

**S N BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

**SECTOR-III, BLOCK-JD
SALT LAKE, KOLKATA**

TENDER DOCUMENTS

FOR

CONSTRUCTION OF 2 NOS. LABORATORY BUILDINGS

**TENDER REFERENCE: SNB/ENGG / TENDER / 2014-15/ 04 /11
Dt.18.07.2014**

**ARCHITECT:
HAVEN Consultants Pvt. Ltd.
14/2, Lake East 6th Road,
Santoshpur , Kol-700075**

**S N BOSE NATIONAL CENTRE FOR BASIC SCIENCES
CONSTRUCTION OF 2 NOS. LABORATORY BUILDINGS
TENDER DOCUMENTS**

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1. NOTICE INVITING TENDER

Sealed Tenders on items rate basis are invited from reliable & experienced contractors for "**Construction of 2 Nos. Laboratory Buildings** " involving Civil, Structural, Plumbing, and other allied building works for S N Bose National Centre for Basic Sciences at Block-JD, Sector-III, Salt Lake, Kolkata -700 098.

1. Name of Work : Construction of 2 Nos. Laboratory Buildings
2. Time allowed for completion : 3 (three) months from the date of issue of work order
3. Estimated Cost of Work : Rs 180 Lac (Rupees One crore and Eighty Lac only)
4. Earnest Money Deposit : Rs. 3,60,000 /- (Rupees Three Lac Sixty Thousand only) in the form of Demand Draft / Pay Order/ Bank Guarantee drawn in favour of S. N. Bose National Centre for Basic Sciences, Kolkata-700098.
5. Cost of tender documents : Rs 1000/-.. (Rupees one thousand -only) per set of documents (in cash) (non-refundable).
6. Availability of tender document : Tender documents can be purchased on any working day between 11:00am- 1:00pm & 2:00pm- 5:00pm from Accounts Section, S N Bose National Centre for Basic Sciences at Block-JD, Sector-II, Salt Lake, Kolkata-700 098, Ph-(033)2335-5705/06 from 18.07.2014 to 31.07.2014.
7. Pre-bid Discussion (with firms who have purchased the Tender documents) : 3:00 PM on 25.07.2014.
8. Last date and time of receipt of Tenders : 2:00 PM on 01.08.2014.
9. Address at which the tenders are to be submitted : In Tender Box placed at Ground floor Main Building S N Bose National Centre for Basic Sciences Block-JD, Sector-III, Salt Lake, Kolkata-700 098.
10. Date and time of opening of Tender(Cover-I) : 3:00 PM on 01.08.2014.

11. Defect Liability Period : 12 months from the date of actual completion of work
12. Validity of Offer : For a period of 90 days from the date of opening of bid
13. Liquidated Damages : As per Clause. 52 of General Conditions of Contract

14. Tender will have to be submitted in two parts Cover-I and Cover-II separately sealed and super scribed with the name of the work and tender reference. These two covers will be inserted into a big cover super scribing the name of work on it.

Cover-I: Shall contain all commercial and general stipulations proposed by the tenderer, and the earnest money in required form. Cover-I will contain the documents as per Clause.4 of General Rules and Instructions for the Guidance of Tenderers.

Cover-II: Shall contain the offered price with the tender documents duly filled. No other condition stipulated in Cover-II other than unconditional general rebate shall be accepted.

15. Cover-I will be opened on 01.08.2014. at 3.00 P.M hours in the presence of Tenderers who desire to attend. Cover-II will be opened only of technically qualified bidders.

16. Price bid details in Cover-II: Rate of each item should be written in figure as well as in words.

The Centre will not be bound to accept the lowest tender and reserves the right to accept or reject any or all the tenders received and to place order on/or more firms without assigning any /one reason whatsoever The notification of award of contract will be made in writing to the successful tenderer by the Centre.

In case the date of opening of tenders is declared as a holiday, the tenders will be opened on the next working day at the same time.

.....
Registrar

S N Bose National Centre for Basic Sciences

2. GENERAL RULES AND INSTRUCTIONS FOR THE GUIDANCE OF TENDERERS

1. Sealed tenders on item rate basis are invited from bidders having sound Technical & Financial capacity for **“Construction of 2 Nos. Laboratory Buildings”** including civil, structural, plumbing, and other allied building works for S N Bose National Centre for Basic Sciences at Block-JD, Salt Lake City, Sector-III, Kolkata 700 098 Estimated cost of project is Rs. 180 Lac.
2. Tender documents consisting of the plans, complete specifications, the schedule of quantities of the above work to be done, and the set of conditions of contract to be complied with by the bidder whose tenders may be accepted, can be purchased at the rate of Rs 1000/- per set from the office of the Accounts Section, S N Bose National Centre for Basic Sciences, Block- JD, Sector-III, Salt Lake, Kolkata-700 098, on all working days from 18.07.2014 to 31.07.2014.
3. The site for the work will be made available to the contractor in its present conditions. No space other than the above site can be made available to the contractor for site office, labour camps, storage etc.
4. Sealed tenders on the item rate basis are invited in two separate sealed covers containing the documents as under :-

Cover-I : Technical Bid comprising (a) Experience in building and structural work of similar value of work (Furnish completion certificate), (b) Valid Sales Tax / VAT, (c) Professional Tax, (d) Income Tax PAN No., (e) Trade License Certificate, (f) Clearance Certificate of VAT, (g) Bank Solvency Certificate, (h) EMD in the form of Demand Draft / Pay Order / Bank Guarantee of a Schedule Bank amounting to Rs. 3,60,000 /- (Rupees Three Lac Sixty Thousand only) as Earnest Money in favour of "S N Bose National Centre for Basic Sciences, Kolkata" payable at `Kolkata`.

Cover-II : The priced tender papers. Any condition mentioned by the tenderer in the Cover- II (Priced tender paper) will not be accepted and the tender will be rejected.

Tender in Cover-I & Cover-II shall be put in a separate sealed cover super scribing the name of the work and is to be dropped in a Tender Box, kept at Ground floor of Main Building of SNBNCBS, Kolkata-700 098.

The Cover I: It will be opened at about 3 P.M on 01.08.2014. Any tender which is not accompanied by the requisite EMD shall be summarily rejected. No interest shall be paid for the period during which the EMD lies with the Centre. Cover II of tenders containing the priced tenders will be opened after opening of Cover-I, on being satisfied that the bidder has been technically qualified.

5. **The time of completion is three (3) months from the date of issue of work order.**
6. The contractors should quote the rate in figures as well as in words, and amount tendered by them. The amount for each item should be worked out and the requisite totals given.
7. All corrections shall be attested by the initials of the tenderers with the seal of the firm. In case any discrepancy/difference is found on checking between rates quoted by the contractor in words and figures or in the amount worked out by him, the following procedure shall be followed:

a) When there is a difference between the rates in figures and in words, the rate which corresponds to the amounts worked out by the contractor, shall be taken as correct.

b) When the amount of any item is not worked out by the contractor or it does not correspond with the rate written either in figures or in words, then the rate quoted by the contractors in words shall be taken as correct.

c) When the rate quoted by the contractor in figures and in words tallies but the amount is not worked out correctly, rate quoted by the contractor shall be taken as correct and not the amount:

d) Amendments as mentioned above shall be based on the tender marked "Original" only.

8. When a contractor signs a tender in an Indian language the tendered amount and the total amount tendered should also be written in the same language. In the case of illiterate contractors the rates or the amounts tendered should be attested by a witness.
9. Earnest money, amounting to Rs. 3,60,000 /- (Rupees Three Lac Sixty Thousand only) in the form of Crossed Demand Draft / Pay Order / Bank Guarantee drawn in favour of S N Bose National Centre for Basic Sciences, Kolkata 700 098 must accompany each tender in Cover-I.
10. The several documents forming the contract are to be taken mutually explanatory of one another, detailed drawing' followed in preference to small scale drawing and figured dimensions in preference to scale and special conditions in preference to General conditions. In the case of discrepancy between the Schedule of Quantities, the Specifications and/or drawings, the following order of preference shall be observed:
 - i) Description of Schedule of Quantities
 - ii) Particular Specification and Special Conditions, if any
 - iii) Drawings
 - iv) Technical Specifications
 - v) Indian Standard Specification of B.I.S.
11. The acceptance of a tender will rest with the Centre which does not bind itself to accept the lowest tender, and reserves to itself the authority to reject any or all of the tenders received and to place order on one or more firms without the assignment of a reason. All tenders in which any of the prescribed conditions are not fulfilled or are incomplete in any respect are liable to be rejected.

