:**

The form work' shall generally comply with the requirements *of* the relevant IS:456.

The centering and shuttering must be properly designed as regards the stability, line any level and water tightness. The contractor must produce calculations to prove the stability *of* the centering. Apart from all the dead weights *of* wet concrete and centering an allowance *of* a live load *of* 500 kgs/sq.m shall be made. Attention is particularly drawn to proper bracing of the scaffolding. *If* timber scaffolding is proposed, the bracing shall be *of*

rectangular timber sections. Bamboo shall not be used for bracing. The props shall be square in section and shall be perfectly straight.

The contractor shall not proceed with concreting till the consultants approve the scheme and erection of centering and details of formwork.

The contractor will be allowed to remove vertical surface of formwork any time after forty-eight hours from the time of placing concrete. However, the contractor shall remain fully responsible for any damage to the concrete arising out of this and shall take at his own cost all corrective measures asked by the Architect.

GROUP E BRICK WORK:

Brick masonry in foundation and superstructure:

Only best quality locally available bricks of approved class designation as approved by, the consultants shall be used in the work.

Bricks shall be adequately soaked, before use in brick masonry work, by profusely spraying with clean water. Half or cut bricks shall not be used except when necessary to complete the bond.

Bricks shall be laid on the layer of mortar spread and shall be set in position by gently tapping. Inside faces shall be buttered with mortar, before the next brick is laid and pressed against it. All vertical joints shall be fully filled with mortar before next layer is laid. All courses shall be truly horizontal and vertical joints in alternative courses shall come directly over the other. All connected or brickwork shall be carried on simultaneously and no position of the work should be left more than only meter below the rest of the work. The thickness of joints shall not exceed 1 cm All face joints shall be raked to a depth of about 15 mm, when the mortar is still green. The face of brickwork shall be cleaned at the end of every day's work. Top courses of all plinth, parapet, and steps and below R.C.C. work shall be with brick on edge.

Brick work shall be protected from rain by suitable covering, when the mortar is green suitable marking indicating the date shall be given on each day's work. The surface of brick work shall be kept constantly moist, for a minimum period of 1 day. Holes for scaffolding shall not be allowed on columns, pillars or any brick work less than 1 mtr width. The supports of scaffolding shall be strong and tied to horizontal pieces, over which scaffolding planks shall be tied.

Openings, rebates cut outs etc. shall be required to be left in brick masonry work for ends of beams, bed plats, hold fasts, embedding pipes etc and the same shall be done as required as per drawings and directions of consultants.

Contractor may be required to leave openings in the one brick or half-brick masonry for running A.C.Ducts, pipes, Grilles, etc. The openings left may have to be closed with brick or half-brick work correct to size and shape. Nothing extra will be paid for executing such item.

Nothing extra will be payable/for brickwork in congested areas like shafts an: areas in between inclined RCC members, etc.

Double scaffolding will have to be done for one brick or half brick masonry work and no "key" for scaffolding shall be allowed in the masonry work. Nothing extra will be payable or this account.

For providing grooves, openings, cut outs, chases etc. in any type of brick masonry nothing extra shall be payable.

GROUP F: WOOD WORK

1. Timber

Timber shall be of good quality, well seasoned, free from sap-wood straight in grain, free from decay and dead knots, it shall be reasonably free from large knots, cracks and shakes and shall be of the kind and finish specified.

2. Second class teak:

Usual class of C.P.Teak and other teaks (including Burma, Siam and Malabar teak woods) which are not fit for being classed first class teak shall be classed under this grade. It shall generally conform to the specifications for "Timber" detailed in Para 1 above and shall have uniform colour. There shall generally not be more than 16 nor less than 3 growth rings per inch. The slopes of the grain shall not exceed 1 in 8. The aggregate diameter of all the knots in any piece shall not exceed 1/4th of its width. Individual knots shall not be more than 1" in diameter.

3. Soft-wood:

Kail, Chir and fir of good quality shall be classed under this grade.. It shall conform to the specifications for "Timber" detailed in Para 1 above. There shall not be more than 18 nor less than 8 growth rings per inch.

II. WOOD WORK WROUGHT FRAMED AND FIXED IN DOOR AND WINDOW FRAMES:

1 Timber

Specified timber shall be used. It shall have been sawn in the direction of the grain. Sawing shall be truly straight and square and free from wanes.

2. Wood work:

The work shall be done as per detailed drawings or as directed by the consultant.

The scantlings shall be accurately plane smooth to the full dimensions before being wrought.

3. Joints shall be accurate, neat and strong. Framed joints shall be coated with white lead or other approved paint before the frames are put together. All mortice and tenon joints shall fit fully and accurately without wedging or filling.

5. Finishing:

Woodwork shall be neatly wrought to the exact and true dimensions required. It shall not be painted, oiled or otherwise, treated before it has been approved by the Architect.

6. Coal Tarring:

All portions of timber abutting against or embedded in masonry or concrete shall be painted with boiling coal tar before being placed in position. Junctions of rafters, purlins, beams, wall plates, etc. shall be similarly treated.

7. No woodwork shall be buried in concrete or covered up in the walls until it has been approved by the Architect.

8. In place of coal tar, other wood preservative, such as red lead, if approved by the Architect, may be used.

9. Frames:

Frames shall be secured to the walls with iron holdfasts or separately, unless otherwise specified.

II. FULLY GLAZED DOORS AND WINDOWS:

1. Drawings:

The work shall be carried out in accordance with the drawings or such modifications thereof as are issued from time to time. The directions of the consultant shall be final in the matter.

2. Sills may be required or omitted by the consultant.

3. Timber

Specified timber shall be used. It shall have been sawn in the direction of the grain. It shall be truly straight and square and free from waness.

4. All pieces after being finished shall comply with the required dimensions without patching or plugging of any kind.

5. Frames:

The section and fixing of the frames shall be as shown on the drawings.

6. The sides of the frames abutting against, or portions embedded in the masonry, shall be painted with boiling coal tar or treated alternatively with red lead before being placed in position.

7. The lower ends of the verticals of the frames shall be buried in the floor to the extent of 1-1/2" when the sill is omitted. In the other case, the sill itself shall be buried in the floor to the same extent. The sill shall be protected from damage during construction.

The rebate and moulding on frames shall be as per drawings or as directed by the Architect.

9. Shutters:

The thickness of the shutters shall be as specified. They may be side or top hung, vertical or horizontal pivoted or fixed as per detailed drawings.

10. Styles and rails shall be properly and accurately mortised and tenoned. Rails, which are more than 7" in width, shall have two tenons.

11. Tenons shall pass clean through styles, when assembling a leaf, the styles shall be left projecting forming a horn. The various joints of the members shall be glued, assembled and secured by bamboo pins. The horns shall then be sawn off.

12. Lock and bottom rails haunched to the depth of panel grooves.

13. Panels shall be planed absolutely smooth. Their corners and edges shall be finished in accordance with detailed drawings or as directed by the Architect.

14. Panels shall be feather-tongued into styles and rails.

Sash bars shall be moulded and mitred on the outside and shall be rebated on the inside unless otherwise provided in the drawings.

16. Glazing:

Glazing shall be with good glass panes as approved by the Architect, as specified in S.Q. free from flaws stains scratches or bubbles. The glass shall be of approved manufacturer and shall confirm to IS: 1761 – 1960. The glass panes shall be property cut to fit the rebate of the sashes truly.

17. Glass panes shall be fixed by beading having mitred joints. For works in inferior class of timber, beading may not be used and the glass panes may be fixed with good soft putty. The putty shall be neatly chamfered and finished in straight line. The directions and/or drawings issued by the consultant shall only prevail.

Beading on both sides of glazing as indicated in detailed drawing shall be matched perfectly to their approval of the Architect.

18. Putty shall be made of best whiting (fine powdered chalk preferably passing through a size of 1600 mesh to the square inch) well mixed up by hand and kneaded with as much of pure linseed oil as will form it into a stiff paste.

19. Fittings:

Fittings, shall be of brass aluminium or iron as specified. These shall be provided as per schedule annexed with these specifications, unless otherwise specified.

20. Recesses shall be cut to the exact size and depths for the counter sinking of hinges.
21. Screws fixing the fittings shall be driven home with a screw driver and not hammered in and shall be countersunk wherever indicated in detailed drawings.
22. Wooden cleats and buffer blocks shall be fixed as directed by the Architect.

23. Measurements

The width shall, be measured outside to outside of frames. The height in the case of doors without sills shall be measured from the top of the floor to the top of frame. When however, wooden sills are provided, the height shall be measured from the bottom of the sill to the top of the frame.

III. HALF GLAZED AND HALF PANELLED DOORS

1. Drawings:

The work shall be carried out accordance with the drawings or such modifications thereof as are issued from time to time. The directions of the Architect shall be final in this matter.

2. Other details:

Other specifications shall be the same for Fully glaze doors

IV PANNELED DOORS

1. Drawings

The work shall be carried out in accordance with the drawings or such modifications thereof, as are issued from time to time. The directions of the Architect shall be final in this matter.

Other details

Other specifications shall be the same as for "Fully Glazed Doors" except for "glazing" which will not be necessary in these doors. The wood shall be of size and thickness as shown in the drawing with rebates for receiving the panelling. Beading of specified size shall be fixed around the panelling. Panelling shall be of 12mm thick commercial ply teak ply of approved quality and manufacture.

V. WIRE GAUGE FLYPROOF SHUTTERS

1. Drawings

The work shall be carried out in accordance with the drawings or such modifications thereof as are issued from time to time. The directions of the Architect shall be final in this matter.

2. Frames:

Where wire gauge shutters have to be provided the same frame as the ordinary door or window, the thickness of the frames shall be increased by the specified thickness of the shutters.

3. Shutters:

The thickness of the shutters shall be as specified. Styles and rails shall conform to the specifications detailed for these under "Fully Glazed Doors" except that these shall be rebated to receive the wire gauge, which shall run from the panels.

4. The wire gauge shall be bent at right angles in rebates of styles and rails, turned back and fixed with wooden beading.

5. Wire Gauge:

The wire gauge shall be of 12 mesh per linear inch made of 22 imperial S.W.G. wires.

VI. FLUSH DOOR SHUTTER SPECIFICATIONS

GENERAL

The flush door shutters shall be obtained, from firms of repute, as approved by the Consultants. The contractor shall require bringing a full size sample door and fittings and getting these approved in writing by the Consultants. He shall then arrange supply in accordance with the approved sample. Flush door shutters with first class teak veneering: The shutters shall be as per design, of block board construction and specified thickness. These shall consist of a solid (fully filled) core, laminated or slotted, cove edged with two or three veneers on each face and lipped on all the edges with 1st class, teakwood battens. The facing veneers shall be of 1st class teak. A tolerance of 1/32 inch (1 mm) will be allowed in the thickness of shutters.

Flush door shutters of commercial Type: The specifications for these shutters shall be the same as for flush door shutters with first class teak veneers except that:

- a) The core surfaces shall have two veneers firmly glued on each face of the core. The combined thickness of veneers on each face shall not be less than 4 millimetres.
- b) The lipping battens and the facing veneer shall be of Elm-wood (i.e. Kanju wood) or its equivalent commercial woods Class I as per I.S. specifications IS. 303-1951 in place of first class teak wood.

- c) Flush panel doors shall be of five or more ply block board construction. These shall consist; of a solid (fully filled) core, laminated or slotted, covered with two or more veneers on each face and lipped on all the edges with 1st class teak wood battens. The facing veneers shall of 1st class teak.
- d) **Core:** The core shall be of wood laminae prepared from battens or well seasoned and treated good quality wood, having straight grains. The battens shall be of uniform size pressed together with grains of each piece reversed from that of the adjoining one. The longitudinal joints of the battens shall be staggered and no piece shall be less than 1' 6" in length. Alternatively, the core shall be of, solid board with staggered slots extending for about two-third of depth of approximately 3/4' spacing.
- e) **Lipping:** All the edges of core shall be lipped with 1st class teak wood battens of 1" minimum depth, glued and machine pressed along with the core.
- f) **Veneers:** The core surface shall then have two or more veneers firmly glued on each face. The first veneer (called; cross band) shall be laid with its grains at right angles to these of the; core and the second and third veneers with their grains parallel to them. That under veneers shall of good quality, durable and well seasoned and of well matched and seasoned first class teak, laid along the grains of the core battens. The combined thickness of all the veneers on each face shall not be less than four millimetres.
- g) **General:** The flush panel door shutters shall be obtained from firms of repute that may be approved by the Architect or any other officer authorised by him.

GROUP G: Structural steel fabrication in single and / or built up section:

The scope of work envisaged under the supply, fabrication and erection of structural steel shall, in addition to that described in the item shall also include :

- a) Preparation of fabrication and erection drawings and getting the same approved by the consultants.
- b) Preparation of full scale models for various junctions, if so required.
- c) Transport of fabricated until to place of erection.
- d) Erection of necessary scaffolding erection and supporting devices, during erection and maintaining them as required.

The structural steel used in the works, shall conform to IS 226. These shall be procured only from standard manufacturers, duly approved the consultant. Products manufactured by re-rolling mills shall not be allowed to be used in the work, Electrodes used for welding shall conform to IS 814 and welding shall be done as per IS 823. Bolts and nuts shall conform to IS 1367 and washers shall be as per IS 2021.

Each lot of materials procured by the contractors and brought to the site for incorporation in the works shall be marked for identification and shall be accompanied by Test certificate.

The steel structure shall be laid out in full scale on a level platform, preferably of concrete and/or brick, plastered with cement mortar. The layout shall be got checked and approved; by the Consultant, before the fabrication is started.

The individual members shall be straightened and cut square to correct lengths. The cut ends shall be finished smooth. No two pieces shall be welded or otherwise joined to make the required length of a member.

Welding shall be done by electric arc method. Gas welding shall not be permitted. The welding of the structure should be completed to the maximum extent feasible, before erection. Welding surface shall be free from loose mill scale, rust, paint, grease or other foreign matter while welding. It should be ensured/that:

- i) The base metal is in a fused stage
- ii) The filler metal does not overflow on any unused base metal and
- iii) The base metal is not under cut.

After every interruption, the arc shall be restarted ahead of the previous deposit and moved back to fill the crater. The weld shall be free from cracks, discontinuity in welding and should be free from defects such as under or over size, under or over cutting.