The Centre reserves the right to accept the tender in full or in part and the tenderer shall have no claim for revision of rates or other conditions if his tender is accepted in parts.
12. Canvassing in connection with tenders is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable to rejection.
13. All rates shall be quoted on the proper form of the tender alone.
14. An item rate tender containing percentage below/above will be summarily rejected. However, where a tenderer voluntarily offers an unconditional rebate for payment within a stipulated period in Cover-I, this may be considered. Subject to compliance of all technical specifications and other terms and conditions.
15. On acceptance of the tender, the name of the authorized representative(s) of the contractor who would be responsible for taking instructions from the Owner/Architects shall be communicated to the Owner.

16. Special care should be taken to write the rates in figures as well as in words and the amounts in figures only, in such a way that interpolation is not possible. The total amount should be written both in figures and in words. In case of figures, the words 'Rs.' Should be written before the figure of rupees and words 'P' after the decimal figures, e.g. Rs. 2.15 P. and in case of words, the word 'Rupees' should precede and the word 'Paise' should be -written at the end, unless the rate is in whole rupees and followed by the words 'only' it should invariably be up to two decimal places. While quoting the rate in schedule of quantities, the word 'only' should be written closely following the amount and it should not be written in the next line.
17. The Centre does not bind it-self to accept the lowest or any tender and reserve's to itself the right of accepting the whole or any part of the tender and the tenderer shall be bound to perform the same at the rate quoted.
18. VAT, Sales tax, Cess for welfare of Construction Labour or any other tax on material or on finished works like works contract tax, Turn-over Tax, etc in respect of this contract Shall be payable by the contractor and the Centre will not entertain any claim whatsoever in this respect except Service Tax.
19. The contractor shall give a list of his relatives working with the Centre along with their designations and addresses.
20. No employee of the Centre is allowed to work as a contractor for a period of two years of his retirement from Centre service, without the previous permission of the Centre. This contract is liable to be cancelled if either the contractor or any of his employees is found at any time to be such a person who had not obtained the permission of the Centre as aforesaid before submission of the tender or engagement in the contractor's service.
21. The tender for 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, then the Centre shall be at liberty to forfeit Earnest Money paid along with the tender.
22. The tender for the work shall not be witnessed by a contractor or contractors who himself/themselves has/have tendered or who may and had/have tendered for the same Work. Failure to observe this condition would render tenders of the contractors tendering as well as witnessing the tender liable to summarily rejection.
23. It will be obligatory on the part of the tenderer to tender and sign the tender documents for all the component parts and that, after the work is awarded, he will have to enter into an agreement for each component with the competent authority in the Centre.
24. The notification of award of contract will be made in writing to the successful tenderer by S N Bose National Centre for Basic Sciences.
25. Service Tax is payable by the Centre as per. Govt Rules at rate prevailing at the time of Making payment .of RA/Final Bills to the Contractor, on production of necessary documents by the Contractor towards deposit of such payment to relevant Govt Authority.

3. FORM OF TENDER (To be filled up by the Tenderer)

The Registrar

S N Bose National Centre for Basic Sciences
Block - J D
Sector - III
Salt Lake
Kolkata -700098.

Dear Sir,

Re: **Construction of 2 Nos. Laboratory Buildings** for S N Bose National Centre for Basic Sciences, Block-JD, Sector-III, Salt Lake Kolkata 700 098

1. I/We refer to the tender notice issued by Acting Registrar, S N Bose National Centre for Basic Sciences, Kolkata- 700 098 on your behalf for **Construction of 2 Nos. Laboratory Buildings** and other allied works in connection with the above.
2. I/We do hereby offer, to perform, provide, execute, complete and maintain the works in conformity with the Drawings, Conditions of Contract, Special Conditions, Specifications, Bill of quantities for the sum of Rs.(actual work done at site) at the respective rates quoted in the Bill of quantities.
3. I/We have satisfied myself/ourselves as to the site conditions, examined the drawings and all aspects of the tender conditions, subject to above, I/We do hereby agree, should this-tender be accepted in whole or in part, to :
 - a) Abide by and fulfill all the terms and provisions of the hereto;
 - b) Complete the works within 3(three) months, in two shifts if the Owner/Architects at no extra cost to the Owner.
4. I/We have deposited the earnest money of Rs. 3,60,000 /- (Rupees Three Lac Sixty Thousand only) in the form of Demand Draft / Pay Order / Bank Guarantee which will not bear any interest and is liable for forfeiture:
 - i) If our offer is withdrawn within the validity period of acceptance.
or
 - ii) If the Contract is not executed within 15 days from the date of receipt of the letter of acceptance.
or
 - iii) If the work is not commenced within 14 days after issue of work order.
5. I/we understand that you are not bound to accept the lowest or any tender you receive.

6. Name of Proprietor / Partners / Directors of our Firm:

- i)
- ii)
- iii)
- iv)

Yours faithfully,

Signature:

Designation:

Name of Proprietor / Partners / Directors of the firm authorized to sign or Name of person having power of attorney to sign the contract. (Certified true copy of power of attorney should be attached)

Signature and address of Witness

a) Signature:

Name:

Address:

b) Signature:

Name:

Address:

**4. ARTICLES OF AGREEMENT
(TO BE EXECUTED ON NON-JUDICIAL STAMP PAPER OF RS.100.00)**

ARTICLES OF AGREEMENT made thisday of Two thousand twelve between S N Bose National Centre for Basic Sciences having its Office at Block-JD, Sector-III, Salt Lake, Kolkata 700 098 and any other places (hereinafter referred to as "the OWNER") which expression shall include its successor or successors and assigns) of the ONE PART through the authorized officer(designation).

AND

M/s.....having its registered office at(thereinafter referred to as the 'CONTRACTOR') of the OTHER PART.

WHEREAS the Owner is desirous of conducting **Construction of 2 Nos. Laboratory Buildings** of S N Bose National Centre for Basic Sciences at Block-JD; Sector-III, Salt Lake, Kolkata (hereinafter called the Works).

AND WHEREAS the Owner in order to effectively carry out the said **Construction of 2 Nos. Laboratory Buildings** engaged HAVEN Consultants PVT. LTD. 14/2, Lake East 6TH Road, Santoshpur , Kol-75

(hereinafter referred to as "THE ARCHITECT/CONSULTANT") to prepare plans, drawings and specifications description for execution of the said works of the project, to supervise the work periodically and to assist in concerned technical matters.

AND WHEREAS the Owner has prepared the plans, drawings and specifications, priced schedule of quantities of the said work to be executed at Block-JD, Sector-III, Salt Lake, Kolkata as per conditions of the contract and, special conditions prepared with the assistance of the said Architect/Consultant subject to which the offer of the Contractor shall be accepted.

AND WHEREAS the tender of the Contractor for **Construction of 2 Nos. Laboratory Buildings** at Block-JD, Sector-III, Salt Lake, Kolkata has been approved by the Owner.

WHEREAS the Owner will deduct @5% of the Gross Amount from their each Running Account (RA) bill till the sum, along with the sum already deposited as Earnest Money, will amount to Security Deposit of 5% of tendered value of work. The contractor has to deposit with the Owner a sum @ of 5% of the tendered and accepted value of the work.

Rs.....(Rupees.....) as Performance Guarantee for the work. Thereafter the owner will issue the work order to commence the work to the contractor.

AND WHEREAS said drawings no..... inclusive of the specifications, priced schedule of quantities, conditions of contract and special Conditions (hereinafter collectively referred to as the said condition) have been signed by the parties hereto and the contractor has agreed to execute the works upon and subject to the said conditions.

NOW IT IS HEREBY AGREED AS STATED ABOVE AND

1. In consideration of the payments to be made to the contractor as hereinafter provided the contractor shall upon and subject to .the said conditions execute and complete the works shown upon the said drawings etc and such further detailed drawings as may be furnished to the contractor by the said owner through the Architect as described in the said specifications and the said priced schedule of quantities.
2. The term 'the Architect/Consultant' in the said conditions shall mean the said M/s. HAVEN Consultants Pvt. Ltd., 14/2, Lake East 6th Road, Santoshpur , Kol-75 and in the event of the said Architect/Consultant ceasing to be the Architect/Consultant for the purpose of this contract such other person or persons as shall be nominated for the purpose by the Owner.
3. The plans, agreement and documents above mentioned shall form the basis of this contract and all disputes to be decided in the manner prescribed in the conditions attached hereto.
4. The said contract comprises the Civil, Structural, Plumbing and allied building works for **Construction of 2 Nos. Laboratory Buildings**, as 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 Owner even though said works may not be shown on the drawings or described in the said specifications or the priced schedule of quantities.
5. Notwithstanding what are stated in the special condition, conditions of contract and hereinbefore stated the Owner through the Architect/Consultant reserves to himself the right to alter the drawings and nature of the work and of adding to or omitting any items of works from or of having portions of the same carried out departmentally or otherwise and such alterations or variations shall be carried out without prejudice to this contract.
6. The said conditions shall be read and be treated as forming part of this agreement and the parties hereto will respectively be bound. thereby and to abide by and submit themselves to the conditions and stipulations and perform the same on their parts to be respectively observed and preferred.
7. If the Contractor fails to complete the work in time, he should pay compensation for delay of work @ 1.5% per week of delay to be computed on per day basis which shall not exceed 10% of the tender value of work.
8. Any dispute arising under this agreement shall be referred to the arbitration to a sole arbitrator appointed with consent of the Owner and the contractor as indicated in the Article of the general conditions. The award of the arbitrator shall be final and binding on both parties.