Before welding is commence the plate and the members should be laid out correctly and clamped together or spot welded.

Primer paint shall be applied, before erection.

T-Iron Frame for doors:

The Tee Iron shall be of S.T. 32-0 grade conforming to IS. 1977-1969. The members shall be cut to size as per drawings and joints shall be mitred. The corners of the frame shall be butt-welded and shall form a right angle. Requisite number of holes shall be made in the frame for fixing of fittings. Lugs shall be welded to the frame as shown in the drawings and shall be embedded in cement concrete blocks. A priming coat of paint, with

steel primer of approved manufacture and shade, shall be applied before the frames are fixed in position.

G.2 Steel doors, windows etc.

These shall be fabricated out of standard rolled steel sections; or weight conforming to IS 1038 - 1968 and quality conforming to IS 1977 1969. Joint shall be mitred and shall be welded to form a solid fused welded joint. Welding should be done all along the meeting points of members. The joints should not have any cavities welding shall be ground properly to give a smooth surface.

The hinges shall be of projected the of approved design. The hinge pin shall be of galvanised steel. The handle plate should be welded to the frame before the glazing is fixed. Handles, tower bolts, stays etc. shall be of approved sample and manufacture.

Glass panes of approved manufacture shall only be used in the window. Glass shall conform to the specifications described under the item of glazed teak wood shutters. Metal sash putty conforming to IS 420 – 1953 shall be used for fixing glass panes. Quantity of putty used shall not be less than 185 gm/metre of glass perimeter. Putty shall be painted within 2 weeks, after glazing is fixed. Glazing clips shall be fixed on vertical members, at spacing of not more than 25 cms. Holes for glazing clips shall be provided at the time of fabrication.

All steel surfaces shall be thoroughly cleaned of rust, scale and dirt and a coat of approved steel primer paint shall be applied, before the windows/doors are fixed in position. Lugs not less than 10 cms long fabricated out of 15 x 3mm MS flat shall be welded to the frames and embedded in cement "concrete blocks 15 x 10 x 10 cm size of 1:3:6 mix.

G.3 Wire gauge shutters:

Wire gauge of specification, as described under the item of teak wood wire gauge shutters shall be used. The size of rolled steel section for the wire gauge shutters shall be as per drawings.

STEEL DOORS, WINDOWS AND SASHES

They may be side, top, or centre hung, long vertical, or horizontally pivoted or fixed, and of composite sizes as detailed on the drawings, jointed together side by side or on top of one another by fabricated mullions (vertical coupling members) or transoms (horizontal coupling members) as may be require and as shown on the drawings. The size of the section shall be such as to be adequate for the specific type shown on the drawings. The contractor must include in his rate for additional strengthening members for large sizes of windows and wherever necessary. All sizes shown on the drawings are overall heights and widths of the outside frames of steel windows. The sizes indicated on the drawings shall not vary plus or minus 1/16" (1.5 mm). Weather bars shall be used wherever necessary.

Fabrication: Frames shall be square and flat. Both the fixed and the opening frames shall be constructed of adequate sections for specific type out to proper lengths, mitred and corners electrically flush welded to a true right angle. Sub-dividing bars where necessary shall be tenoned and riveted into the frame.

Side hung shutters: These may be left or right handed, as shown on the drawings. Each shutter shall have two projecting steel hinges 2-5/8" (67 mm) wide with brass pins seated and welded into slots cut in the frames. Friction hinges if in Indian Standard Specification referred to above. Each shutter shall be provided with one heavy Bronx (gun metal) standard handle weighing not less than 165 grammas each with bolt but without striking

plate, mounted on steel plate welded to the opening frames. The handle shall have two point nose, which shall engage a brass striking plate provided on the fixed frame. Each shutter shall have one bronze (gun metal) peg stay arm 12" (300 mm) long and weighing not less than 235 grammes (without cleat) having holes for keeping the shutter open in three different position. The peg and locking brackets shall be welded to the fixed frame and shutter frame respectively.

4. Vertically pivoted shutters: Section for this type of shutters shall be such that the window shutter is waterproof. Each shutter shall be pivot hung on two pairs of bronze (gun metal) tapered cup friction centre. Each shutter shall be provided with handles and peg stays as specified for side hung shutters.

5. Top hung shutters:

Each shutter shall have two plain steel hinges with brass pins, riveted or welded into the slot cut in the frame. The peg stay shall be similar as per side hung shutters but 18" (45 mm) long. The locking bracket shall be fixed to the frame.

Centre hung shutter:

Each shutter shall be hung on two pairs bronze cup pivots (friction type) riveted to the outer and inner frame to permit the shutter to swing through an angle approximately 85 Degree. (upper part opening inside and the lower part outside). It shall be so balanced that it remains open at any desired angle. Each shutter shall be fitted with bronze spring catch weighing not less than 100 grmmes (without cleat) secured to the frame with brass screws and shall close into the mild steel malleable iron catch plate welded to the outer frame. A cord pully wheel (brass) in malleable iron bracket shall be welded to the will of the frame together with mild steel eye-welded to the bottom of the shutters in a position corresponding to that of the pully.

Shop finish:

All steel surfaces shall be thoroughly cleaned free of rust, scale burrs, or dirt and mill scale by pickling or phosphating and immediately painted with two coats of ready mixed, red lead non- setting, primer conforming to IS 102-1950 before dispatch.

GROUP H. FLOORING:

H.1 CEMENT CONCRETE FLOORING:

The surface on which the flooring is laid shall be wetted and smeared with a coat of neat cement slurry after the surface is thoroughly cleaned and laitance removed in the sub grade.

Flooring shall be laid to require thickness as specified in the description of item. The flooring shall be laid in panels as directed by the Consultant. Area of each panel shall not exceed 2 sqm and length in any direction shall not exceed 2 meters. The panels shall be made by fixing 4 mm thick glass panes and of width; same as flooring thickness in cement mortar 1:2. The top edge of the strip shall be at proper level as per directions of consultant and the flooring shall be laid to the same level. Alternate panels shall be laid on different days.

Concrete of quality and conforming to specifications, described under the group "Cement Concrete work shall be used for flooring work.

Immediately after the cessation of beating to consolidate the concrete, the surface shall

be left for some time for the moisture to dry up. Dry cement shall then be mixed with water to form a thick slurry and shall be properly pressed on to the flooring and finished smooth. The junctions of floor with skirting, dado etc shall be rounded off, where so desired.

Curing shall be started after hardening and shall be continued for a minimum period of ten days. The surface shall not be covered with gunny cloth or any other material (to facilitate the curing), which may leave permanent, blots on the surface. The surface shall be tested with straight edges and corrected if necessary.

H.2 CEMENT MORTAR SKIRTING:

The skirting shall be flush with the wall plaster or project out uniformly as desired, from the wall plaster, on all sides of the room. The thickness of skirting shall be exclusive of the keys or grooves in brickwork. The surface on which skirting is done shall be thoroughly cleaned, washed and kept wet before the skirting is commenced. The plaster shall be finished with neat cement slurry. The top surface shall be truly horizontal and the edges and top and shall be finished neat and smooth.

Curing shall be started from the next day after skirting and shall be done continuously for the next 7 days.

H.3 Kota stone flooring/skirting/counter Top:

The stones shall be of approved quality and shade and shall be machine cut to the required thickness. The stone shall be hard sound, dense, homogeneous in texture, free from cracks, decay weathering and flaws. The slabs shall have the top surface polished.

The stones shall be fine chisel dressed on the sides to full depth. The sides shall be table rubbed before laying. Mortar shall be spread uniformly and the stone shall be laid on top, tapped with wooden mallet, to bring it at level with adjoining slabs. The top surface of mortar shall then be corrected by adding fresh mortar in the hollows. The mortar shall then be allowed to harden a bit and cement slurry shall be spread over the mortar. The edges of adjacent stone slabs shall be buttered with cement slurry mixed with pigment to match the shade of the stone.

The flooring shall be cured for a minimum of 7 days. The stones fixed adjoining the walls shall enter not less than 12 mm under the plaster, skirting or dado. The grinding and polishing shall be done with carborandum stones of grade 120 and 320. In case of skirting the top line shall be cut straight to line and shall be ground and polished, as the vertical surface.

H.4 Marble flooring, skirting and counter tops:

Marble used in the works shall be hard, sound, dense, homogenous in texture and uniform in colour, free from stains, cracks, decay and weathering, The moisture absorption after 24 hours of immersion in water should not exceed 0.4% by weight. Hardness, on khos scale shall be minimum of 3. specific gravity, determined as per IS 1122 – 1974 shall not be less than 2.5

Marble slabs/tiles from the same block shall be used in one area. The marble slabs shall be of thickness and size as specified in the drawings and the quality shall be got approved by the Consultant, before laying. The method of lying rubbing and polishing shall be the same, as specified for kota-stone flooring.

H.5 Red Sand Stone flooring, cladding/dadoing and other miscellaneous usage

The stones shall be of approved quality and shade and shall be machine art to the required thickness. The stone shall be hard sound, dense, homogeneous in texture, free from cracks; decay, weathering of flaws. The top surface shall be polished or chisel finished as indicated in detailed drawings. The stone slabs shall be of thickness and size as specified in the drawing and the quality shall be got approved by the consultant before laying. The method of laying shall be the same as specified for Kota-stone flooring.

H.6 Granite Flooring

The specifications shall be the same as applicable to Red sandstone and Kota stone.

H:7 Glazed tile dados

The tiles shall be of approved manufacture and shall be of size, as shown in the drawings. They shall be true to size, with right-angled corners, free from cracks, crazing spots, chipped edges and corners. Glazing shall be uniform, all over the surface.

The surface on which the dado is fixed shall be cleaned thoroughly washed with water and kept wet, before the skirting/dado work is commenced.

B. **TECHNICAL SPECIFICATIONS FOR SANITARY/PLUMBING WORK**

SECTION I - GENERAL TECHNICAL CONDITIONS

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 and/or shown on the plumbing drawings.

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

Sanitary Fixtures.

Soil, Waste, Rainwater and vent pipes.

Water supply (internal & External).

Garden hydrant system.

External Sewerage system.

Storm water drainage system.

Pumps and equipments.

- 1.3 Services rendered under sub-section 1.4 shall be done without any extra charge.
- 1.4 The contractor must get acquainted with the proposed site for the works and study 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 unavoidable 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.

Works area shall be areas shown in the plan attached.

2. **SPECIFICATIONS**

- 2.1 Work under this contract shall be carried out strictly in accordance with specifications attached with the tender.
- 2.2 Items not covered under these specifications due to any ambiguity or misprints, or additional works, the work shall be carried out as per latest specifications of the Central Public Works Department with latest amendments as applicable in the contract.
- 2.3 Works not covered under Para 2.1 and 2.2 shall be carried out as per relevant Indian Standards specifications or codes of practice and, if not available, as per British standards specifications or codes of practice or unified plumbing code of U.S.A.

3. **EXECUTION OF WORK**

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

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.

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 along with the specified phasing, if any.

4. DRAWINGS

- 4.1 Plumbing drawings are diagrammatic but shall be followed as closely as actual construction permits. Any deviations made shall be in conformity with the architectural and other services drawings.
- 4.2 Architectural drawings shall take precedence over plumbing or other services drawings as to all dimensions.
- 4.3 Contractor shall verify all dimensions at site and bring to the notice of the Architects or Engineer-in-Charge all discrepancies or deviations noticed. Architects decision shall be final.
- 4.4 Large size details and manufacturers dimensions for materials to be incorporated shall take precedence over small-scale drawings.
- 4.5 Any drawings supplied with the tender shall be returned in good conditions along with the tender.
- 4.6 Any drawings issued by the Architects/Consultant for the works are the property of the Architects/Consultant and shall not be lent, reproduced or used on any works other than intended without the written permission of the Architects/Consultant.

5. INSPECTIONS AND TESTING OF MATERIALS

- 5.1 Contractor shall be required, if requested, to produce manufacturers test certificate for the particular batch of materials supplied to him. The tests carried out shall be as per the relevant Indian standards.
- 5.2 For examination and testing of materials and works at the site contractor shall provide all testing and gauging equipment necessary but not limited to the followings:
 - a) Theodolite
 - b) Dumpy level
 - c) Steel tapes
 - d) Weighing machine
 - e) Plumb bobs, Spirit levels, Hammers
 - f) MicrometersThermometers, Stoves
Hydraulic test machine
Smoke test machine
- 5.3 All such equipment shall be tested for calibration at any approved laboratory, if required by the Engineer-in-Charge.
- 5.4 All testing equipment shall be preferably located in special room meant for the purpose.

6. METRIC CONVERSION

- 6.1 All dimensions and sizes of materials and equipment given in the tender document are commercial metric sizes.
- 6.2 Any weights, or sizes given in the tender having changed due to metric conversion, the nearest equivalent sizes accepted by Indian standards shall be acceptable without any additional cost.

7. REFERENCE POINTS

7.1 Contractor shall provide permanent bench marks, flag tops and other reference points for the proper execution of work and these shall be preserved till the end of the work.

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

8. REFERENCE DRAWINGS

8.1 The contractor shall maintain one set of all drawings issued to him as reference drawings. These shall not be used on site.

All corrections, deviations and changes made on the site shall be shown on these reference drawings for final incorporation in the completion drawings. All changes to be made shall be initialled by the Engineer-in-Charge.

9 SHOP DRAWINGS

9.1 The contractor shall submit to the Engineer-in-Charge four copies of the shop drawings.

9.2 Shop drawings shall be submitted under following conditions:

- a) Showing any changes in layout in the plumbing drawings.
- b) Equipment layout and piping, wiring diagram.
- c) Manufacturer or contractor's fabrication drawing for any materials or equipment supplied by him.

9.3 The contractor shall submit four copies catalogues manufacturers drawings, equipment characteristic data or performance charts as required by the Engineer-in-charge.

10. COMPLETION DRAWINGS

10.1 On completion of work, contractor shall submit one complete set of original tracings and two prints of "as built" drawings to the Engineer-in-Charge. These drawings shall have the following information:

- a) Run of all piping & diameters on all floors and vertical stacks.
- b) Ground and invert levels of all drainage pipes together with location of all manholes and connections upto outfall.
- c) Run of all water supply lines with diameters, locations, of control valves, access panels.
- d) Location of all mechanical equipment with layout and piping connections.