IN WITNESS WHEREOF, the parties hereto have executed these presents the day and year first here in above written.

WITNESS

1. OWNER
- 2.

EXECUTANTS

2. CONTRACTOR

*Common Seal

- In case of the Company, the common seal be affixed pursuant to resolution of Board of Directors in accordance with Articles of Association of the Company the directors etc as the case May be affixing common seal may initial in token thereof and also by putting their names.

5. GENERAL CONDITIONS OF CONTRACT

Except where provided for in the description of the individual items in the schedule of quantities and in the specifications and conditions laid down hereinafter and in the Drawings, the work shall be carried out as per standard specifications and under the direction of Owner/Architects.

1.0 INTERPRETATION

In construing these conditions, the specifications, the schedule of quantities, tender and Agreement, the following words shall have the meaning herein assigned to them except where the subject or context otherwise requires :

- i) Owner/Employer : The term Owner/Employer shall denote S N Bose National Centre for Basic Sciences, Block-JD, Sector-III, Salt Lake, Kolkata 700 098 or any of its employees representative authorized on their behalf.
- ii) Architects/Consultants : The term Architects/Consultants shall mean HAVEN Consultants Pvt. Ltd. 14/2, Lake East 6TH Road, Santoshpur , Kol-75 or in the event of his/their ceasing to be the Architects for the purpose of this contract such other person/s as the Owner shall nominate for the purpose.
- iii) Site Engineer : The term Site Engineer shall mean the person/s appointed and paid by the Owner to superintend the work.
- iv) Contractor: The term contractor shall meanand his/their heirs, legal representatives, assigns and successors.
- v) Site : The site shall mean the site where the works are to be executed as shown on the site plan.
- vi) Drawings: The work is to be carried out in accordance with drawings, specifications, the schedule of quantities and any further drawings which may be given by the Owner during execution of the work. A set of drawings is provided with the tender to give the general idea about the total construction.

All drawings relating work given to the contractor together with a copy of schedule of quantities are to be kept at site and the Owner/Architects shall be given access to such drawings or schedule of quantities whenever necessary.

In case any detailed Drawings are necessary contractor shall prepare such detailed drawings and/or dimensional sketches therefore and have it confirmed by the Owner/Architects prior to taking up such work.

The contractor shall ask in writing for all clarifications on matters occurring anywhere in drawings, specifications and schedule of quantities or to additional instructions at least 10 days ahead from the time when it is required for implementation so that the Owner may be able to give decision thereon.

- vii) The "Works" shall mean the work or works to be executed or done under this contract.
- viii) "Act of Insolvency" shall mean any act as such as defined by the Presidency Towns Insolvency Act or in Provincial Insolvency Act or any amending statutes.
- ix) "The Schedule of Quantities shall mean the schedule of quantities as specified and forming part of this contract.
- x) "Priced Schedule of Quantities" shall mean the schedule of quantities duly priced with the accepted quoted rates of the contractor.
- xi) "Notice in writing" or "written notice" shall mean a notice written, typed or in printed characters sent (unless delivered personally or otherwise proved to have been received) by registered post to the last known private or business address or registered office address and shall be deemed to have been received when in the ordinary course of post it would have been delivered.

2.0 SCOPE

The work consists of **Construction of 2 Nos. Laboratory Buildings** at Salt Lake, Kolkata in accordance with the "drawings" and "Schedule of Quantities". The civil, structural, plumbing and other allied works are within the scope of this tender. It includes furnishing all materials, labour, tools and equipment and management necessary for the incidental to the execution and completion of the work. All work, during its progress and upon completion, shall conform to the lines, elevations and grades as shown on the drawings furnished by the Owner/Architects. Should any detail essential for efficient completion of the work be omitted from the drawings and specifications it shall be the responsibility of the contractor to inform the Owner/Architects.

The contractor is to furnish and install such detail with Owner's/Architects' concurrence, so that upon completion of the proposed work the same will be acceptable and ready for use.

Owner/Architects may in their absolute discretion issue further drawings and/or written instructions, details, directions and explanations, which are, hereafter collectively referred to as "The Owner's/Architect's instructions" in regard to :

- a) The variation or modification of the design quality or quantity 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 specification.
- c) The removal from the site of any defective material brought thereon by the contractor and the substitution of any other material thereof.
- d) The demolition removal and/or re-execution of any work executed by the contractor/s.
- e) The dismissal from the work of any persons employed thereupon.
- f) The opening up for inspection of any work covered up.
- g) The rectification, and making good of any defects under clauses hereinafter mentioned and those arising during the maintenance period (defects liability period).

The contractor shall forthwith comply with and duly execute any work comprised in such Owner's/Architects' instructions, provided always that verbal instructions, directions and explanations given to the contractor's or his representative upon the Works by the Owner/Architects shall if involving a variation be confirmed in writing to the contractor/s within seven days. No works for which rates are not specifically mentioned in the priced schedule of quantities, shall be taken up without written permission of the Owner/Architects. Rates of items not mentioned in the priced schedule of quantities shall be fixed by the Owner in consultation with the Architects as provided in Clause "variation".

The contractor shall set up a field laboratory with necessary equipments for day to day testing of materials like grading of coarse and fine aggregates, silt content and bulkage of sand crushing strength of concrete etc. Such laboratory shall be set up at site during mobilization period so that the field laboratory is available from the date of commencement of work.

Regarding all factory made products for which ISI marked products are available, only products bearing ISI marking shall be used in the work. Other products should be supplied as per the brand name mentioned in the Technical Specifications.

3.0 DETAILED DRAWINGS AND INSTRUCTIONS

The Owner through its Architect shall furnish with reasonable promptness additional instructions by means of drawings or otherwise necessary for the proper execution of the work. All such drawings and instructions shall be consistent with the Contract Documents, true developments thereof, and reasonably inferable therefrom.

The work shall be executed in conformity therewith and the Contractor shall not work without proper drawings and instructions.

Immediately after receipt of the work order of the contract the contractor shall prepare a progress schedule and submit the same to the Owner through the Architect for approval which shall indicate the dates for the starting and completion of the various stages of constructions.

4.0 COPIES FURNISHED

The Contractor on the signing hereof shall be furnished by the Owner through its Architect free of charge with a copy of the priced schedule of quantities/rates, two copies of each of the said drawings and one copy of specifications and two copies of all further drawings issued during the progress of the work. Any further copies of such drawings required by the Contractor shall be supplied on payment of the charges thereof by the contractor.

5.0 OWNERSHIP OF DRAWING

All drawings, specification and copies thereof furnished by the Owner through its Architects are the property of the Owner. They are not to be used on other work, and with the exception of the signed contract set, are to be returned to the Owner on request at the completion of the work.

6.0 SUPERINTENDENCE SUPERVISION

The Contractor, shall give all necessary personal Superintendence during the execution of the work and this obligation and liability will continue until expiration of the 'Maintenance Period' .The contractor shall also during the whole time of work when in progress employ a competent representative who shall be constantly in attention at the site while his men are at work. Any

directions, explanations, instructions or notices given by the Owner or the Architect to such representative shall be deemed to have been given and duly served on the contractor.

7.0 FAILURE BY CONTRACTORS TO COMPLY WITH OWNER'S/ARCHITECT'S INSTRUCTIONS

If the contractor after receipt of written notice from the Owner and/or the Architect requiring compliance within ten days fails to comply with such further drawings and/or Owner's/Architect's instructions, the Owner through the Architect or other person, may employ other person to execute any such work whatsoever that may be necessary to give effect thereto and pay all cost incurred in connection therewith and same shall be recoverable from the contractor by the Owner on the certificate of the Architect as a debt or shall have right to deduct same from any money due or to become due to the contractor.

8.0 TENDERER SHALL VISIT THE SITE

Intending tenderer shall visit the site and make himself .thoroughly acquainted with the local site condition, nature and requirements of the works, facilities of transport condition, effective labour and materials, access and storage for materials and removal of rubbish. The tenderer shall provide in their tender for cost of carriage, freight and other charges as also for any special difficulties and including police restriction for transport etc for proper execution of work as indicated in the drawings. The successful tenderer will not be entitled to any claim of compensation for difficulties faced or losses incurred on account of any site condition which existed before the commencement of the work or which in the opinion of the Owner/Architects might be deemed to have reasonably been inferred to be so existing before commencement of work.