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

10.3 All "Warranty cards" given by the manufacturers shall be handed over to the Engineer-in-Charge.

11 CONTRACTORS RATES

11.1 Rates quoted in this tender shall be inclusive of cost of materials, labour, supervision,

erection, tools, plant, scaffolding, service connections, transport to site, taxes, octroi and levies, breakage, wastage and all such expenses as may be necessary and required to completely do all the items of work and put them in a working condition.

- 11.2 Rates quoted are for all heights and depths required for this work.
- 11.3 All rates quoted must be for complete items inclusive of all such accessories, fixtures and fixing arrangements, nuts, bolts, hangers as are a standard part of the particular item except where specially mentioned otherwise.
- 11.4 All rates quoted are inclusive of cutting holes and chases in walls and floors and making good the same with cement mortar / concrete of appropriate mix and strength as directed by Engineer-in-Charge. Contractor shall provide holes, sleeves, recesses in the concrete and masonry work as the work proceeds.
- 11.5 Rates quoted shall be inclusive of cost incurred in testing, commissioning of works and materials.

12. **TESTING**

- 12.1 Piping and drainage works shall be tested as specified under the relevant clauses of the specifications.
- 12.2 Tests shall be performed in the presence of the Engineer-in-Charge / Consultant.
- 12.3 All materials and equipment found defective shall be replaced and whole work tested to meet the requirements of the specifications.
- 12.4 Contractor shall perform all such tests as may be necessary and required by the local authorities to meet Municipal or other bye-laws in force.
- 12.5 Contractor shall provide all layout, equipment and criteria for the performance of the tests.

13. **SITE CLEARANCE AND CLEANUP**

- 13.1.1 The contractor shall, from time to time clear away all debris and excess materials accumulated at the site.
- 13.1.2 After the fixtures, equipment and appliances have been installed and commissioned, contractor shall clean-up the same and remove all plaster, paints, stains, Stickers and other foreign matter of discoloration leaving the same in a ready to use condition.
- 13.3 On completion of all works, contractor shall demolish all store, remove all surplus materials and leave the site in a ready to use condition. Failing which the same shall be done at contractor's risk and cost.

14 **LICENCE AND PERMITS**

- 14.1.1 Contractor must hold a valid plumbing license issued by the Municipal authority or other competent authority under; whose jurisdiction the work falls.
- 14.1.2 Contractor must keep constant liaison with the Municipal authority and obtain approval of all drainage and water supply works carried out by him.
- 14.3 Contractor shall obtain, from the Municipal Authority, completion certificate. With respect to his work as required for occupation of the building.
- 14.4 All inspection fees or submission fees paid by the contractor shall be reimbursed by the employer on production of valid official receipts.

15 **RECOVERY OF COST FOR MATERIALS ISSUED TO CONTRACTORS FREE OF COST**

- 15.1 If any materials issued to the contractor, free of cost, are damaged or pilfered, the cost of the same shall be recovered from the contractor on the basis of actual cost to owner which shall include all freight and transportation, excise duty sales tax, octrio, import duty etc, plus 50%. The actual cost given by the employer shall be final and binding on the contractor

16 CUTTING & MAKING GOOD

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

17 MATERIALS SUPPLYING BY EMPLOYER

- 17.1 The contractor shall verify that all materials supplied I by the employer conform to the specifications of the relevant item in the tender. Any discrepancy found shall be brought to the notice of the Engineer-in-charge.

18 MATERIALS

- 18.1 All materials used in the works shall conform to the tender specification.
18.2 As far as possible materials bearing I.S. certification marks shall be used with the approval of the Engineer-in-Charge.
18.3 unless otherwise specified and expressly approved in writing by the engineer-in-Charge, materials of makes and specification mentioned with tender shall be used.

19 MOCK UP

The contractor shall install all pipes, fixtures, clamps and accessories and fixing devise 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 reuse 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 work repaired by other agencies and debit the cost of such repairs to the contractor.

End of the Section-I

TECHNICAL PLUMBING SPECIFICATION
SANITARY FIXTURES

SECTION-II

1. **SCOPE OF WORK**

- 1.1.1 Work under this section shall consist of furnishing all material and labour as necessary and required to all sanitary fixtures, brass and chromium plated fittings and accessories as required by the drawings and specified hereinafter given in the schedule of quantities
- 1.2 Without restricting to the generality of the foregoing the sanitary fixtures shall include all sanitary fixtures, C.P. fittings and accessories etc. necessary and required for the building.
- 1.3 Whether specifically mentioned or not all fixtures and appliances shall be provided with all fixing devices, nuts, bolts, screws, hangers as required

2. **GENERAL REQUIREMENTS**

- 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.
- 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.
- 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.
- 2.4 All fittings and fixtures shall be fixed; in a neat workman like manner true to levels and heights as 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 contractors cost.
- 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.

3. **Indian W.C.**

- 3.1 Indian W.C. pan shall be Orissa pattern of specified in the schedule of quantities shall be provided with a 100 mm dia cast or porcelain P or S traps with or without vent horn as required as per site.
- 3.2 W.C. shall be flushed by means of a C.I. high level flushing cistern or low level cistern of polyethylene body complete with accessories as specified in bill of quantities.
- 3.3 The W.C. shall be fixed in level in a neat workman like manner. The W.C. and trap shall be set in cement concrete 1:2:4 mix (cement: 2 coarse sand: 4 stone aggregate 20mm nominal size) joints between W.C. and flush pipe shall be made with a putty or white lead and linseed oil and caulked well or with an approved rubber joint.

4.0 **ANGLO INDIAN W.C.**

- 4.1 Anglo Indian W.C. shall be wash down type 'P' or 'S' Trap set.
- 4.2 Each Anglo Indian W.C. set shall be provided with a solid plastic seat with cover of colour given in the schedule of quantities, rubber buffers and chromium-plated hinges.
- 4.3 Plastic seat shall be so fixed that it remains absolutely stationary in vertical position without falling down on the W.C.
- 4.4 Each Anglo Indian W.C shall be flushed with a porcelain flushing cistern or an exposed or concealed type flush Valve. Flush pipe/bend shall be connected to the W.C by means of a suitable rubber adapter.

5.0 **EUROPEAN W.C.**

- 5.1 European W.C. shall be wash down, single or double symphonic type, floor or wall mounted set, flushed by means of matching porcelain low level flushing cistern, or an exposed or concealed type flush valve, as specified in schedule of quantities. Flush pipe/bend shall be connected to the W.C. by means of suitable rubber adaptor. Wall hung W.C. shall be supported by C.I. floor mounted chair.
- 5.2 Each W.C. seat shall be absolutely stationary in falling down on the W.C..

6.0 **URINALS**

- 6.1 Urinals shall be as specified in the price bid or lipped type half stall white glazed vitreous China of app. size 630x420x380mm size as approved.
- 6.2 Half stall Urinals shall be provided with 15 mm dia C.P. spreader, 32 mm dia C.P. domical waste and C.P. cast brass bottle trap with pipe and will flange, and shall be fixed to wall by one C.I. bracket and two C.I. wall clips as recommended by manufacturers complete as directed by Engineer-in-Charge.
- 6.3 Flushing cistern for urinals shall be automatic type cast iron or vitreous china as given in the schedule of quantities. Each flushing cistern shall have a copper siphon and inlet noose cock to control the flow. Flushing cistern shall be fixed to wall with C.I. brackets. Cast iron cistern and brackets shall be painted with two coats of white enamel paint. Cistern may be concealed in pipe shafts or false ceilings where required as directed by Engineer-in-charge.

- 6.4 Flush pipes of flushing cistern with sizes of main and branch flush pipes shall be as follows:-

No. of Urinals In range	Capacity of cistern liters	Size of main flush pipe	Size of branch flush pipe	Size of connection to urinal
One	5	--	--	15
Two	10	20	--	15
Three	10	25	--	15

- 6.5 Alternatively, urinals may be flush with flush valves, exposed or concealed type.

- 6.6 Waste pipes for urinals shall be any one of the following:

- a) G.I. Pipes
- b) Rigid P.V.C.
- c) Lead pipes

Waste pipes may be exposed on wall or concealed in chase as directed by the Engineer-in-Charge. Specifications for waste pipes shall be same as given in sub-section 8.0 to 10.0 Section III.

7. **LAVATORY**

- 7.1 Lavatory basins shall be white glazed vitreous china or polymarble of size, shape and type specified in the bill of quantities.
- 7.2 Each basin shall be provided with C.I. clips and the basin securely fixed to wall basins over the brackets without secure not be accepted.
- 7.3 Each basin shall be provided with 32mm *dia* C.P. waste with overflow, pop-up waste or rubber plug and *chain* as given *in the bill of quantities* 32mm *dia* C.P. brass bottle trap with C.P.
- 7.4 Each basin shall be provided with fittings or mixing fitting as specified in the bill of quantities.
- 7.5 Basins shall be fixed at proper heights as shown on drawings. If height is not specified, the rim level shall be 79 cms above the floor or as Engineer-in-charge.

8.0 **SINKS**

- 8.1 Sinks shall be of precast Terrazzo marble, or white glazed fireclay or vitreous china or stainless steel or any other material a specified in the schedule of quantities.
- 8.2 Each sink shall be provided with C.I. brackets and clips and securely fixed. Counter top sinks shall be fixed with suitable angle iron clips or brackets as recommended by the manufacturer. Each sink shall be provided with 40 mm dia C.P. waste with chain and plug or P.V.C. waste. Fixing shall be done as directed by Engineer-in-charge. :
- 8.3 Supply fittings for sinks shall be mixing fittings or C.P. taps as specified in the bill of quantities.

9.0 **MIRRORS**

- 9.1 Mirrors shall be electro coated copper 5.5 mm thick of guaranteed reputed make (as given in the guide list of approved materials. The size shall be specified in the bill of quantities or shown on the drawings. The image shall be clear and without waviness at all angles of vision.
- 9.2 Mirrors shall be plywood be provided with backing of 12 mm thick or 6 mm thick cement asbestos sheet fixed with C.P. brass semi round headed screws and cup washers or C.P. brass clamps as specified or instruction by Engineer-in-Charge.

10.0 **SHOWER SET -**

- 10.1 Shower set shall comprise of one / two C.P. brass concealed stock cocks with two long body brass / C.P. brass / bib cock, or bath spout or of quantities.
- 10.2 Each shower set shall also be provided with C.P. shower arm with flange and showerhead of approved quality as specified in the bill of quantities.
- 10.3 Concealed stop cocks shall be so fixed as to keep the wall flange clear off the finished wall. Wall flanges embedded in the finishing shall not be accented.

11 **ACCESSORIES**

- 11.1 Contractor shall install all chromium plated and porcelain accessories as show in the

drawing or directed by engineer-in-charge, and given in the bill of quantities.

11.2 All C.P.accessories shall be fixed with C. round head screws and cup washers in wall plugs or nylon sleeves and shall include making good as required or directed by Engineer-in-Charge.

11.2 Porcelain accessories shall be fixed in walls and set in cement mortar 1:2(1 cement : 2coars sand) and fixed in relation to the riling work.

12. URINAL PARTITIONS

12.1 urinal partitions shall be white glazed vitreous china or 25mm thick marble of size specified in the bill of quantities.

12.2 Porcelain partitions shall be fixed at proper heights with C.P. brass bolts, anchor fasteners and M.S. clips as recommended by the manufacturer and directed by Engineer-in-Charge.

13.0 MEASUREMENT

13.1 Rate for providing and fixing of sanitary fixtures accessories, urinal partitions shall include all items. And operations stated in the respective specifications and bill of quantities and nothing extra is payable.

13.1 Rates for all items under specifications Para above shall be inclusive of cutting holes and chases and making good the same, C.P.screw, nuts, bolts and any fixing arrangements required and recommended by manufacturers., testing and commissioning.

End of section II

1 **SCOPE OF WORK**

- 1.1 Work under this section shall consist of furnishing all labour, materials, equipments and appliances necessary and required to completely install all soil, waste, Vent and rainwater pipes as required by the drawings, specified hereinafter and given in the bill of quantities.
- 11.2 Without restricting to the generality of the foregoing the soil, waste Vent and rainwater pipes system shall include the followings:-
- a) Vertical and horizontal soil vent waste and vent pipes rainwater pipes and fitting, joint clamps and connections to fixtures.
 - b) Connection of pipes to gully traps & manholes etc.
 - c) Floor and urinal traps cleanout plugs, inlet fittings and rainwater heads as specified.
 - d) Waste pipes connections from all fixtures e.g. wash basins, sinks urinals, kitchen equipments.
 - e) Testing of all pipes.

2 **GENERAL REQUIREMENTS**

- 2.1 All materials shall be new of the best quality conforming specifications and subject to the approval of Engineer-in-Charge.
- 2.2 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner.
- 2.3 Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall cause obstruction in shafts, passages etc.
- 2.4 Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals as specified.
- 2.5 Access doors for fittings and cleanouts shall be so located that they are easily accessible for repair and maintenance.
- 2.6 All works shall be executed as directed by Engineer-in-Charge.

3.1 **CAST IRON PIPES & FITTINGS**

- 3.1.1 Soil, Waste, vent anti-siphon age and rainwater pipes shall be cast iron pipes. All pipes shall be straight and smooth and inside free from irregular bore, blowholes, cracks and other manufacturing defects. Pipes shall be centrifugally spun iron soil pipes conforming to I.S. 3989-1970, or sand-cast I.S. 1729-1967.
- 3.1.2 Standard weight dimensions and pig lead required for joints shall be as follows:-

For pipes conforming to I.S. 3989 – 1970 (centrifugally spun soil pipes)

Nominal	Diameter	Thickness	Overall Weight 6' length or 1.83 M	Internal diameter of of socket	Depth of lead
INCH	MM	MM	KG	MM	MM
2	50	3.5	8.5	73	25
3	75	3.5	12.7	99	25.
4	100	4.0	19.2	126	25
6	150	5.0	35.5	178	38

For conforming to I.S. 1729-1967 (sand cast iron soil pipes and fittings)

Nominal	Diameter	Thickness	Overall Weight 6' length or 1.83 M	Internal diameter of socket	Depth of lead
MM	MM	KG	MM	MM	INCH
2	50	5	11.41	76	25
3	75	5	16.52	101	25
4	100	5	21.67	129	25
6	150	5	31.91	181	38

3.1.3 **Tolerance**

Acceptable tolerance for pipes to I.S. 3989 and I.S. 1729 shall be as follows:-

- a) Wall thickness -15%
- b) Length Weight +20 mm
- c) Weight -10%

3.2 **Fittings**

3.2.1 Fittings shall conform to the same Indian standard specifications.

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

3.2.3 Access door shall be made up with 3mm tick insertion rubber washer and white lead. For cosy removal later. The fixing shall be air and water tight.