9.0 TENDERS

The entire set of tender paper issued to the tenderer should be submitted fully priced and also signed on the last page together with initials on every page. Initial/signature will indicate the acceptance of the tender papers by the tenderer. The schedule of quantities shall be filled in as follows:

- i) The 'Rate' column to be legibly filled in ink in both English figures and English words.
- ii) Amount column to be filled in for each item and the amount for each sub head as detailed in the "Schedule of Quantities".
- iii) All corrections are to be initialed.
- iv) The 'Rate Column' for alternative items shall be filled up.
- v) The 'Amount' column for alternative items of which the quantities are not mentioned shall not be filled up.
- vi) In case of any errors/omissions in the quoted rates, the rates given in the tender marked "Original" shall be taken as correct rates.
- vii) When there is difference between the rates in figures and in words the rate which correspond to the amounts worked out by the contractor shall be taken as correct.

No modifications, writings or corrections can be made" in the tender papers by the tenderer, but may at his option offer his comments or modifications in a separate sheet of paper attached to the original tender papers.

The Owner reserves the right to reject the lowest or any tender and also to discharge any or all the tenders for each section or to split up and distribute any item of work to any specialist firm or firms, without assigning any reason.

The tenderers should note that the tender is strictly on the item rate basis and their attention is drawn to the fact that the rates for each and every item should be correct, workable and self-supporting if called upon by the Owner/Architects detailed analysis of any or all the rates shall be submitted. The Owner/Architects shall not be bound to recognize the contractor's analysis.

The works will be paid for as "measured work" on the basis of actual work done.

All items of work described in the schedule of quantities are to be deemed and paid as complete works in all respects and details including preparatory and finishing works involved, directly, related to and reasonably detectable from the drawings, specifications and schedule of quantities and no further extra charges will be allowed in this connection. In the case of lump-sum charges in the tender in respect of any item of works, the payment of such items of work will be made for the actual work done on the basis of lump-sum charges as will be assessed to be payable by the Owner/Architects.

The Owner has power to add or to omit from any work as shown in drawings or described in specifications or included in schedule of quantities and intimate the same in writing but no addition, omission or variation shall be made by the contractor without authorization from the Owner. No variation shall vitiate the contract.

The tenderer shall note that his tender shall remain open for consideration for a period of 90 days from the date of opening of the tender.

10.0 SCHEDULE FOR COMPLETION OF WORK

The contractor shall submit a time and progress chart in a form approved by the Owner through its Architects within fifteen days from the date of issue of work order or the date on which the contractor is instructed to take possession of the site, whichever is later.

The contractors shall have to put all their resources and endeavour to complete the buildings, if possible, earlier than the schedule time shown in the programme. Keeping the general target dates as given in bar chart of the tender, the contractors shall have to prepare detailed PERT Network showing in addition to the items already indicated in the programme, other items, the completion of which would affect the overall time schedule of the programme. This network programme shall clearly indicate the completion of Project. The contractors shall have to prepare their own material in flow according to the final Network Programme as accepted by Owner. The Network programme shall have to be updated at regular intervals and modified programme shall be submitted to the Architects/Owner for approval. In no case the overall date for the completion of important items as indicated in the programme should be changed without prior consent of Architects/Owner.

11.0 PERMITS AND LICENCES

Permits and licences for release of materials which are under Government control will be arranged by the contractor. The Owner will render necessary assistance, sign any forms or applications that may be necessary.

12.0 GOVERNMENT AND LOCAL RULES

The contractor shall conform to the provisions of all local Bye-laws and Acts. relating to the work and to the Regulations etc of the Government and Local Authorities and of any company with whose system the structure is proposed to be connected. The contractor shall give all notices required by said Act, Rules, Regulations and Byelaws etc and pay all fees payable to such authority/authorities for execution of the work involved. The cost, if any, shall be deemed to have been included in his quoted rates, taking into account all liabilities for licences, fees for footpath encroachment and restorations etc and shall indemnify the Owner against such liabilities and shall defend all actions arising from such claims or liabilities.

13.0 TAXES AND DUTIES

The tenderers must include in their tender- prices quoted for all duties royalties, cess and VAT or any other taxes or local charges if applicable. The rates shall also include sales tax on works contract as per State Government norms and Labour Welfare Cess. No extra claim on this account will in any case be entertained.

14.0 POSSESSION PRIOR TO COMPLETION

The Owner shall have the right to take possession of or use any completed or partially completed part of the work. Such possession or use shall not be an acceptance of any work not completed in accordance with the contract Agreement.

15.0 EXCEPTED MATTERS

If the dispute or differences pertain to the undernoted matters the decision in writing of the Officer designated in and signing the contract documents shall be final, conclusive and binding on the parties.

- i) Instructions.
- ii) Transactions with Local Authorities.
- iii) Proof of quality of materials.
- iv) Assigning or underletting of the contract.
- v) Certificate as to the causes of delay on the part of the contractor and justifying extension of time.
- v) Rectifying of defects pointed out during the Defects Liability Period.
- vi) Notice to the contractor to the effect that he is not proceeding with due diligence.
- vii) Certificate that the contractor has abandoned the contract.
- viii) Notice of determination of the contract by the Employer.

16.0 QUANTITY OF WORK TO BE EXECUTED

The quantities shown in the Schedule of Quantities are tentative to cover the entire new structure indicated in the: but same may vary on the basis of actual requirement at site. As such no claim on this ground will be entertained by the Owner. The Owner reserves the right to execute only a part or the whole or any excess of the work thereof without assigning any reason thereof.

17.0 OTHER PERSONS ENGAGED BY THE OWNER

The Owner reserves the right to execute any part of the work included in this contract or any work which is not included in this contract by other Agency or persons and contractor shall allow all reasonable facilities and use of his scaffolding for the execution of such work. The main contractor shall extend all cooperation in this regard.

18.0 LABOUR & PAYMENT OF WAGES TO LABOUR

No labour below the age of 18 years shall be employed on the work.

Payment of Wages to Labour.

- a) The contractor shall pay to labour employed by him either directly or through specialized firms, wages not less than fair wages as applicable within the State of West Bengal or as per the provision of the Contract Labour (Regulation and Abolition) Act, 1970 and the Contract Labour (Regulation and Abolition) Central Rules 1971 wherever applicable.
- b) The contractor shall notwithstanding the provision of any contract of the contrary cause to pay fair wages to labour indirectly engaged on the work, including any engaged by his specialized firms in connection with the said work, as if the labour has been immediately employed by him.
- c) In respect of all labour directly or indirectly employed in the work for performance of the contractor's part of this agreement the contractor shall comply with or cause to be complied with the Labour Regulations as mentioned in Sub-para (a) above made from time to time in regard to payment of wage, wage period, deductions from wages, recovery of wages not paid and deductions unauthorisedly made, maintenance of wage books or wage slips, publication of scales of wages and other terms of employment, inspection and submission of periodical returns and all other matters of the like nature or as per the provisions of the contract Labour (Regulation and Abolition) Act 1970 and . the Contract labour (regulation and Abolition) rules 1971 wherever applicable.
- d) The Owner concerned shall have the right to deduct from the moneys due to the contractor any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason non-fulfillment of the conditions of the contract for the benefit of the workers non-payment of wages or of deductions made from his or their wages which are not justified by their terms of contract or non-observance of the Regulations as mentioned above.
- e) The contractor shall comply with the provisions of Wages Act, 1936, minimum wages Act, 1945. Employees Liability Act, 1938, Industrial Dispute Act, 1947. Maternity benefit Act, 1961 and the Contract Labour (Regulations and Abolition) Act, 1970 or the modification thereof or any other Laws relating thereto and the Rules made thereunder from time to time.
- f) The contractor shall indemnify the Owner against payment to be made under and for the observance of the laws aforesaid and the CPWD Contractors 'Labour Regulations having

application within the State of West Bengal without prejudice to his right to claim indemnity from his sub-contractors.

- g) The Regulation aforesaid shall be deemed to be a part of his contract and any breach thereof shall be deemed to be breach of this contract.

19.0 EARNEST MONEY AND SECURITY DEPOSIT

The tenderer will have to deposit an amount of Rs. 3,60,000 /- (Rupees Three Lac Sixty Thousand only) in the form of Demand Draft/Pay Order/Bank Guarantee drawn in favour of the S N Bose National Centre for Basic Sciences at the time of submission of tender as an Earnest Money. The Owner is not liable to pay any interest on the Earnest Money. The Earnest Money Of the unsuccessful tenderers will be refunded without any interest soon after the decision to award the work is taken or after the expiry of the validity period of the tender.

A sum of 5% of the gross amount of the bill shall be deducted from each RA bill of the contractor till the sum along with the sum already deposited as Earnest Money amounts to Security Deposit @ 5% of the tendered value of the work. In addition the contractor will be required to deposit an amount equal to 5% of the tendered value of the contract as Performance Guarantee within fifteen days of the issue of Letter of Intent but before award of work.

Performance guarantee May be accepted as Bank Guarantee of -Scheduled Banks and State Bank of India.

The Security Deposit and Performance Guarantee may be refunded without any interest within 14 (fourteen) days after the end of defects liability period provided he has satisfactorily carried out all the work and attended to all defects in accordance with the conditions of the Contract.

20.0 CONTRACTOR TO PROVIDE EVERYTHING NECESSARY

The contractor shall provide everything necessary for the proper execution of the work according to the intent and meaning of the drawings, schedule of quantities and specifications taken together whether the Same may or may not be particularly shown or described therein provided that the same can reasonably be inferred therefrom and if the contractor finds any discrepancies therein he shall immediately and in writing, refer the same to the Owner/Architects whose decision shall be final and binding. The contractor shall provide himself for ground and fresh water for carrying out of the works at his own cost. The Owner shall on no account be responsible for the expenses incurred by the con-tractor for hired ground or fresh water obtained from elsewhere.

The rates quoted against individual items will be inclusive of everything necessary to complete the said items of work within the contemplation of the contract, and beyond the unit price no extra payment will be allowed for incidental or contingent work, labour and/or materials inclusive of all taxes and duties whatsoever except for specific items, if any, stipulated in the tender documents.

The contractor shall supply, fix and maintain at his own cost, for the execution of any work, all tools, tackles, machineries and equipments and all the necessary centering, scaffolding, staging, planking, timbering, strutting, shoring, pumping, fencing, boarding, watching and lighting by night as well as by day required not only for the proper execution and protection of the said work but also for the protection of the public and safety of any adjacent roads, streets, walls, houses, buildings, all other erections, matters and things and the contractor shall take down and remove any or all such centering, scaffolding, planking, timbering, strutting, shoring etc as occasion shall be required or when ordered so to do and shall fully reinstate and make good all matters and things disturbed during the execution of works to the satisfaction of the Owner/Architects.

The contractor shall also provide such temporary road on the site as may be necessary for the proper performance of the contract, and for his own convenience but not otherwise. Upon completion, such roads shall be broken up and levelled where so required by the drawings unless the Owner shall otherwise direct.

The contractor shall at all times give access to workers employed by the Owner or any men employed on the buildings and to provide such parties with proper sufficient and if required, special scaffolding, hoists and ladders and provide them with water and lighting and leave or make any holes, grooves etc in any work, where directed by the Owner as may be required to enable such workmen to lay or fix pipes, electrical wiring, special fittings etc. The quoted rates of the tenderers shall accordingly include all these above mentioned contingent works.

21.0 TIME OF COMPLETION, EXTENSION OF TIME & PROGRESS CHART

21.1 Time of Completion : The entire work is to be completed in all respects within the stipulated period. The work shall be deemed to be commenced within fourteen days from the date of acceptance letter or date of handing over of site, whichever is later. Time is the essence of the contract and shall be strictly observed by the contractor.

The work shall not be considered as complete until the Owner/ Architects have certified in writing that this has been completed and the Defects Liability Period shall commence from the date of such certificate.

21.2 Extension of Time : If in the opinion of the Owner/Architects the works be delayed (a) by reason of any exceptionally inclement weather, or (b) by reason of instructions from the Owner in consequence of proceedings taken or threatened by or disputes, with adjoining or neighboring owners or (c) by the works, or delay of other contractors or tradesmen engaged or nominated by the Owner and not referred to in the specification or (d) by reason of authorized extra and additions or (e) by reason of any combination of workmen or strikes or lock-out affecting any of the building or trades or (f) from other causes which the Owner may consider are beyond the control of the contractor, the Owner at the completion of the time allowed for the contract shall make fair and reasonable extension of time for completion in respect thereof. In the event of the Owner failing to give possession of the site upon the day specified above the time of completion shall be extended suitably.

In case of such strikes or lockouts, as are referred to above, the contractor shall, immediately give the Owner, written notice thereof. Nevertheless, the contractor shall use his best endeavours to prevent delay and shall do all that may be reasonably required, to the satisfaction of the Owner to proceed with the works and on his doing so that it will be ground of consideration by the Owner for an extension of time as above provided. The decision of the Owner as to the period to be allowed for an extension of time for completion hereunder (which decision shall be final and binding on the contractor) shall be promulgated at the conclusion of such strike or lock-out and the Owner shall then, in the event of an extension being granted, determine and declare the final completion date. The provision in clause 52 with respect to payment of liquidated damages shall, in such case, be read and construed as if the extended date fixed by the Owner were substituted for and the damage shall be deducted accordingly.

21.3 Progress of Work: During the period of construction the contractor shall maintain proportionate progress on the basis of a Programme Chart submitted by the contractor immediately before commencement of work and agreed to by the Owner/Architects. Contractor should also include planning for procurement of scarce material well in advance and reflect the same in the Programme Chart so that there is no delay in completion of the project.

22.0 TOOLS, STORAGE OF MATERIALS, PROTECTIVE WORKS AND SITE OFFICE REQUIREMENTS

The contractor shall provide, fix up and maintain in an approved position proper office accommodation for the contractor's representative and staff which offices shall be open at all reasonable hours to receive instruction notices or communications and clear away on completion of the works and make good all work disturbed.

All drawings maintained on the site are to be carefully mounted on boards of appropriate size and covered with a coat of approved varnish. They are to be protected from ravages of termites, ants, and other insects.

The contractor shall provide, fix up and maintain a telephone connection in their site office which should be available to the PMC free of cost for their office use.

The contractor shall provide at his own cost all artificial light required for the work and to enable other contractors and sub-contractors to complete the work within the specified time.

The contractor shall provide a suitable temporary hut for the watchmen and clear away the same when no longer required and to provide all necessary attendance, lights etc required.

The contractor shall arrange for temporary latrines for the use of workers and field staff and keep the same in a clean and sanitary condition to the satisfaction of the Public Health Authorities and shall cause such latrines and soil to be cleared away whenever necessary and shall make good all the works disturbed by these convenience.

Every precaution shall be taken by the contractor to prevent the breeding of mosquitoes on the works during the construction, and all receptacles, cistern, water tanks etc used for the storage of water must be suitably protected against breeding of mosquitoes. The contractor shall indemnify the Owner against any breach of rules in respect of anti-malarial measures.

The contractor shall not fix or place any placards or advertisement of any description or permit the same to be fixed or placed or upon any boarding gantry, building structure other than those approved by the Owner.

Protective Measures : The contractor from time to time of being placed in possession of the site must make suitable arrangements for watching, lighting and protecting the work, the site and surrounding property by day, by night, on Sundays and other holidays.

Contractor shall indemnify the Owner against any possible damage to the building, roads, or members of the public in course of execution of the work.

The contractor shall provide necessary temporary enclosures, gates, entrances etc for the protection of the work and materials and for altering and adopting the same as may be required and removing on completion of the works and making good all works disturbed.

Storage of Materials : The contractor shall provide and maintain proper sheds for the proper storage and adequate protection of materials etc and other work that may be executed on the site including the tools and materials of nominated sub-contractors and remove same on completion.

Cement godown shall be constructed for storing about six weeks requirement of cement and stored as per norms with a stack of 10 bags each and 2 feet opening all around with 2 feet passage of each stack. Structure shall be waterproof from all the sides and top. Cement should be stored one feet above of the ground level and have pucca raised floor.

So also reinforcement bars are to be stored above the ground level to prevent the same from getting rusted.

Tools : Theodolite, levels, prismatic compass, chain, steel and metallic tapes and all other surveying instruments found necessary on the works shall be provided by the contractor for the due performance of this contract as instructed by the Site Engineer.

All measuring tapes shall be of steel and suitable scaffolding and ladders that may be required for safety taking measurement and shall be supplied - by the contractor. The carpenters/ masons/ workers and the supervisors on the works shall carry with them always a one metre or two metre steel tape, a measuring tape of 30 metres, a spirit level, a plumb bob and a square .and shall check the work to see that the work is being done according to the drawing and specifications. The Site Engineer will use any or all measuring instruments or tools belonging to the contractors as he chooses for checking the works executed or being executed on the contract. The electricians and supervisors of the electrical contractor shall always carry with them measuring tape (30 metres) one test lamp with leads and one neon tester, multi meter, . Tong tester etc and make available to the Architect/Owner all the measuring instruments and tools that are required for checking the work.

The contractor should cover in his rates for making provisions for all reasonable facilities for the use of his scaffolding, tools and plant etc by nominated sub-contractors for their work.

23.0 CLEARING SITE AND SETTING OUT WORKS

The site shown on the plan shall be cleared of all obstructions, loose stone, and materials rubbish of all kinds. All holes or hollows whether originally existing or produced by removal or loose stone or materials shall be carefully filled up with earth well rammed and levelled off as directed at his own cost.