3.2.4 **Fixing**

3.3.1 All vertical pipes shall be fixed by M.S. Clamps truly vertical. Branch pipes shall be connected to the stick at the same angle as that of the fittings. No collars shall be used on vertical stacks. Each stack shall be terminated at top as directed by the Engineer-in Charge.

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

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

3.4 **Cast Iron Pipes for Drainage**

3.4.1 All drainage lines passing under building, floors and roads, in exposed position above ground or at basement ceiling level shall be C.I. LA pipes position of such pipes shall be generally shown either on ground level drawings or upper basement.

3.4.2 Cast iron pipes shall be centrifugally spun iron pipes conforming to 1.5. 1536-19'67. Quality certificates shall be furnished.

3.4.3 **Fittings Inspection Chambers**

a) Fittings used for C.I. drainage pipe shall conform to I.S. 1538-1967. Wherever possible junction from branch pipes shall be made by a My-tree.

b) Contractor shall provide cast iron inspection chamber at all junction as indicated on drawings or directed by Architects. Inspection chambers shall be specially cast with inlet, outlet and branches of appropriate and required sizes. Branches shall be 'Y' type wherever possible.

c) Cleanout plugs shall be provided on head of each drain and at location indicated on Plan directed by architects. Cleanout plugs shall be of size catching the full bore of the pipe. Plugs shall be made out with G. I. coupling caulked into the socket of the pipe or fittings. The end shall be provided with a brass screwed plug with suitable key for opening. -

Laving

a) All cast iron pipes and fittings shall be jointed with best quality soft pig lead which shall be free from impurities. In wet trenches joints shall be made from lead wool. Nothing extra will be a paid or lead wool joint. Depth of pig lead and weight for joints shall be as given in sub section 3.1.2. of section II.

b) The spigot of pipe or fittings shall be centered in the ad-jointing socket by caulking. Sufficient turns of tarred gaskin will be given to leave unfilled the required depth of socket for depth of 45mm when the gaskin has been caulked tightly to the barrel and against the face of the socket. Molten pig lead shall then be poured to fill the remainder of the socket. This shall then be done in our pouring. The lead shall then be solidly caulked with suitable tools and hammers weighting not less than 2 kg.

c) For lead wool joints the socket shall be caulked with tarred gaskin, as explained above. The lead wool shall be inserted into the sockets and tightly caulked home by skein with suitable tools and hammers of not less than 2 Kg weight until joint is filled.

Testing

All cast iron pipes for drainage shall be tested to a hydraulic test of 3-meter head. Test for straightness shall be same as for stoneware pipe as given 4.4 (B) of Section VI. A test register shall be maintained which shall be signed and dated by contractor, and representative of architects.

4.0 **Clamps**

4.1 M.S. clamps shall be of standard design and fabricated from M.S. flat 40x3mm thick. They shall be painted with two coats of black bitumen paint before fixing.

- 4.2 Where M.S. clamps are to be fixed on RCC columns or slotted angles, walls or beam they shall be fixed with 40x3mm flat iron "U" type clamps with anchor fasteners of approved design or 6mm nuts and bolts.
- 4.3 Structural clamps shall be fabricated from M.S. structural member e.g. rods, angles, channels flats as per detailed drawl or as directed. Contractor shall provide all nuts, bolts, welding material and paint the clamps with one coat of red oxide and two or more coats of black enamel paint. Wooden saddles, where required shall be provided free of cost.
- 4.4 Slotted angle/channel supports on walls shall be provided wherever shown on drawings. Angles/channels shall be of sizes shown on drawings or specified in bill of quantities, angles/channels shall be fixed to brick walls with bolts embedded in cement concrete blocks and to RCC alls with suitable anchor fasteners. The spacing of support bolts horizontally shall not exceed 1 m.
- 4.5 Wherever M.S. Clamps are required to be anchored directly to brick walls, concrete slabs, beams or columns, nothing extra shall be payable for clamping arrangement and making good with cement concrete 1:2:4 mix (1 cement: 2 coarse sand: 4 mm stone aggregate 20mm nominal size) as directed by the Engineer-in-charge.

5. **TRAPS**

5.1 **Nahni Trap or Floor Traps**

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

5.2 **Urinal Traps**

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

- 5.3 Bathroom traps and connections shall ensure free and silent flow of discharging water. These traps shall be 'P' or 'S' type as required. Where specified, contractor shall provide a specified type G.I. inlet fitting to the trap without 01- with one, two or three inlet sockets to receive the waste pipe shall be provided. Joint between waste inlet socket shall be threaded joint. The traps shall be set in cement concrete blocks as specified in extra above without extra charge.

5.4 **C.P./Stainless Steel Gratings**

Floor and Urinal traps shall be provided with 100-150mm square or round C.P./stainless steel grating, with rim of approved design and shape. Minimum thickness shall be 4-5 mm or as specified in the bill of quantities.

6.0 **JOINTING**

Soil, waste vent and rainwater pipes shall be jointed with refined pig lead conforming to IS: 27-1977. A sufficient skein of jute rope shall be caulked to leave a minimum space for the pig lea as given in sub- section 3.1.2 of Section-II to be poured in. After 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.

7. **CLEANOUT PLUGS**

Contractor hall provide cast brass cleanout plugs as required. Cleanout plugs shall be threaded and provided with keyholes for opening. Cleanout plugs shall be fixed to the

pipe by a G.I. socket and lead caulked joint and flush to the floor finish to the entire satisfaction of the Engineer-in-charge.

8. **WASTE PIPE FROM APPLIANCES**

8.1 Waste pipe from appliances. E.g. wash basins, sinks, urinals, bathtubs, water coolers, shall be of galvanized steel, lead or PVC quantities or shown on the drawings.

8.2 All pipes shall :outfalls of drains be fixed in gradient towards the outfalls of drains. Pipes inside room shall be in chase unless otherwise shown on drawings. Where required pipes may be run of 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
P.V.C. Pipes	180 cms	120 cms
Lead Pipes	120 cms	120 cms

8.3 **Galvanised Pipes**

Pipes shall be galvanized steel tubes conforming to IS: 1239-1979 (medium class) and quality certificates shall be furnished. Pipes shall be provided with all required fittings e.g. Tees, couplings, Bends, Elbows, Unions, Reducers, Nipples, Plugs all G.I. waste pipes shall be terminate at the point of connection with the appliance with an outlet of suitable diameter.

9. **LEAD PIPES**

9.1 Where specified, lead pipes shall be used for wastes and connections lto anti-siphon age pipes and W.C. connections.

9.2 Lead pipes shall be seamless drawn pipes conforming to IS: 404 (part-I) 1977. Weight and wall thickness shall be as follows:-

Nominal I/D	Wall thickness	Wt. Kg / M.
32 mm	2.6	3.28
40 mm	2.6	3.95
50 mm	2.7	5.07
75 mm	2.7	7.48
100 mm	2.7	9.88

9.3 Lead pipes shall be straightened by wooden mandrel and bent to required shape by filling sand. Connection between appliances, stacks or traps shall be made with solder joints. Solder shall be 64% lead and 36% pure tin. All lead waste pipes in exposed positions shall be painted with one coat of red primer and two or more coats of synthetic enamel paint of approved quality and shade.

10. **POLYTHENE PIPES**

10.1 Where specified, polythene pipes shall be high density polythene pipes conforming to IS: 4984-78. The details of the nominal outer diameter, weight and working pressure at 20°C shall be as per the above standards.

10.2 Polythene pipes may be cold bending to a radius of not less than eight times or their external diameter. Pipes bent for smaller radius may be made by hot bending.

10.3 Fittings used for polythene pipes shall be compression-moulded fittings matching to the above specifications.

10.4 **Jointing**

Jointing for polythene pipes shall be made by means of butt-welding or detachable joints or angled joints or screwed joints. The type of joints shall be used as per the site conditions. Where polythene pipes are used for rainwater pipes the pipe will be finished with G.I. joint complete as directed by Engineer-in-Charge.

10.5 All pipes shall be tested after installation for a pressure equal to twice the maximum working pressure in the line.

11.0 **CEMENT CONCRETE**

Cast iron soil and waste pipes under floors in sunken slabs and in wall chases (when cut specially for the pipe) shall be encased in cement concrete 1:2:4 mix (1 cement: 2 coarser sand: 4 stone aggregate 12 mm size) 75 mm in bed and around. When pipes are running well above the structural slab, the encased pipes shall be supported with suitable cement concrete pillars of required height and size at intervals as directed by Engineer-in-Charge.

12.0 **PAINTING**

12.1 Soil, waste vent and rainwater pipes in exposed location, in shafts and pipe spaces shall be with two or more coats of synthetic enamel paint to give an even shade.

12.2 Paint shall be of approved quality and shade, where directed pipes shall be painted in approved pipe colour code.

12.3 Waste pipes in chase shall be painted with two coats of bitumen paint covered with polythene tape and a final coat of bitumen paint. Exposed pipes shall be painted with two or more coats of synthetic enamel paint.

12.4 C.I. soil and waste pipes below ground and covered in cement concrete or lead pipes shall not be painted.

13.0 **CUTTING AND MAKING GOOD**

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

14. **TESTING**

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

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

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

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

15.0 **MESUREMENTS**

15.1 General

15.1.1 Rates for all items quoted shall be inclusive of all work and given in the above mentioned specifications and schedule of quantities and applicable for the work under floor, in shafts or at ceiling level at all heights and depths.

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

15.1.3 All rates are inclusive of pre-testing and on testing of the installations, materials commissioning.

15.2 Pipes (Unit of measurement. Leaner metre to the nearest centimetre)

15.2.1 C.I. (L.A.) pipes shall be measured along the centre line when fixed; correct to a centimetre including all fittings and lead caulked joints along its length.

15.2.2 C.I. Soil, Waste vent and rainwater pipes shall be measured overall along the centre line correct to a centimetre including all fittings along its length. The rate for these pipes shall be inclusive of all fittings, holder bat clamps, lead caulked joints and all other items described in the schedule of quantities. Traps structural clamps and cement concrete, shall however be paid separately under the relevant item.

15.2.3 G.I. P.V.C. polythene or lead pipes shall measured per running metre correct to a centimetre for the finished work, which shall include fittings e.g. Bends, Tees, Elbows, Reducers, Crosses, Sockets, Nipples and Nuts but exclude brass or gunmetal taps (cocks), valves lead connection pipes and shower rose. The length shall be taken along centre line of the pipes and fittings. All pipes and fittings shall be classified according to their diameter, method of jointing and fixing substance, quality and finish. The diameters shall be nominal diameter of internal bore. The pipes shall be described as including all cutting and waste. In case of fittings of unequal bore, the largest bore shall be measured.

15.3 Cement concrete around pipes shall be measured along the centre *or* the pipeline measured per linear, metre and includes any masonry supports, shuttering, centring and cutting complete as described in the relevant specifications.

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

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

15.6 **Structural Clamps:** Structural clamps and U clamps shall be paid for by weight per kg. rates shall be inclusive of all nuts, bolts, drilling, cutting, welding. Weight of clamps shall be calculated from the actual length used in structural member multiplied by its theoretical weight given in manufacturers catalogues weight of nuts, bolts, shall not be taken into account.

15.7 Excavation for soil pipes: No extra payment shall be admissible with respect to excavation, refilling and disposal of surplus earth for cast iron soil and waste pipes.

End of Section-III

SECTION – IV

EXCAVATION FOR PIPE LINE

1.0 **EXCAVATION**

The excavation for pipe works shall be open cutting unless the permission of the Engineer-in-Charge for the ground to be tunnelled is obtained in writing. Where sewers have to be constructed along narrow passages, the Engineer-in-Charge may order the excavation to be made partly in tunnel and in such cases the excavated soil shall be brought back later on for refilling the trenches or tunnel.

1.2 **Opening out Trenches**

In excavation the trenches, etc. the solid road metal ling, pavement, curoing and turf is to be placed on one side and preserved for reinstatement when the trenches or other excavation shall be, filled up. Before any road metal is replaced, it shall be carefully shifted. The surface of all trenches and holes shall be restored and maintained to the satisfaction of the Engineer-in-Charge and of the owners of the roads or other property traved and the contractor shall not cut out or break down any live fence of trees in the line of the proposed works but shall tunnel under them, unless the Engineer-in-Charge shall order to the contrary.

The contractor shall grub up and clear the surface over the trenches and other excavations of all trees, stumps roots and all other encumbrances affecting execution of the work and shall remove them from the site to the approval of the Engineer-in-Charge.

1.3 **Obstruction of Roads**

The contractor shall not occupy or obstruct by his operation more than one half of the width of any road or street and sufficient space shall then be left for public and private transmit, he shall remove the materials excavated and bring them back again when the trench is required to be refilled. The contractor shall obtain the consent of the Engineer-in-Charge in writing before closing any road to vehicular traffic and the foot walks must be clear at all times.

1.4 **Removal of Filth**

All night soil, filth or any other offensive matter met with during the execution of the works, immediately after it is taken out of any trench, sewer or cess pool, shall not be deposited on to the surface of any good and damage done to buildings and other property. If in the opinion of the Engineer-in-Charge he fails to make good such works with all practicable despatch, the Engineer-in-Charge shall be at liberty to get the work done by the contractor or deducted from, any money that may be or become due to him or recovered from him in any other manner according to the law of the land.

1.8 **Disposal of Surplus Soil**

The contractor shall at his own costs provide, places for disposal of all surplus not required to be used on the works. As each trench is refilled the surplus soil shall be removed, the surface properly restored and sides left clear.