The contractor shall set out the works and shall be responsible for the true and perfect setting out of the work and for the correctness of the positions, levels, dimensions and alignment of all parts thereof. If at any time, any error shall appear during the progress of any part of the work irrespective of the fact that the layout had been approved by the Owner/Architects, the contractor shall at his own expenses rectify such error, if called upon to the satisfaction of the Owner. The contractor shall further set out the works to the alternative positions at the site until one is finally approved and the rates quoted in his tender should include for this and no extra on this account will be entertained.

24.0 DATUM

The average ground level will be considered as the crown of the nearest road, which should be taken as "Datum" which is however, subject to final confirmation by the Owner/Architects. All levels shown in the drawings are to be strictly adhered to.

25.0 BENCHES

The contractor is to construct and maintain proper benches of all the main walls, in order that the lines and levels May be accurately checked at all times.

These benches will consist of salwood post of adequate length and minimum diameter 75 mm to be driven in the ground at suitable distance as directed encased with brickwork. The wire nails will be driven on the top of salwood post on the centre lines of columns, walls', inside and outside faces of foundations trenches, in order that lines may be stretched between the benches and accurate intersection of excavation. Centre line of walls, columns etc may be clearly indicated and checked at any time if it is so required.

26.0 ACCESS

Any authorized representative of the Owner shall at all reasonable times have free access to the works and/or to the workshops, factories or other places where materials are being prepared or constructed for the work and also to any place where the materials are lying or from where they are

being obtained, and the contractor shall give every facility to the Owner or their, representatives necessary for inspection and examination and test of the materials and workmanship. Except the representatives of the Owner no person shall be allowed at any time without the written permission of the Owner.

27.0 MATERIALS, WORKMANSHIP, SAMPLES, TESTING OF MATERIALS

All the works specified and provided for in the specifications or which may be required to be done in order to perform and complete any part thereof shall be executed in the best and most workmanlike manner with materials of the best and approved quality of the respective kinds in accordance with the particulars contained in and implied by the specifications and as represented by the drawings or according to such other additional particulars, and Instructions as may from time to time be given by the Owner/Architects during the execution of the work, and to his entire satisfaction.

The Contractor shall have to arrange water by boring tubewell for Building work at his own cost and that water to be tested before starting of work from approved testing lab.

As directed by the Owner/Architects the contractor shall have to carry out tests on materials and workmanship in approved materials testing laboratories or as prescribed by the Owner/Architects at his own cost to prove that the materials etc, under test conform to the relevant IS. Standards or as specified in the specifications. All the samples shall be supplied by the contractor at his own cost as directed by the Owner/ Architects. The necessary charges for preparation of mould (in case of concrete cube) transporting, testing etc, shall have to be borne by the contractor. No extra payment on this account should in any case be entertained. The contractor shall provide all assistance, instruments, machine labour and materials for examining measuring and testing of work and the quality, weight or quantity of any materials used and supply samples before incorporation in the work for testing as may be selected and required by the Owner/Architects. Tests of all materials should be carried out as per latest LS. specifications. Sequence of testing of all materials shall be as advised by the Owner/Architects.

All the materials (except where otherwise described) stores and equipment required for the full performance of the work Linder the contract must be provided through normal channels and must include charge for import duties, sales tax, octroi and other charges and must be the best of their-kind available and the contractor/s must be entirely responsible for the proper and efficient carrying out of the work. The work must be done in the best workmanlike manner. Samples of all materials to be used must be submitted to the Owner/Architects when so directed by the Owner/Architects and written approval from Owner/Architects must be obtained prior to placement of order.

During the Inclement weather the contractor shall suspend concreting and plastering for such time as the Owner/ Architects may direct and shall protect from injury all work when in course of execution. Any damage (during constructions) to any part of the work for any reasons due to rain, storm, or neglect of contractor shall be rectified by the contractor in an approved manner at no extra cost.

Should the work be suspended by reason of rain, strike, lock-outs or any other cause, the contractor shall take all precautions necessary for the protection of work and at his own expenses shall make good any damage arising from any of these causes.

The contractor shall cover up and protect from damage, from any cause, all new work and supply, all temporary/doors, protection to windows, and any other requisite protection for the execution of the work whether by himself or special tradesmen or nominated sub-contractor and any damage caused must be made good by the contractor at his own expenses.

28.0 REMOVAL OF IMPROPER WORK

The Owner shall during the progress, of the work have power to order in writing from time to time the removal from the work within such reasonable time or times as may be specified in the order of any materials which in the opinion of the Owner Architects are not in accordance with specification or instructions, the substitution or proper re-execution of any work executed with materials or workmanships not in accordance with the drawings and specifications or instructions. In case the contractor refuses to comply with the order, the Owner shall have the power to employ and pay other agencies to carry out the work and all expenses consequent thereon or incidental thereto as certified by Owner/Architects shall be borne by the contractor or may be deducted from any money due to or that may become due to the contractor. No certificate which may be given by the Architects shall relieve the contractor from his liability in respect of unsound work or bad materials.

29.0 CONTRACTOR'S EMPLOYEES

The contractor shall employ technically qualified and competent supervisors for the work who shall be available (by turn) throughout the working hours to receive and comply with instructions of the Owner/Architects. The contractor shall engage at least one experienced Engineer as Site-In-charge for execution of the work. The contractor shall employ in connection with the work persons having the appropriate skill or ability to perform their job efficiently. The contractor shall employ local labourers on the work as far as possible. No labourer below the age of sixteen years and who is not an Indian National shall be employed on the work. Any labourer supplied by the contractor to be engaged on the work on day-work basis either wholly or partly under the direct order or control of the Owner or his representative shall be deemed to be a person employed by the contractor.

The contractor shall comply with the provisions of all labour legislation including the requirements of

- a) The Payment of Wages Act.
- b) Owner's Liability Act.
- c) Workmen's Compensation Act.
- d) Contract Labour (Regulation & Abolition) Act, 1970 and Central Rules 1971.
- e) Apprentices Act 1961.
- f) Any other Act or enactment relating thereto and rules framed thereunder from time to time.

The contractor shall keep the Owner saved harmless and indemnified against claims if any of the workmen and all costs and expenses as may be incurred by the Owner in connection with any claim that may be made by any workmen.

The contractor shall comply at his own cost with the order of requirement of any Health Officer of the State or any local authority or of the Owner regarding the maintenance of proper environmental sanitation of the area where the contractor's labourers are housed or accommodated, for the prevention of small pox, cholera, plague, typhoid, malaria and other contagious diseases. The contractor shall provide, maintain and keep in good sanitary condition adequate sanitary accommodation and provide facilities for pure drinking water at all times for the use of men engaged on the works and shall remove and clear away the same on completion- of the works. Adequate precautions shall be taken by the contractor to prevent nuisance of any kind on the works or the lands adjoining the same.

The contractor shall arrange to provide first-aid treatment to the labourers engaged on the works. He shall within 24 hours of the occurrence of any accident at or about the site or in connection with execution of the works, report such accident to the Owner and also to the competent authority where such report is required by law.

30.0 NOMINATED SUB-CONTRACTOR

All specialists, Merchants, Tradesmen and others executing any work or supply and fixing any goods for which prime cost prices or provisional sums are included in the Schedule of Quantities/ Rates and/or specifications who may be nominated or selected by the Owner are hereby declared to be sub-contractors employed by the contractor and are herein referred to as nominated sub-contractors.

No nominated sub-contractor shall be employed on or in connection with the works against whom the Owner shall make reasonable objection or save where the Owner and contractor shall otherwise agree who will not enter into a contract provided :

- a) That the nominated sub-contractor shall indemnify the contractor against the same obligations in respect of the sub-contract as the Contractor is under in respect of this contract.
- b) That the nominated sub-contractor shall indemnify the contractor against claims in respect of any negligence by the sub-contractor, his servants or agents or any misuse by him or them of any scaffolding or other plants the property of the contractor or under any workmen's compensation Act in force.
- c) Payment shall be made to the nominated sub-contractor by the contractor within fourteen days of his receipt of the Architect's certificate provided that before any - certificate is issued the contractor shall upon request furnish to the Architect proof that all nominated sub-contractor's accounts included in previous certification have been duly discharged, in default where of the owner may pay the same upon a certificate of the Architect and deduct the amount thereof from any sums due to the contractor. The exercise of this power shall not create private of contract between the Owner and the sub- contractor.