1.9 **Timber of Sewer and Trenches**

- A) The contractor shall at all times support efficiently and effectively the sides of the sewer trenches and other excavations by suitable timbering, piling and sheeting and they shall be loose, timbered in loose or sandy strata and below the surface of the sub soil water level.
- B) All timbering, sheeting and piling with their walling and supports shall be of adequate dimensions and strength and fully braced and strutted so that no risk of collapse or subsidence of the walls of the trench shall take place.
- C) The contractor shall be held responsible and will be accountable for the sufficiency of all timbering, sheeting and piling used as also for all damage to persons and property resulting from improper quality, strength, placing, maintaining or removing of the same.

1.10 **Shoring of buildings**

The contractor shall shore up all buildings, walls and other structures, the stability of which is liable to be endangered by the execution of the work and shall be fully responsible for all damages to persons or property resulting from any accident.

1.11 **Removal of Water from Sewer, Trench etc.**

- A) The contractor shall at all times during the progress of the work keep the trenches and excavations free from water which shall be disposed of by him in a manner as will neither cause injury to the public health nor to the public or private property nor to the work completed or in progress nor to the surface of any roads or streets, nor cause any interference with the use of the same by the public.

1.12 **Width and Depth of Trench**

The Engineer-in-Charge shall have power by giving an order in writing to the contractor to increase the maximum width in respect of which payment will be allowed for excavation in trenches for various classes of sewer, manholes and other works in certain lengths to be specifically laid down by him, where on account of bad ground or other unusual conditions, he considers that such increased widths are necessary in view of the site conditions.

2.0 **MEASUREMENTS**

2.1 **Excavation**

Measurement for excavation of pipe trenches shall be made per linear metre under the respective category of soil classification encountered at site.

- a) Ordinary soil
- b) Hard solid (Hard moorum & Soft rock)
- c) Hard rock required chiselling
- d) Hard rock requiring blasting

2.1.1 Trenches shall be measured; between outside walls of manholes at top and the depth shall be the average depth between the two ends to the nearest cm. The rate quoted shall be for a depth upto 2.5m or as given in the bill of quantities.

2.1.2 Payment for trenches more than 1.5 m in depth shall be made separately and as given in bill of quantities.

2.2 Refilling, Consolidation

and Disposal of Surplus earth

Rate quoted for excavation of trenches shall be inclusive of refilling, consolidation and disposal of surplus earth within a lead of 50m. No separate payment for refilling shall be made.

End of Section - IV

SECTION – V

WATER SUPPLY

1.0 SCOPE

- 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.
- 1.2 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 and insulation of water pipe lines, wherever required.
 - d) Control valves, masonry chambers and other appurtenances.
 - e) Connections to all plumbing fixtures equipment, tanks and appliances.
 - f) Excavation and refilling of pipe trenches, wherever necessary.

2.0 GENERAL REQUIREMENTS

- 2.1 All materials shall be new of the best quality conforming specifications. All works executed shall be to the satisfaction of the Engineer-in-Charge.
- 2.2 Pipes and fittings shall be fixed truly vertical horizontal or in slopes as required in a neat workmanlike manner.
- 2.3 Short or long bends shall be used on all main pipe lines as far as possible. Use of elbows shall be restricted for short connections. As far as possible all bends shall be formed by means of a hydraulic pipe bending machine for pipes up to 65mm dia.
- 2.4 Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.
- 2.5 Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals specified.
- 2.6 Valves and other appurtenances shall be so located as to provide easy accessibility for operations, maintenance and repairs.

3.0 G.I. PIPES, FITTINGS & VALVES

- 3.1 All pipes inside the buildings and where specified, outside the building shall be galvanized steel tubes conforming to I.S. 1239-1979 of class specified. When class is not specified they shall be medium class.
- 3.2 Fittings shall be malleable iron galvanized fittings, of approved make. All fittings shall have manufacturer's trademark stamped on it. Fittings for G.I. pipes shall include couplings, bends, tee, reducers, nipples, unions, and bushes. Fittings shall be I.S. 1879-(part I to X) 1975.
- 3.3 Pipes and fittings shall be jointed with screwed fittings care shall be taken to remove burr from the end of the pipe after cutting by a round file. Genuine red lead with grummet and

a few strands of fine hemp shall be applied. All pipes shall be fixed in accordance with layout and alignment shown on the drawings. Care shall be taken to avoid air pockets. G.I. pipes inside toilets shall be fixed in wall chases well above the floor. No pipes shall be run inside a sunken floor as far as possible. Pipes may be run under the ceiling 01 floors and other as shown on drawings.

4.0 **CLAMPS**

G.I. pipes in shafts and other locations shall be supported by M.S. clamps of design approved by Engineer-in-Charge. Pipe in wall chases shall be anchored by iron hooks. Pipes at ceiling level shall be supported on structural clamps fabricated from M.S. structural as described in section II. Pipes in typical shafts shall be supported on slotted angles / channels as specified elsewhere.

5.0 **UNIONS**

Contractor shall provide adequate number of unions on all pipes to enable dismantling later. Unions shall be provided near each gunmetal valve, stop cocks, or check valves and on straight runs as necessary at appropriate locations as required and/or directed by Engineer-in- Charge.

6.0 **FLANGES**

Flanged connections shall be provided on pipes where shown on the drawings, all equipment connections as necessary and required or as directed by Engineer-in- Charge. Connections shall be made by the correct number and size of the bolts and made with 3 mm thick insertion rubber washer. Where hot water or steam connections are made insertion gasket shall be of suitable high temperature grade and quality approved by Engineer-in-charge. Bolt hole dia for flanges shall conform to match the specification for C.I. sluice valve I.S. 780.

7.0 **TRENCHES**

All .G.I pipes below ground laid in trenches shall have a minimum cover of 60 cms. Excavation for trenches shall be done as specified under section-IV but the width and depth of the trenches shall be as follows:-

Dia of pipe -----	Width of trench -----	depth of trench -----
15mm to 50mm	30 cms	45 cms
65mm to 100mm	45 cms	75 cms

8.0 Where specified in the bill of quantity all G.I. pipes in trenches shall be protected with fine sand, 15 cms thick layer all round before filling in the trenches.

9.0 **PAINTING**

9.1 All pipes above ground shall be painted with one coat of red/lead and two coats of synthetic enamel paint of approved shade and quality. Pipes shall be painted to standard colour code specified by Engineer-in-Charge.

9.2 All pipes in chases and below floor shall be painted with two or more coats of anti-corrosive bitumen paint.

10.0 **PIPE PROTECTION**

10.1 Where specified in the bill of quantities all pipes below ground shall be protected against corrosion by two coats bitumastic paint, wrapping with polythene tape and then applying a final coat bitumastic paint.

11.0 INSULATION

11.1 Magnesia Insulation

Hot water pipes fixed in chase shall be insulated by wrapping 6mm thick asbestos rope dipped in 85% magnesia solution around the pipes and finished with a coat of 1: 3 cement plaster mixed with rapid hardening cement.

11.2 External Hot water pipes in shafts, floors, and trenches shall be insulated by two layers of 6mm thick insulation and then will be having finished smooth surface with 12mm thick cement plaster.
(Two layers of 6mm thick of mix 1:2 portland cement and fine sand).

12.0 H. D. P. E. THREADED PIPE

12.1 The H.D.P.E pipes shall be of threaded type of G.I. standard i.e. having specifications equivalent to G.I of IS:1239 medium Class.

12.2 The H.D.P.E pipe shall confirm to pressure rating of 10Kg/Sq.cm and shall only be used for internal cold water supply in the building.

12.3 All other specifications for laying and jointing shall confirm to as that G.! pipes including for fittings etc., except pipe protection is required in this case as specified in para 9.1., 9.2 and 10.0

13.0 CAST IRON PIPES

13.1 Pipes for water supply mains shall be cast iron pipes shall be centrifugally spun iron pipes class LA conforming to I.S: 1536. Quality certificates shall be furnished.

13.2 Fittings and Inspection, Chambers

Fittings used for C.I. drainage pipe shall conform to I.S. 1538-1967. Whenever possible junctions from branch pipes shall be made by a 'Y'-tee.

13.3 Anchor Block

Suitable anchor blocks shall be provided at all bends and tees to encounter the excessive thrust developed due to water hammer.

13.4 Rubber Joints

Joints between two pipes shall be made by premoulded rubber joints with suitable tackles in a manner recommended and approved by the manufacturer. No joints shall be covered until the lines are hydraulically tested.

13.5 Lead caulked joints:

a) Joints between pipes and C.I. fittings shall be made with refined pig lead. The spigot of the pipe shall be centered in the adjoining socket by caulking sufficient turns of tarred gaskin, which will be caulked into the joint to leave depth of 5mm for pig lead. Molten pig lead all then be poured into the joint in one pouring. The lead shall then be solidly caulked with suitable tools and hammers.

- b) Contractor may use lead wool joints in wet trench conditions. No additional payment for lead wool joints will be admissible.

14.0 **VALVES**

14.1 **GUNMETAL VALVES**

- a) Valves 65 mm dia and below shall be heavy gunmetal full way valves or globe valves conforming to I.S. 778-1971 20 Kg/Sq.cm class. Valves shall be tested at manufacturer's works and the same stamped on it.
- b) All valves shall be approved by the Engineer-in-charge before they are allowed to be used on work.

14.2 **Sluice Valves**

- a) Sluice valves shall be socketed type flanged type conforming to I. S. 780.
- b) Joints for socketed valves shall be lead caulked joints as specified above.
- c) Joints for double flanged sluice valves shall be made with suitable flanged / socketed tail pieces on the pipe line and flanges joints made with 3mm thick insertion rubber gasket with appropriate number of bolts, nuts and washers.
- d) Sluice valves shall be installed at all branches and as shown on the drawings.

14.3 **Scour Valves:**

Scour valves shall be C.I. sluice valves as specified above. They shall be installed at the lowest level or tail end of the pipe section as shown on drawings and directed by Engineer-in-Charge.

14.4 **Air valves**

- a) Air valves shall be single acting type air valves with cast iron body and bronze/gunmetal internal parts and plastic float.
- b) Each air valve shall be provided with a cast isolating Sluice valve of specification above.

15.0 **FIRE HYDRANTS:**

- 15.1 Fire hydrants shall be cast iron stand post type with 63mm dia instantaneous gunmetal outlets conforming to I.S. 908.
- 15.2 Each fire hydrant shall be provided with a 80mm iron sluice valve, duct foot bend and a suitable dia flanged cast iron pipe for correcting installation height of the hydrant.

16.0 **VALVE CHAMBERS**

Contractor shall provide suitable brick masonry chambers in cement mortar 1: 5 (1 cement: 5 coarse sand:) on cement concrete foundations 150mm thick 1:5:10 m1X (1 cement: 5 fine sand: 10 graded stone aggregate 40mm nominal size) 15mm thick cement plaster inside and outside finished with a floating coat of neat cement inside with cast iron surface box approved by fire brigade including excavation, back filling complete. Valve chambers shall be of following sizes:

For depths 90 cm

60 x 60 cm

For depths upto 100 cm beyond 120 x 12 cm

17.0 **TESTING**

17.1 All pipes, fittings and valves shall be tested by hydrostatic pressure of 7 kg/Sq.cm.

Pressure shall be maintained of a period of at least two hours without appreciable drop in the pressure after fixing at site. ($\pm 10\%$)

A test register shall be maintained and all entries shall be signed and dated by contractor (s) and engineer.

17.2 In addition to the sectional testing carried out during the construction, contractor shall test the entire installation after connections to the overhead tanks or pumping system or mains lie 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 during the defects liability period without any extra cost.

17.3 After completion of the water supply system, contractor shall test each valve by closing and opening it a number of times to observe it efficiently. Valves which do not effect shall be replaced by new ones at no extra cost and the same shall be tested as above.

18.0 **MEASUREMENT**

18.1 **Pipes**

Pipes shall be measured per linear metre (to the nearest cm) and shall be inclusive of all fittings e.g. couplings, tees, bends, elbows, unions, deduction for valves shall be made, cutting holes chases and mailing good the same and all items mentioned in the specifications and bill of quantities.

18.2 Gunmetal and cast iron valves shall be measured by numbers.

18.3 Single flanges shall be measured by numbers (per single flange) and shall include bolts, nuts, washers and 3mm thick rubber gasket complete.

18.4 Pair of flanges shall be measured by number of pairs and shall include bolts, nuts, washers, and 3 mm thick rubber gasket complete.

18.5 **Making connections**

Making connections to pumps, equipment, heat exchangers and appliances shall be paid by number and shall include the labour and fixing arrangement for each connection. Flanges, pipes and valves for connections shall be paid for separately under the relevant items. No payment under this item shall be admissible for making connections to R.C.C. under ground tanks.

18.6 **Insulation :**

a) Insulation for hot water pipes shall be measured per linear metre (to the nearest cm) along the centre line of pipe and shall be measured over all fittings and flanges. No separate or additional payment shall be made for insulation of bends, tees, flanges or other fittings and valves. The rate shall include all items specified in the bill of quantities and given in the specifications.

18.7 Aluminum cladding shall be measured by square meter area of the finished surface. The rate shall be inclusive of all items given in the schedule of quantities.

18.8 **Painting**

- a) Painting for pipes and over insulation shall be measured per linear metre over finished surface and shall include all valves and fittings for which no deduction shall be made.

19.0 **DISINFECTION**

- 19.1 After completion of the work contractor shall flush clean the entire system with the city's filtered water after connection has been made.
- 19.2 After the first flushing, add commercial bleaching powder to achieve a dosage of 2 to 3 mg/l of water in the system added and flushed. This operation should be performed twice to ensure that the system is fully disinfected and usable.

20.0 **PRE-COMMISSIONING:**

- 20.1 Ensure that all pipes are free from debris and obstructions.
- 20.2 Check all valves and fire hydrant for effective opening and closing action. Defects should be rectified or valves replaced.
- 20.3 Ensure that all connections to branches has been made.
- 20.4 Ensure that mains have been connected to the respective pumps, underground and overhead tanks.
- 20.5 Water supply should be available at main underground tank.
- 20.6 All main line valves should be closed.

21.0 **COMMISSIONING**

- 21.1 Fill underground tank with water. Add 1 Kg. Fresh bleaching powder after making solution to be added near inlet.
- 21.2 Start water supply pump and allow water to fill main underground tank. Water will first fill the fire tank and then overflow to the domestic tanks.
- 21.3 After filling overhead reservoir, drain the same to its one forth capacity through tank scour valve. This is to ensure removal of all mud, debris etc. from the tank).
- 21.4 Fill overhead tank to full.
- 21.5 Release water in the main lines by opening valves in each circuit. Drain out water in the system through system scour valves or fire hydrant in lower regions. Ensure clean water is now coming out of the system.
- 21.6 Open valves for individual clusters. Observe for leakages or malfunctions, check pressure & flow at end of line by opening hydrants etc. remove and rectify defects noticed.
- 21.7 check all fire hydrants for proper operation by opening each valve and allowing water to flow for a few minutes. Also check for effective closure of valve.
- 21.8 The entire water supply system should be disinfected with bleaching powder and system flush cleaned.

21.9 Send four samples of water drawn from four extreme locations for testing for bacteriological test in sterilized bottles obtained from the concerned laboratory. (Laboratory personal may collect the samples themselves).

22.0 **RESPONSIBILITY:**

22.1 Responsibility for various activities in pre-commissioning and commissioning procedures will rest with the contractors.

End of section-V

SECTION – VI

SEWERAGE / DRAINAGE SYSTEM

1.0 SCOPE OF WORK

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

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 collection chambers, manholes and drop connections.
- d) Construction of grease trap etc.,
- e) Connection to external sewer line.
- f) Storm water drainage and disposal.

2.0 GENERAL REQUIREMENTS

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

2.2 Drainage lines shall be laid to the required gradients and profiles.

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

2.4 Location of all manholes, catch basins, shall be got confirmed from the contractor from the Engineer- in-Charge before the actual execution of work at site.

2.5 All works shall be executed as directed by Engineer-in-Charge.

3.0 ALIGNMENT AND GRADE

The sewer pipe shall be laid to alignment and gradient shown on the drawings but subject to such modifications as shall be ordered by the Engineer-in-Charge from time to time to meet the requirements of the works. No deviations from the lines, depths of cutting or gradients of sewers shown on the plans and sections shall be permitted except by the direction in writing of the Engineer-in-Charge.

4.0 SALT GLAZED STONEWARE

4.1 Stoneware pipes shall be of first class quality salt glazed and free from rough texture inside or outside and straight. All pipes shall have the manufacturers name marked on it and shall comply to IS: 651-1971.

Laying and Jointing of Stoneware Salt Galzed Pipes:

- A) Pipes are liable to be damaged in transit and not withstanding tests that may have been made before despatch each pipe shall be examined carefully on arrival at site. Each pipe shall be rung with a wooden hammer or mallet and those that do not ring true and clear) shall be rejected. Sound pipes shall be carefully stacked to prevent damage. All defective pipes should be aggregated, marked in a conspicuous manner and their use in the works prevented.

- B) The pipes shall be laid with sockets leading uphill and should rest on solid and even foundations for the full Length of the barrel. Socket holes shall be formed in the foundation sufficiently deep to allow the pipe jointer room to work right round the pipe and as short as practicable to admit the socket and allow the joint to be made.
- C) Where pipes are hot bedded on concrete the trench bottom shall be left slightly high and carefully bottomed up as pipe laying proceeds. So that the pipe barrels rest on firm ground. If elevation has been carried too low it shall be made up with cement concrete 1:5:10 mix at the contractor's cost and charges.
- D) If the bottom of the trench consists of rock or very hard ground that cannot be easily excavated to a smooth surface, the pipes shall be laid on cement concrete bed of 1:5:10 mix to ensure even bearing.

4.3 **Jointing of Pipes**

- A) Tarred gaskin shall first be wrapped round the spigot of each pipe and the spigot shall then be placed into the socket of the pipe previously laid, the pipe shall then be adjusted and fixed in its correct position and the gaskin caulked tightly home so as to fill not more than one quarter of the total length of the socket.
- B) The remainder of the socket shall be filled with stiff mix of cement mortar 1: 1 (1 cement: 1 clear sharp washed sand). When the socket is filled, a fillet should be formed round the joint with a trowel forming an angle of 45 degrees with the barrel of the pipe. The mortar shall be beaten up and used after it has begun to set.
- C) After the joint has been made any extraneous materials shall be removed from inside of the newly with a suitable scrapper or "Badger". The newly made joints shall be protected until set from the sun, drying winds, rain or dust. Sacking or other materials, which can be kept damp, shall be used. The joints shall be exposed and space left all round the pipes for inspection by the Engineer-in-Charge. The inside of the sewer must be left absolutely clear in bore and free from cement mortar or other obstructions throughout its entire length and shall efficiently drain and discharge.

4.4 **Testing**

- A) All lengths of the sewer and drain shall be fully tested for water tightness by means of water pressure maintained for not less than 30 minutes. Testing shall be carried out from manhole. All pipes shall be subjected to a test pressure of at least 1.5 metre head of water. The test pressure shall, however not exceed 1.5 metre head at any point. The pipes shall be plugged preferably with standard design, rubber plugs on both ends. The upper end shall, however, be connected to a pipe for filling with water and getting the required head.
- B) Sewer lines shall be tested for straightness by:
 - (i) Inserting a smooth ball 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 the length of the pipe and emerge at the lower end.
 - (ii) Means of a mirror at one end and a lamp at the other end. If the pipeline is straight the full circle of light will be seen otherwise obstruction or deviation will be apparent.

- C) The contractor shall give a smoke test to the drains and sewer at his own expense and charges, if directed by the Engineer-in-Charge.
- D) A test register shall be maintained which shall be signed and dated by contractor, Engineer-in-Charge and representative of architects/consultants.

5.0 **GULLY TRAPS**

- 5.1 Gully traps shall be of the same quality as described for stoneware pipes in clause 4.
- 5.2 Gully traps shall be fixed in cement concrete 1:5:10 mix (1 cement; 5 coarse sand: 10 stone aggregate 40mm nominal size) and a brick masonry chamber 30x30 cm inside in cement mortar 1:5 with 15x15 cm grating inside and 30x30 cm C.I. sealed cover and frame weighting not less than 7.3 kg to be constructed as per standard drawing. Where necessarily sealed cover shall be replaced with C.I. grating of the same size.

6.0 **REINFORCED CEMENT CONCRETE PIPES**

- 6.1 All underground storm water drainage pipes and sewer lines where specified (other than those specified cast iron) shall be centrifugally spun RCC pipes of specified class. Pipes shall be true and straight with uniform bore. Throughout cracked warped pipes shall not be used on the work. All pipes shall be tested by the manufacturer and the contractor shall produce, when directed a certificate to that effect from the manufacturer.

6.2 **Laying**

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

6.3 **Jointing**

After setting out the pipes the dollars shall be centered over the joint and filled in with tarred gaskin, so that sufficient space is left on either side of the collar to receive the mortar. The space shall then be filled with cement mortar 1:2 (1 cement: 2 fine sand) and caulked by means of proper tools all joints shall be finished at an angle of 45 degree to the longitudinal axis of the pipe on both side of the collars neatly.

6.4 **Testing**

All pipes shall be tested to a Hydraulic test of 1.5m head for at least 50 minutes at the highest point in the section under test. Test shall also be carried out similar to those for stoneware pipes given above. The smoke test shall be carried out by the contractors if directed by the Engineer-in-Charge, at the expense and charges of the contractor. A test register shall be maintained. Which shall be signed and dated by contractor/Engineer-in-Charge and representative of Architects/Consultant?

7.0 **CAST IRON PIPES FOR DRAINAGE**

- 7.1 All drainage lines passing under building, floors land roads with heavy traffic, in exposed position above ground e.g. service floor and basement ceiling shall be cast iron pipes position of such pipes shall generally be shown on the drawings.
- 7.2 Cast iron pipes shall be centrifugally spun iron pipes conforming to I:S 1536-1967. Quality certificates shall be furnished.

7.3 **Fittings and Inspection Chambers**

- A) Fittings used for C.I. drainage pipe shall conform to I.S: 1538-1967. Wherever possible junction from branch pipes shall be made by a 'Y' tee.
- B) Cleanout plugs shall be provided on head of each drain and at location indicated on plans or directed by Engineer-in-Charge. Cleanout plugs shall be of size matching the full bore of the pipe. Plugs shall be made out with G. I. coupling caulked into the socket of the pipe or fittings. The end shall be provided with a brass screwed plug with suitable key for opening.

7.4 **Laying**

- A) All cast iron pipes and fittings shall be jointed with best quality soft pig lead (conforming to IS: 27-1977) which shall be free from impurities. In wet trenches joints shall be made from lead wool. Nothing extra will be paid for lead wool joints. Depth of pig lead and weight for joints shall be as given in I.S. code.
- B) The spigot of pipe or fittings shall be centered in the adjoining socket by caulking. Sufficient turns of tarred gaskin to i.e., unfilled the required depth of socket for depth of 45mm when the gaskin has been caulked tightly home. Jointing ring shall be placed round the barrel and against the face of the socket. Molten pig lead shall then be poured to fill the remainder of the socket. This shall be done in one pouring. The lead shall then be solidly caulked with suitable tools and hammers weighting not less than 2 kg.
- C) For lead wool joints the socket shall be caulked with tarred gaskin, as explained above. The lead wool shall be inserted into the sockets and tightly caulked home by skien with suitable tools and hammers of not less than 2 kg weight until joint is filled.

7.5 **Testing**

All cast iron pipes for drainage shall: be tested to a hydraulic test of 3 metre head. Test for straightness shall be same as for stoneware pipe given above. A test register shall be maintained which shall be signed and dated by contractor, Engineer-in-charge and representative of Architect/Consultant.:

8.0 **CEMENT CONCRETE AND MASONRY WORKS (FOR MANHOLES AND CHAMBERS ETC.)**

8.1 **Materials**

- a) 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 durability of the structure. In general, the water suitable for drinking purposes shall be considered good enough for constructional purposes.

- b) **Aggregate for Concrete**

The aggregate for concrete shall be in accordance with I.S. 383 and I.S. 515 in general, these shall be free from all impurities that may cause corrosion of the reinforcement. Before actual use these shall be washed in water, if required as per the direction of Engineer-in-Charge. The size of the coarse aggregate shall be done as per I.S.383.

- c) **Sand**

Sand for various constructional purposes shall comply in all respects with I.S 650, and I.S. 2116. It shall be clean, coarse hard and 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 I.S. 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 I.S. 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 Indian Standards. All such materials shall be approved by the Engineer-in-Charge before use.

8.2 **Cement Concrete (Plain 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.

8.3 **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.

8.4 **Cement Concrete for Pipe Support**

- A) Wherever specified or show on the drawings, all pipes shall be supported in bed all round or in haunches. The thickness and mix of the concrete shall be
- B) Unless otherwise directed by the Engineer-in-Charge cement concrete for bed, all round or in haunches shall be laid as follows:-

Upto 1.5M 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)
R.C.C. or S.W. in Sub soil water	All Round (1:3:6)	In Haunches (1:3:6)	In Haunches (1:3:6)
C.I. pipes (in all Conditions)	All round (1:4:8)	In Haunches (1:4:8)	In Haunches (1:4:8)
R.C.C. pipes or C.I. Pipes under or Building	All round (1:4:8)	All round (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 insitu cradles. Cradles shall be as shown on the drawings.
- D) Pipes in loose soil or above ground shall be supported on brick or stone masonry pillars shown on the drawings.

9.0 MANHOLES AND CHAMBERS

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

9.2 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 in the drawings.

Where not specified, manholes shall be constructed as follows:-
(All dimensions internal clear in cms)

Size of manhole Type	90 x 80 Rect.	120 x 90 Rect.	140 dia Circular
----- Maximum depth	100	245	----- Any depth Beyond 245
Average thickness of R.C.C. slab	15	15	-----
Size of cover and Frame (Internal Diameter)	61 x 45.5	50 dia	50 dia
Weight of cover and frame	38 Kg. Or Heavier ++ as specified	116 Kg or 208 Kg	116 Kg or 208 Kg
-----	-----	-----	-----

9.3 All manholes shall be provided 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 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.

- 9.4 All manholes shall be plastered with 12/15mm thick cement mortar 1:3 (1 cement.: 3 coarse sand) and a floating coat of neat cement inside. Manhole shall be plastered outside as above but with rough plaster.
- 9.5 All manholes with depths greater than 1 M shall be provided with 20mm square or 25mm round rods catch rungs set in cement concrete blocks 25 x 10 x 10cms in 1:2:4 mix 30cms vertically and staggered. Footrests shall be coated with coal tar before embedding.
- 9.6 All manholes shall be provided with cast iron cover and frames and embedded in reinforced cement concrete slab weight of cover, frame and thickness of slat shall be as specified in the bill of quantities or given above.
- 9.7 All rainwater collection chambers shall be of the size 50x45x60cm (internal) with horizontal C.I./M.S. grating as specified. The grating along with frame shall be of size 500x450mm grating having total Wt. of app. 38 Kg and of approved sign and quality as per instruction of Engineer-in-Charge. The remaining details of construction shall be same as stated above for the construction of the manholes, etc.

10.0 **DROP CONNECTION**

- 10.1 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 of the required sizes.
- 10.2 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 interest one clamp for each drop connection. All points shall be lead caulked Joints 25mm deep.
- 10.3 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 within C.I. hinged type frame and cover 30cms x 30cms. The connection shall be embedded in cement concrete 1 :12: 4 mix 15cms all round the pipe and tee upto the surface. Chamber of the tee.
- 10.4 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.

11.0 **MAKING CONNECTIONS**

Contractor shall connect the new sewer line to the existing manhole by cutting the walls, benching and restoring them to the original condition. A new channel shall be cut in the benching of the existing manhole for the new connection contractor shall remove all sewage and water if encountered in making the connection without additional cost.

12.0 **MEASUREMENT**

12.1 **Stoneware Pipes / R.C.C. Pipes / C.I. Pipes**

Stoneware pipes/R.C.C. pipes/C.I. pipes shall be measured for the finished length of the pipe line per linear metre i.e. (a) lengths between manholes shall be recorded from inside of one manhole to inside of other manhole, (b) length between socket of pipe near gully trap and inside of manhole. Rate shall include all items given in the Bill of quantities and specifications.