31.0 DAMAGE TO PERSONS AND PROPERTY INSURANCE ETC

The contractor shall be responsible for all injury to the work or workmen to persons, animals or things and for all damages to the structural and/or decorative part of property which may arise from the operations or neglect of himself or any subcontractor or of any of his or a sub-contractor's employees, whether such injury or damage arise from carelessness, accident or any other cause whatsoever in any way connected with the carrying out of this contract. The clause shall be held to include inter-alia, any damage to buildings whether immediately adjacent or otherwise, and any damage to roads, streets, foot paths or ways as well as damages caused to the buildings and the works forming the subject of this contract by rain, wind or other inclemency of the weather. The contractor shall indemnify the Owner and hold harmless in respect of all and any expenses arising from any such injury or damages to persons or property as aforesaid and also in respect of any claim made in respect of injury or damage under any acts of compensation or damages consequent upon such claim. The contractor shall reinstate all damage of every sort mentioned in this clause, so as to deliver the whole of the contract works complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damages to the property or third parties. The contractor shall effect the insurance necessary and indemnify the Owner entirely from all responsibility in this respect. The insurance must be placed with a company approved by the Owner and must be effected jointly in the name of the contractor and the Owner (the name of the latter being placed first in the policy i.e Centre A/C.

..... (Contractor's Name) and the policy lodged with the latter: The scope of insurance is to include damage or loss to the contract itself till this is made over in a complete state. Insurance is compulsory and must be effected from the very initial stage. The contractor shall also be responsible for anything which may be excluded from damage to any property arising out of incidents, negligence or defective carrying out of this contract i.e. the Contractors' All Risk Insurance shall have extension for covering cross liability arising, if any, during execution of work relating to Air Conditioning, . Electrification, Erection of Lift etc.

The Owner shall be at liberty and is hereby empowered to deduct the amount of any damages, compensations, costs, charges and expenses arising or accruing from or in respect of any such claim or damages from any sums due or to become due to the contractor.

32.0 INSURANCE

Unless otherwise instructed the contractor shall insure the works and keep them insured until the virtual completion of the contract against loss or damage by fire and/or earthquake, flood. The insurance must be placed with a company approved by the Owner, in the joint names of the Owner and the contractor for such amount and for any further sum if called to do so by the Owner, the premium of such further sum being allowed to the contractor as an authorised extra.

The contractor shall deposit the policy and receipt for premiums paid with the Owner within 21 (twenty one) days from the date of issue of work order unless otherwise instructed. In default of the contractor insuring as provided above, the Owner on his behalf may so insure and may deduct the premiums paid from any money due, or which may become due to the contractor. The contractor shall as soon as the claim under the policy is settled or the work reinstated by the Insurance Company should they elect to do so, proceed with due diligence with the completion of the works in the same manner as though the fire has not occurred and in all respects under the conditions of the contract. The contractor in case of rebinding or reinstatement after fire shall be entitled to extension of time for completion as the Owner may deem fit.

33.0 MEASUREMENT OF WORKS

The contractor will record and submit measurement for verification of Project Management Consultant/Site Engineer. The contractor should submit their bill with such measurements.

The PMC/Site Engineer shall on receipt of the bill from the contractor, intimate him that he requires the measurements of the work to be verified at site and the contractor shall forthwith attend or send a qualified Agent to assist the PMC's representative Employer's representative in taking such measurements and calculation and to furnish particular or to give all assistance required by either of them.

Should the contractor not attend or neglect or omit to send such Agent then the measurements taken by the PMC/Site Engineer or his representative shall be taken to be the correct measurements of the works. The contractor or his Agents may at the time of measurements take such notes and measurement as he may require.

It shall be ensured that the method of measurement is in accordance with the contract. The precision in measurements shall be as laid down in IS 1200. Any points of disagreement with the contractor pertaining to measurements shall be promptly referred to the decision of the Competent Authority.

Extra/deviated items, as claimed by the contractor, shall not be recorded in Measurement Book until they are approved by the Competent Authority.

In case some allegedly extra/deviated item is carried out by the contractor while complying with approved drawings and specifications and the same is to be covered up, the Project Management Consultant shall check the item and its specification and record its measurements but simultaneously enter up the provision that their admittance is subject to the approval by the Competent Authority. Both the measurements and the provision shall be got signed by the contractor.

34.0 CONCEALED WORK

The contractor shall give due notice to the Employer whenever any work is to be buried in the earth, concrete or in the bodies of walls or otherwise, becoming inaccessible later on, in order that the work may be inspected and correct dimensions taken before such burial, in default whereof the same shall, at the opinion of the Employer be either opened up for measurement at the contractor's expense or no payment may be made for such materials, should any dispute or difference arise after the execution of any work as to measurements etc or other matters which cannot be conveniently tested or checked, the notes of the employer shall be accepted as correct and binding on the contractor.

35.0 PAYMENTS

All bills shall be prepared by the contractor in the printed form prescribed by the Owner/Architects after the measurements are endorsed as mentioned in Clause No. 33 (Measurement of Works). Normally one interim bill shall be prepared each month subject to minimum value for interim certificate as stated in these documents. The bills in proper forms must be duly accompanied by detailed measurements in support of the quantities of work done and must show deductions for all previous payments, retention money, etc.

The Architects shall issue a certificate after due scrutiny of the contractor's bill stating the amount due to the contractor from the Owner. The Owner will have the discretion to amend the certificate of Architects if considered necessary and the contractor shall be entitled to payment thereof, within the period of honouring. certificates named in these documents.

The refund of retention money will be made within 14(fourteen) days after the end of defect liability period, he has satisfactory carried out all the work and attended to all defects in accordance with the conditions of contract.

If the Owner has supplied any materials or goods to the contractor, the cost of any such materials or goods will be progressively deducted from the amount due to the contractor in accordance with the quantities consumed in the work.

All the interim payments shall be regarded payments by way of advance against the final payment only and not as payments for work actually done and completed and shall not preclude the requiring of bad, unsound, and imperfect or unskilled work to be removed and taken away and reconstructed, or re- erected or be considered as an admission of the due performance of the contract, or any part thereof in any respect Or the accruing of, any claim, nor shall, it conclude determine or affect In. anyway the power of the Owner under these conditions or any of them as to the final settlement and adjustment of the accounts or otherwise or in any other way vary or affect the contract. The final bill shall be submitted by the contractor within one month of the date fixed for completion of the work or of the date of certificate of completion furnished by the Site Engineer/PMC and payment shall be made within four months from the date of receipt of the final bill by the PMC.

36.0 FINAL CERTIFICATE AND PAYMENT

On completion of the work, the contractor shall be furnished with a certificate by the Owner of such completion, nor shall the work be considered completed until the contractor shall have removed from the premises on which the work shall be executed all scaffolding surplus materials and rubbish and cleaned of the dirt from all work executed.

The final bill shall be accompanied by a certificate of completion from the Owner. Payments of final bill shall be made after deduction of Retention Money as specified in Clause 19 of these conditions, which sum shall be refunded after the completion of the Defects Liability Period after receiving the Owner's certificate that the contractor has rectified all defects to the satisfaction of the Owner/

Architects. The acceptance of payment of the final bill by the contractor would indicate that he will have no further claim in respect of the work executed.

37.0 VARIATION / DEVIATION

The contractor may when authorized and shall, when directed in writing by the Owner and or omit, or vary the works shown in the drawings or described in the specifications or included in the priced schedule of quantities. The contractor on his own accord shall make no addition, omission or variation without such authorization or direction. A verbal authorization or direction by the Owner shall when confirmed correctly by the Contractor in writing within 8 days shall be deemed to have been given in writing.

The contractor shall send to the Employer once in every month a statement giving particulars, as full and detailed as possible/ of all claims for any additional payment to which the contractor may consider himself entitled and of all extra or additional work ordered by the Employer which he has executed during the preceding month.

No final interim claim for payment for any such work or expense will be considered which has not been included in such a statement provided always that the architect shall be entitled after taking employer's sanction to authorise payment to be -Made for any such work or expense, notwithstanding the contractor's failure to comply with this condition, if the contractor has, at the earliest practicable opportunity, notified the architect in writing that he intends to make a claim for such work.