12.2 **Gully Traps**

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

12.3 **Manholes**

- a) All manholes shall be measured by numbers and shall include all items specified above and necessary excavation, refilling & disposal of surplus earth.
- b) Manholes with depths greater than specified under the main item shall be paid for under "extra depth" and shall include all items as given for manholes. Measurement shall be done to the nearest cm. Depth of the manholes shall be measured from top of the manhole cover to bottom of channel.

SECTION = VII PUMPS, MECHANICAL & ELECTRICAL EQUIPMENTS

1.0 DOMESTIC PUMPS, FIRE PUMPS AND WATER TREATMENT EQUIPMENT

- 1.1 Work under this sub-head consists of furnishing all labour, materials equipment and accessories necessary and required to completely install pumping system for various water supply services specified hereinafter and given in the bill of quantities.
- 1.2 Without restriction to the generality of the foregoing the work of pumps and water treatment equipment shall include the followings:
- a) Domestic pumps
 - b) Pipes, valves, accessories, hangers, supports and connection to proposed pipe work.
 - c) Motor control panels, cable trays, power control cabling and allied electrical works.

2.0 PUMP SET

2.1 Water Supply Pumps

- 2.1.1 Water supply pumps shall be suitable for clean water. Pumps shall be single or multistage, monoblock horizontal, vertical, centrifugal pumps with cast iron body and gunmetal/bronze impeller, stainless steel shaft and coupled to a tefc electric motor by means of a flexible coupling. Each pump should operate a curve 15M below specified head.
- 2.1.2 Pump and motor shall be mounted structural or C.I. base plate.
- 2.1.3 Each pump shall be: provided with a totally enclosed fan cooled induction motor of H.P. and RPM specified in the bill of quantities.
- 2.1.4 Each pumping set shall be provided with a 150mm dia gunmetal "Bourdon" type pressure gauge with gunmetal isolation cock and connecting piping.
- 2.1.5 Provide vibration eliminating pads appropriate for each pump (Resistoflex or equivalent).
- 2.1.6 Provide rate of flow measuring meter with every set of pumps as shown on the drawings and given in the bill of quantities (to be paid separately).
- 2.1.7 All water supply pumps shall be provided with mechanical seals.

3.0 CABLES

- 3.1 Contractor shall provide all power control cables from the motor control centre to various motors, level controllers and other control devices.
- 3.2 Cables shall conform to IS: 1554 and carry ISI mark.
- 3.3 Wiring cables shall conform to IS: 694.
- 3.4 All power and wiring cables shall be copper conductor PVC insulated armoured and PVC sheathed of 1100 volts grade.
- 3.5 All control cables shall be copper conductor PVC insulated armoured and PVC sheathed 1100 Volt grade.
- 3.6 All cables shall have stranded conductors. The cables shall be in drums as far as possible and bear manufacturer's name.

3.7 All cables joints shall be made in approved manner as per standard practice.

4.0 **CABLE TRAYS**

4.1 Contractor shall provide M.S. slotted cable trays at locations as shown on the drawings and of size as given in the bill of quantities.

4.2 Cable trays shall be supported from the bottom of the slab at intervals of 60cms 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.

4.3 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.

4.4 Cable trays shall be MEK, DEXION, or any other approved equivalent make.

5.0 **EARTHING**

5.1 There shall be an independent ear thing station. The ear thing shall consist of an earth tape connected to an independent plat made of copper or G.I. having a conductivity of not less than 100% international standard. All electrical apparatus, cable boxes and sheath / armour clamps shall be connected to the main bar by means of branch earth connections of appropriate size. All joints in the main bar and between main bar and branch bars shall have the lapping surface properly tinned to prevent oxidation. The joints shall be revitted and sheathed.

5.2 Earth plates shall be buried in a pit of 1.20x1.20M at minimum depth of 3M below ground. The connections between main bars shall be made by means of three 10mm brass studs and fixed at 100mm centres. The pit shall be filled with coke breeze, rock salt and loose soil. A G.I. pipe of 20mm dia with perforations on the periphery shall be placed vertically over the plate to reach ground level or watering.

A brick masonry manhole 30x30x30cm size shall be provided to surround the pipe for inspection. A bolted removable link connecting main bar outside the pit position leading to the plates shall be accommodated, in this manhole for testing.

6.0 **MOTOR CONTROL CENTRES**

6.1 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-enamelled paint of approved make and shade. It shall be fitted with suitable etched plastic identification plates for each motor. The cubicle shall comprise of the followings:- (Switchgear as given in the bill of quantities).

- a) Incoming main switch fuse unit of required capacity.
- b) Isolation switch fuse unit, one for each motor.
- c) Fully automatic D.O.L. / Stanrdelta starters suitable for motor H.P. with push buttons one for each motor and on / off indicating neon lamps.
- d) Single phasing prevent or of appropriate rating for each motor.
- e) Rotary duty selected 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 for in incoming main and on/off indicating lamps for each Motor.
 - i) Rotary switch for manual or auto operation for each pump (manual/auto/off)
 - j) Fully taped separate aluminium bus bars of required capacity.
 - k) Space for liquid level controllers as specified.
 - l) The panel shall be prewired with colour-coded wiring. All interconnecting wiring from Incoming main to switch gear, meters and accessories within the switch board panel.
- 6.2 All switchgears and accessories shall be of approved make such as "Siemens, English Electric, Larson & Toubro" or equivalent.
- 6.3 Switchboard cubicles shall be floor or wall mounted type as recommended by Manufacturers.
- 7.0 **PIPING**
- 7.1 Pipes for water supply services shall be galvanised steel tubes to I.S:1239 (medium class). Fittings and flanges shall be malleable. Pipes shall be ITC or BST make and G. I. fittings "R" brand.
- 7.2 Full way valve end check-valve above 65mm dia and be C.I. double flanged conforming to I.S: 780 manufactured by Kirloskar, Burn, Kilburn or IVC.
- 7.3 Full way end check valve, 65mm dia and below shall be gunmetal tested to 20 Kg/Sqcm Pressure (Leeder or G.G. make) certified end conforming to I.S: 778. Class II.
- 7.4 Section strainer or foot valves shall be gunmetal.
- 7.5 **Joints**
- All G.I. pipes and fittings shall be provided with screwed joints.
- 7.6 **Testing**
- All G.I. pipes shall be tested to hydro statically for a period of 30 minutes to a pressure of 7 KG/Sq.cm without drop *in* pressure.
- 8.0 **MEASUREMENTS**
- 8.1 Raw water and soft water pumps shall be measured by numbers and shall include all item as given in the bill of quantities.
- 8.2 Motor control panel and level controllers shall be measured by numbers.
- 8.3 Pipes for suction and delivery header and mains shall be measured per linear metre along the centre line of the pipe and shall be inclusive of all fittings.
- 8.4 Cable trays and cables shall be measured per linear more.
- 8.5 Structural clamps including hangers shall be measured by weight calculated from sections used. No separate payment shall be admissible for bolts; anchor bolts rawl plugs, etc.
- 8.6 No separate payment shall be made for making connections of the existing service lines to the pumps. Vibration eliminator pads, which are, include in the scope of this work.

9.0 **GUARANTEE**

- 9.1 The contractor shall submit a warranty for all equipment, materials and accessories supplied by him against manufacturing defects, malfunctioning or under capacity functioning.
- 9.2 The form of warranty Engineer-in-charge shall be as approved by the Engineer-in-Charge.
- 9.3 The warranty shall be valid for a period of one from the date of commissioning and handling over.
- 9.4 The warranty shall expressly include replacement of all defective or under capacity equipment Engineer-in- Charge may allow repair of certain equipment if the same is found to meet the requirement for efficient functioning of the system. :
- 9.5 The warranty shall include replacement of any equipment found to have capacity lesser than the rated capacity as accepted in the contract. The replacement equipment shall be approved by the Engineer-in-charge.
- 9.6 The contractor shall include in his rate the operation of all mechanical equipments for period of six months from the date of commissioning. No separate payment will be made on this account.

C. TECHNICAL SPECIFICATIONS FOR ELECTRICAL WORKS

1. INTERNAL WIRING:

1.1 System of wiring

The system of wiring shall consist of single core PVC insulated copper conductor wires in PVC conduits concealed or exposed as called for on the drawings.

1.2 General

Prior to laying and fixing of conduits, the Contractor shall carefully examine the drawings indicating the layout of conduits satisfy himself about the sufficiency of number Cold size of conduits, location of junction boxes, sizes and location of switch boxes and other relevant details. Any discrepancy found in the drawings shall be brought to the notice of the Consultant Architect. Any modifications suggested by the Contractor shall be got approved by the Consultant Architect before the actual laying of conduits is commenced.

1.3 Materials

PVC Conduit: PVC conduits shall be extruded conduits. The minimum wall thickness shall be 2mm for conduits upto 25 diameters and 2.5 mm wall thickness for conduits above 25 mm diameter.

1.3.1 Connections

All joints shall be fully water tight and sealed by applying PVC jointing compound as per manufacturer's recommendation. Junction boxes and running joints shall be provided at suitable places to allow for subsequent extension, if any, without undue dismantling of conduit system. As far as possible, diagonal run of conduits shall be avoided.

Conduit system shall: be erect and straight as far as possible. Separate conduits shall be run for '15amps' power outlet wiring. The joints in conduit shall be free of burrs to avoid damage to installation of conductors while pulling them through the conduit.

1.4 Bends in Conduit

Where necessary, bends or diversions may be achieved by means of bends and/or circular inspection boxes with adequate and suitable inlet and outlet connections In case of recessed system each junction box shall be provided with a cover properly secured and flush with the finish wall surface, so that the conductors inside the conduit are easily accessible. No bend shall have radius less than 12 ½ times the outside diameter of the conduit.

1.5 Fixing Conduits

Conduits and junction boxes shall be kept in position while the walls, slabs and floor are under construction and proper holdfasts shall be provided. Conduit: shall be so arranged as to facilitate easy drawing of wires through them. Adequate junction boxes of approved quality and size shall be provided. Where conduits cross expansion joints in the building, adequate expansion fittings or other approved devices shall be used to take care of any relative movement. All conduits shall be installed so as to avoid steam and hot water pipes. Conduit stubs in floor slabs shall be kept as short as possible above finished floor level in order to avoid any damage to them. After the conduits, junction boxes, outlet boxes and switch boxes are installed in position, their outlet shall be properly plugged or covered so that water, mortar, insects or any other foreign matter does not enter into the conduit system.

Where called for, surface conduits shall be fixed by spacer bar saddles at intervals not more than 1000 mm and 100 mm from both sides of fitting or accessories.

The saddles shall be 3 mm x 19 mm galvanised mild steel flat, properly treated, securely fixed to support by means of rawl bolts and brass machine screws. Conduit in chases shall be avoided. Where unavoidable, conduit shall be fixed by means of staples not more than 600 mm apart and the chases filled with cement mortar 1:6. Cutting of horizontal chases is prohibited. All socketed connections shall be made fully watertight by the use of Topolin or as suggested by manufacturer PVC conduits.

1-6 **Switch outlets**

All outlets for switches, sockets and other receptacles shall be equipped with rust proof outlet boxes of sheet steel fabricated from 16 SWG sheet as called for, having smooth external and internal surface to true finish. Where called for, outlet boxes for receiving switches and fan regulators shall be fabricated to approved sizes and covered with 3/16th inch thick decorative laminate sheet.

Outlets exposed to the weather shall be fully weather tight, complete with rubber gasketed covers. Outlets where used shall be painted with two coats of bituminous paint before they are fixed in position, outlet boxes fixed in concrete shall have a minimum depth of 75 mm and the wall thickness of the boxes and spouts shall not be less than 2mm.

1.7 **Inspection Boxes**

Rust proof boxes of cast iron and of required size, having smooth external and internal finish shall be provided to permit periodical inspection and to facilitate removal and replacement of wires when required. Inspection boxes shall be mounted on walls/ ceiling finished surface and shall be provided with 3/16th) inch thick decorative laminate sheet cover to the box with brass screws. Adequate ventilation holes shall be provided in the inspection box covers.

1.8 **Telephone system**

Conduit, junction boxes, draw boxes, outlet boxes and covers to boxes for telephone system shall be as described under relevant clauses elsewhere in these specifications. The conduit for telephone wiring shall be of specified size and shall terminate at outlets as indicated on the drawings. All telephone system conduits shall have '14' SWG galvanized steel pull wires installed.

1.9 **Conductors**

All PVC insulated copper conductor wires shall conform in all respects to Indian standards.

1.10 **Bunching of wires**

Wires carrying current shall be so bunched in that the outgoing and return cables are drawn in conduit. Cables originating from two different shall not be run in the same conduit.

1.11. **Drawing conductors**

The drawing and jointing of copper conductor wires and cables shall be executed with due regard to the following precautions:

While drawing insulated wires into the conduits, care shall be taken to avoid scratches and kinks which cause breakage of conductors. There shall be no sharp bends. Insulation shall be shaved off like sharpening of a pencil and it shall not be removed by

cutting it square of wiring. Strands of wires shall not be cut for connecting terminals. The terminals shall have sufficient cross sectional area to take all strands and shall be thinned. The connecting brass screws shall have flat ends. All looped joints shall be connected through terminal blocks / connectors. The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less.

Conductors having nominal cross-sectional area exceeding 4 sq.mm shall always be provided with cable sockets. At all bolted terminals, brass flat washers of large area and approved steel spring washers shall be used. Brass nuts and bolts shall be used for all connections.

Only certified wiremen and cable jointers shall be employed to do jointing work. All wires and cables shall bear the manufacturer's label and shall be brought to site in new and original packaging. For all internal wiring, PVC insulated wires of 250/440 volts grade shall be used. The sub-circuit wiring for points shall be carried out in looping in system and no joint shall be made.

2. SWITCHES, RECEPTACLES & FIXTURES

2.1 Switches

All 5/15 amp switches shall be piano type switcher 220 V AC. All switches shall be fixed inside the switch boxes on the cover plates with Brass machine screws and nuts leaving ample space at the back and sides for accommodating wires. Flush mounted fan regulators shall be fixed inside the switch boxes over the cover plate with brass machine screws and nuts. The switch controlling the light point or fan shall be connected on the phase wire of the circuit. Switches shall be located at 1200 mm above floor level unless otherwise indicated.

Cover Plates: All switch receptacles and telephone system outlets in the walls shall be provided with white urea power pressed cover plate of standard configuration of switches manufacturer. The cover plates shall be secured to the box with counter sunk brass screws.

The switch controlling the point outlets and socket outlets shall be on the Phase wire of the circuit. The earth terminal of the socket shall be connected to the earth terminal provided inside the box by means of 2.5 sq mm insulated copper wires. No joints are allowed in the length of the conductors. If the use of joint connections is unavoidable due to any specific reasons, prior permission in writing shall be obtained from the Architect/Elect. Consultant/Engineer in charge before the use of such connections. No wire shall be drawn into any conduit, until all work, of any nature that may cause injury to the wire, is completed. Care shall be taken in pulling the wires so that no damage occurs to the installation of the wire. Before the wires are drawn into the conduits, the conduits shall be thoroughly cleaned of moisture, dust, dirt or any other obstruction by forcing compressed air through the conduit. The minimum size of PVC insulated copper conductor wires for all sub circuit shall be as follows. Wiring for lights, exhaust fans and ceiling fan points shall be 2.5 Sq cm. The two 15 amp power outlets shall be grouped, in one circuit where: called for. Wiring for the first power outlet shall be carried out with 4 sq. mm PVC insulated copper conductor wires. Wiring for the second power outlet shall be carried out with 4 sq mm. PVC insulated copper conductor wires. All power outlets shall be provided with 2.5 sq mm insulated copper earth wires.

2.3 Colour code of conductors

Colour code shall be maintained for the entire wiring installation: Red, Yellow, Blue for the three for phases, Black for neutral, Green for earth.

2.4 Ceiling fans

All ceiling fans shall be provided with suspension arrangements in the concrete slab/roof numbers. It is the duty of the contractor to make those provisions at the appropriate stage of construction. The fan hook boxes shall be fabricated from 16 SWG sheet steel: in Hexagonal shape and provided with 12 mm dia. MS rod bent to shape. Exhaust fans shall be fixed at locations shown on the drawings. They shall be wired to a plug socket and at a convenient location near the fans. All switch and outlet boxes, fan and light fittings shall be bonded to earth through copper wire properly screwed on to the body to make an effective contact.

3. **CABLES**

3.1 **General**

MV cables shall be supplied, inspected, laid, tested and commissioned in accordance with drawings, specifications relevant Indian standard specifications, and cable manufacturer's instructions. The cable shall be delivered at site on original drums with manufacturer's name clearly written on the drums.

The recommendation of the cable manufacturer with regard to jointing and sealing shall be strictly followed.

3.2 **Materials**

The MV cables shall be PVC insulated Aluminium conductor armoured cable conforming to IS:1554 laid in trenches, ducts and underground as shown on drawings.

3.3 **Inspection**

All cables shall be inspected upon receipt at site and checked for day age during transit.

3.4 **Cable termination**

Cable terminations shall be done in terminal cable box using cable glands. All pipe sleeves shall be sealed with sealing compound.

3.5 **Bonding of cables**

Where a cable enters any piece of apparatus it shall be connected to the casing by means of an approved type of armoured clamp and gland. The clamps must grip the armouring firmly to the gland or casing, so that no undue stress passed on to the cable conductors due to vibrations. The gland or cone shall be capable of effecting a good electrical bond between both the armouring and the casing.

3.6 **Laying cables**

Cables shall be laid by skilled and experienced workmen using adequate rollers to minimize stretching of the cable. The cable drums shall be placed on jacks before unwinding the cable, Great care shall be exercised in laying cables to avoid forming kinks, the drums shall be unrolled and cables run over wooden rollers in trenches at intervals not exceeding 2 meters. Cable shall be laid at a depth of 0.75 meters below ground level.

A cushion of sand not less than 80 mm shall be provided both above and below the cable and joint boxes and other accessories. Cables shall not be laid in the same trench or along side of a waterman. The cables shall be laid first in excavated trench and the layer of 80 mm sand shall be spread over the cable. The cable then shall be lifted and placed over the sand bed. The second layer of 80 mm sand shall then be spread over the cable. The relative position of the cables, laid in the same trench shall be preserved and the cables shall not cross each other as far as possible. At all changes in directions in horizontal and vertical planes, the cable shall be bent smooth with a radius of bend not less than 12 times the diameter of cable. Minimum 3 meters long loop shall be provided at

both sides of every straight joint and 5 meters at each end of cable. Distinguishing marks shall be made on the cable ends for identification. Insulation tapes of appropriate voltage and in Red, Yellow and Blue colours shall be wrapped just below the sockets for phase identification.

3.7 **Protection of cables**

The cables shall be protected by bricks on the top layer of sand for the full length of underground cable. Where more than one cable is running in the same trench, the bricks shall cover all the cables and shall project a minimum of approximately 80 mm on either side of the cables.

Cables under road crossings and any other places subject to heavy traffic shall be protected by running them through Hume pipe of suitable size. The depth of the hume pipe shall be 1 meter below the finished road level.

3.8 **Excavation & Back Filling:**

All excavation and brick fill including timbering, shoring and pumping required for the installation of the cables shall be carried out by the Contractor in accordance with the drawing and requirements laid down elsewhere. Trenches shall be true to line and grades. Back fill for trenches shall be filled in layers not exceeding 150 mm. Each layer shall be properly rammed and consolidated before laying the next layer. The Contractor shall restore all surfaces, roadways, side walks, curbs, walks or other works cut by excavation to their original conditions, satisfactory to the Architect including disposal of surface soil as directed.

3.9 **Testing of cables**

Prior to laying cables, the following tests shall be carried out:

- a. Insulation test between phases, phase and earth length of cable before and after jointing.

On completion of cable laying work, the following test shall be conducted in the presence of the Architect/consultant.

- a. Insulation Resistance Test (Sectional and overall)
- b. Continuity Resistance Test
- c. Sheathing continuity Test
- d. Earthing Test.

All tests shall be carried out in accordance with relevant Indian Standard Code of Practice and Indian Electricity Rules. The Contractor shall provide necessary instruments, equipment and labour for conducting the above test and shall bear all expenses in connection with such tests. All tests shall be carried out in the presence of the Architect/Consultant.

3.10 **Markers & Warning Plates**

Approved CI cable markers shall be provided along the route of the cables at every 30 meters distance and at both ends of road crossing, indicating "MV CABLES". Special CI markers shall be provided at all buried cable joints indicating "ELECTRICAL CABLE JOINT".

4. **DISTRIBUTION BOARDS**

The Distribution Panel and Distribution boards shall be suitable for operation on 3 phase/single phase 415/230 volts, 50 cycles neutral grounded at transformer and short circuit level not less than 5 MV 415 volts.

The Distribution panel/boards shall comply with the latest edition of relevant Indian Standards and Indian Electricity Rules and Regulations.

4.1 Construction

The Distribution panels / boards shall be metal enclosed sheet steel cubical, indoor, dead front, floor mounting / wall mounting type. The distribution boards shall be totally enclosed, completely dust and vermin proof. Gaskets between all adjacent units and beneath all covers shall be used to render the joints dust proof. Distribution boards shall be preferably arranged in multitier. All doors and covers shall be fully gasketed with foam rubber and / or rubber strips and construction of Distribution boards shall be 16 SWG thick and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet metal shall be seam welded, all welding slag grounded off and welding pits wiped smooth with plumber metal.

All panels and covers shall be properly fitted and square with the frame and holes in the panel correctly positioned. Fixing screws shall enter into holes tapped into an adequate thickness of metal or provided with bank nuts. Self threading screws shall not be used in the construction of distribution boards.

Knockout holes of appropriate size and number shall be provided in the distribution board in conformity with the location of incoming and outgoing.

4.2 Bus Bar Connections

Rectangular cross section suitable for full load current for MCB's shall be provided on the phase of live conductors of each circuit, and a neutral bar for earthed neutral. The individual banks of MCB's shall be detachable. Phase separation barriers of 3 mm thick Bakelite sheet shall be provided between. There shall be ample space behind the fittings to accommodate all the wiring. All the internal wiring of distribution boards shall be concealed behind 3 mm thick Bakelite sheet. All the distribution boards shall be completely factory wired, read for connections. All the terminals shall have adequate current rating and size to suit individual feeder requirements. Each circuit shall be clearly numbered from left to right to correspond with the wiring diagram. All the switches and circuits shall be distinctly marked with a small description of the service installed.

4.3 Switch Fuse

The switch fuse units shall be 3 pole double break type suitable for load duty quick make and break action. Separate neutral link shall be provided in the switch. All switch fuse units shall be provided with hinged doors duly interlocked with operating mechanism, so as to prevent opening of the door when the switch is in "ON" position and also to prevent closing of the switch when the door is not properly secured. All contacts shall be silver plated and all live parts shall be shrouded. High rupturing capacity (HRC) fuse links shall be provided with switch fuse units and shall be in accordance with IS:2208 and having rupturing capacity not less than 31 MVA at 415 volts. HRC fuse links shall be provided with visible indicators to show that they have operated.

4.4 Earthing

Copper earth bars of 25 mm x 3 mm shall be provided for the distribution panel for the full length of the panel and connected to the frame work provisions shall be made for connection from this earth bar to the main earthing bar on both sides of the distribution panel.

4.5 Painting

All sheet steel shall undergo a process of degreasing, pickling in acid cold rinsing, phosphating, passivating and then sprayed with a high corrosive resistant primer. The primer shall be baked in an oven. The finishing treatment shall be by application of two coats of synthetic enamel paint of approved colour and stoved.

4.6 **Labels**

Engraved PVC labels shall be provided on all incoming and outgoing feeder switches. Circuit diagram showing the arrangement of the circuit inside the distribution board shall be pasted on inside of the panel door and covered with transparent laminated plastic sheet. All the distribution boards shall be subject to tests specified in relevant Indian Standards and test certificate shall be furnished.

5.1 **EARTHING**

5.1 **Earthing**

All the non-current carrying metal parts of electrical installation shall be earthed properly. All metal conduits, trunking, cable sheaths, switch gear, distribution fuse boards, lighting fittings and all other parts made of metal of specified earthing conductors to an efficient earth electrode. All earthing will be in conformity with the relevant provision of rules 33 and 61 of the Indian Electricity Rules 1956, and Indian Standard Specifications IS:3043.

5.2 **Electricity Conductor**

Every earthing conductor shall be of bare G.I./Copper/insulated coppers called for on drawings / specified in bills of quantities, and shall be protected against mechanical injury or corrosion.

5.3 **Sizing of Earthing Conductors**

The cross sectional area of earthing conductor shall be as called for on the drawing.

5.4 **Construction of Earthing Conductors**

Main earthing conductors shall be taken from the earth connectors at the main switch boards to an earth electrode with which the connection is to be made. Sub-main earthing conductors shall run from the main switch board to the sub-distribution boards.

Circuit earthing conductors shall -un from the exposed metal of equipment and shall be connected to any point on the earthing conductors, or its distribution board.

5.5 **Earthing stations**

Earthing electrode shall consist of a C.I. pipe(12 mm wall thickness) of 100 mm dia and 3.7 meters long. The electrode shall be 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 be one piece and no joints shall be allowed in the electrode. Wherever possible earth electrodes 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 electrode shall be kept vertically and surrounded with 150 mm thick layer of charcoal dust and salt mixture upto a height of 2.5 metres from the bottom. At the top of the electrode a funnel with a mesh shall be provided for watering the earth. The main earth conductor shall be connected the electrode, just below the tunnel, with proper terminal lugs and check nuts. The tunnel over the C.I. pipe and earth connection shall be housed in a masonry chamber, approximately 300 mm long, 300 mm wide and 300 mm deep. The masonry chamber shall be provided with a cast iron cover resting over a CI frame embedded in masonry.

5.6 Earth Connections

All metal clad switches and other equipment carrying single phase current shall be connected to earth by a single connection. All metal clad switches carrying medium voltage shall be connected to earth by two separate and distinct connections. The earthing conductors inside the building wherever exposed shall be properly protected from mechanical injury by running the same in G.I. pipe of adequate size. The earthing conductor shall be painted to protect it against corrosion.

Earthing conductor outside the building shall be laid 600 mm below the finished ground level. The overlapping in GI strips in joints shall be riveted. Lugs of adequate capacity and size shall be used for all termination of conductor wires above 6 sq.mm size. Lugs shall be bolted to the equipment body to be earthed after the metal body is cleaned of paint and other oily substance.

5.7 Resistance to Earth

The resistance of each earth system shall not exceed 1.0 ohm.

6. TESTING

6.1 General

After the completion of the work, the entire installation shall be subject to following tests:

1. Wiring continuity test
2. Insulation continuity test
3. Earth continuity
4. Earth Resistivity Test

Besides the above tests any other test specified by the local authority shall also be carried out. All tested and calibrated instruments for testing, labour and materials and incidentals necessary to conduct the above tests shall be provided by the contractor at his own cost.

6.2 Testing of wiring

The entire wiring system shall be tested for continuity of circuits, short circuits and earthing after wiring is completed and before energising by the Contractor in the presence of the Architects.

6.3 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 roles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure provided that it does not exceed 660 volts for medium voltage circuits. Where the supply is derived from AC- three 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 than be carried out after removing all metallic connections between the two pole of the installation and in these circumstances the insulation resistance between conductors of installation shall not be less than that specified: above. The insulation resistance between the case of frame work of housing and power appliance and all live parts of each appliance shall not be less than

that specified in the relevant Indian Standard specification or where there is no such specification shall not be less than half a megohm.

6.4 Earth continuity Test

The earth continuity conductor metallic envelopes of cables shall be tested, for electric continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance or earth leakage circuit breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one mega ohm.

6.5 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 throughout and such conductor shall be labelled or marked for connections to an outer or phase conductor or to the non-earthed conductor of the supply. In the three or four wire installation a test shall be made to verify that every non-linked single pole switch is fitted in a conductor to one of the other or phase conductor of the supply. The entire installation shall be subject to the final acceptance of the consultant as well as the local authorities.

6.6 Earth Resistivity Test

Earth resistivity test shall be carried out in accordance with Indian Standard code of practice for earthing IS: 3043. All tests shall be carried out in the presence of Architect.

c. SAFETY CONDITIONS FOR UNDERTAKING SITE WORK

All the Contractor's workmen shall be covered under the Employee's State Insurance Scheme/Janata Policy/any other scheme which may be specified by

The statutory Authorities from time to time.