The rates for additional, altered, substituted work shall be arrived at in accordance with the following rules :

- i) The net rates of prices in the contract schedule shall determine the valuation of (the rates for) the extra work (items) where such extra work is of similar character and is executed under similar conditions as the work priced therein.
- ii) If the rates for the extra/ altered or substituted (deviated) work are not provided for (available) in the contract schedule, they shall to the extent possible be derived out of rate given in that schedule for similar or near similar items. For the purpose of such deviation, where necessary and when so directed, the contractor shall furnish detailed analysis for the said similar or near similar items in the contract schedule. For such portions of the analysis, for the extra, altered or substituted (deviated) work for which prices cannot be abstracted from the corresponding analysis of rates for the said similar or near similar items in the contract schedule, market rates substantiated by purchase bills/vouchers dependable printed price schedules of building materials of different types shall be adopted, using factors and constants for quantum of material, labour T & P and sundries from standard analysis of rates adopted by the National Building Organisation, Ministry of Works & Housing, Govt of India in preparation of All India Standard Schedule of Rates 1977 and adding 15% over towards profits and overheads. When called upon to do so the contractor shall submit the required purchase bill/vouchers.
- iii) In respect of a contract which incorporates more than one schedule the rate applicable in case (i) above if not provided for in the schedule pertaining to the work in which the addition, alteration or substitution (deviation) occurs shall be taken as the lowest applicable rate in other schedule. Similarly in case (ii) above if similar or near similar items cannot be found in the schedule pertaining to the work in which the addition, alteration or substitution (deviation) occurs, similar or near similar items from the other schedule shall be adopted.
- iv) In the case of additional, altered or substituted (deviated) work for which rates cannot be reasonably be derived as at (ii) and (iii) above, the rates shall be worked out adopting

market prices, substantiated by purchase bill/vouchers, using factors and constants for quantum of materials, labour, T & P and sundries from standard analysis of rates adopted by the National Building Organisation, Ministry of Works & Housing, Govt of India in preparation of AU India Standard Schedule of Rates, 1977 and addition 15% towards profit and overheads. When called upon to do so the contractor shall submit his purchase bills/vouchers to the architects and employer

- v) The quantity shown in the schedule of items of work are approximate and may vary considerably. The contractor shall carry out all work upto a total variation of plus or minus ten percent (10%) of the tendered value of the contract and the rates quoted against each item shall remain firm within this variation limit. Quantity of any individual item may vary to any extent or may be excluded altogether or any new item may be included; and the contractor shall not be entitled for any compensation, due to variation and omission. additional, altered or substituted (deviated) work in the contract schedule are to be adopted for deviation of rates for the additional, altered or substituted (deviated) work and whether the said rates cannot be derived from similar or near similar items in the contract schedule will be decided by the Employer.
- vi) In case (ii) to (iv) the contractor is required to submit his analysis of rates adopting the principles enunciated and the architect, after scrutinizing the analysis and other papers furnished will allow such rates as he considers reasonable after obtaining Employer's sanction.
- vii) Where extra work is of such a nature that it cannot be properly measured or valued the contractor shall be allowed day work priced at the net rates stated in the tender or the priced schedule of quantities or if not so stated then in accordance with the minimum local day work rates and wage for the district notified by the concerned authority provided that in either case if required by the architects, vouchers, muster rolls and other documents, required for proper verification of the labour employed and the materials deployed on the said work and the costs thereof be delivered to the Owner or his representative on or before the end of the week following that in which the work has been executed: The question as to whether extra work is of such nature that it cannot be properly measured or valued will be decided by the Owner. The margin to be allowed on actual costs to the contractor towards profit and overhead shall be 15%.
- viii) Maximum percentage of quantity of items of work to be executed (even considering cl. 37 (v) in case of (a) superstructure – 30% and (b) Foundation – 100% beyond of which rates are to be determined in accordance with cl. 37(i) to 37 (iv), (v) and (vii).

38.0 SUBSTITUTION

Should the contractor desire to substitute any materials and workmanship, he/they must obtain the approval of the Owner/Architects in writing for any such substitution well in advance. Materials designated in this specifications indefinitely by such term as. "Equal" or "Other approved" etc. specific 'approval of the Owner/Architects has been obtained in writing.

39.0 PREPARATION OF BUILDING WORKS FOR OCCUPATION AND USE ON COMPLETION

The whole of the work will be thoroughly inspected by the contractor and deficiencies and defects put right. On completion of such inspection the contractor shall inform the Employer that he has completed the work and it is ready for inspection.

On completion the contractor shall clean all windows and doors including the cleaning and oiling if necessary, of all hardware, inside and outside, all floors, staircases, and every part of the building. He will leave the entire building neat and clean and ready for immediate occupation and to the satisfaction of the Owner.

40.0 CLEARING SITE ON COMPLETION

On completion of the works the contractor shall clear away and remove from the site all constructional plant, surplus materials, rubbish and temporary works of every kind and leave the whole of the site and the works clean and in a workmanlike condition to the satisfaction of the Owner/Architects.

41.0 DEFECTS AFTER COMPLETION

The contractor shall make good at his own cost and to the satisfaction of the Employer all defects, shrinkage, settlements or other faults which may appear within 12 months after completion of the work. In default the Owner may employ and pay other persons to amend and make good such damages, losses and expenses consequent thereon or incidental thereto shall be made good and borne by the contractor and such damages, loss and expenses Shall be recoverable from him by the Owner or may be deducted by the Owner, in lieu of such amending and making good by the contractor, deduct from any money due to the contractor a sum equivalent to the cost of amending such work and in the event of the amount retained being insufficient, recover that balance from the contractor from the amount retained .under Clause No. 19 together with any expenses the Owner may have incurred in connection therewith.

42.0 ESCALATION

No price escalation will be allowed for this contract. The rate quoted shall be firm throughout the tenure of the contract (including extension of time, if any, granted) and will not be subject to any fluctuation due to increase in cost of materials, labour, sales tax, octroi, etc.

43.0 IDLE LABOUR

Whatever the reasons may be, no claim for idle labour, additional establishment cost of hire and labour charges of tools and plants would be entertained under any circumstances.

44.0 SUSPENSION

If the contractor except on account of any legal restraint upon the Owner preventing the continuance of the work or in the opinion of the Owner shall neglect or fail to proceed with due diligence in the performance of his part of the contract or if he shall more than once make default, the Owner shall have the power to give notice in writing to the contractor requiring the work be proceeded within a reasonable manner and with reasonable despatch, such notice purport to be a notice under this clause:

After such notice shall have been given the contractor shall not be at liberty to remove from the site of the works or from any ground contiguous thereto any plant or materials to subsist from the date of such notice being given until the notice shall have been complied with, if the contractor fails to start the work within 7 (seven) days after such notice has been given to proceed with the works as therein prescribed, the Owner may proceed as provided in Clause 45 (Termination of Contract by Owner).

45.0 TERMINATION OF CONTRACT BY OWNER

If the contractor being a company go into liquidation whether voluntary or compulsory or being a firm shall be dissolved or being an individual shall be adjudicated insolvent or shall make an assignment or a composition for the benefit of the greater part in number of amount of his creditors or shall enter into a Deed or arrangement with his creditors, or if the Official Assignee in insolvency, or the Receiver of the contractor in insolvency, shall repudiate the contract, or if a Receiver of the contractor's firm appointed by the court shall be unable within fourteen days after notice to him requiring him to do so, to show to the reasonable satisfaction of the Owner that he is able to carry out and fulfil the contract, and if so required by the Owner to give reasonable security therefor, or if the contractor shall suffer execution to be issued, or shall suffer any payment under this contract to be attached by or on behalf of and of the creditors of the contractor, or shall assign, charge or encumber this contract or any payments due or which may become due to the contractor, thereunder, or shall neglect or fail to observe and perform all or any of the acts matters of things by this contract, to be observed and performed by the contractor within three clear days after the notice shall have been given to the contractor in manner hereinafter mentioned requiring the contractor to observe or perform the same or shall use improper materials or workmanship in carrying on the works, or shall in the opinion of the Owner not exercise such diligence and make such due progress as would enable the work to be completed within due time agreed upon and shall fail to proceed to the satisfaction of the Owner after three clear days notice requiring the contractor so to do shall have been given to the contractor as hereinafter mentioned, or shall abandon the contract, then and in any of the said cases, the Owner may notwithstanding previous waiver determine the contract by a notice in writing to the effect as hereinafter mentioned, but without thereby affecting the powers of the Owner of the obligations and liabilities of the contractor the whole of which shall continue in force as fully 'as- if the contract, had not been so determined and as if the works subsequently executed had been executed by or on behalf of the contractor (without thereby creating any trust in favour of the contractor) further the Owner or his agent, or servants, may enter upon and take possession of the work and all plants, tools, scaffoldings, sheds, machinery, steam and other power, utensils and materials lying upon premises or the adjoining lands or roads and sell the same as his own property or may employ the same by means of his own servants and workmen in carrying on and completing the works or by employing any other contractors or other persons or person to complete the works, and the contractor shall not in any way interrupt or do any act, matter or things to prevent or hinder such other contractors or other persons or person employed from completing and finishing or using the materials and plants for the works when the works shall be completed, or as seen thereafter as conveniently may be, the Owner shall give notice in writing to the contractor to remove his surplus materials and plants and should the contractor fail to do so within a period of 14 days after receipt by him the Owner may sell the same by Public Auction and shall give credit to the contractor for the amount so realised. Any expenses or losses incurred by the Owner in getting the works carried out by other contractors shall

be adjusted against the amount payable to the contractor by way of selling his tools and plants or due on account of work carried out by the contractor prior to engaging other contractors or against the Security deposit.

46.0 WATER SUPPLY

The rates quoted by the contractor shall include all expenditure for providing water for the full contract period required for the works, including that for the work people and all staff on the site. He may make his own arrangement for the supply of good quality water suitable for use in the works and the work people. He shall obtain municipal connection, and all charges for connection and consumption shall be borne by him. If municipal water is not available, or inadequate, he shall make other arrangements like sinking tubewells, or making bore-wells, or transport from outside by tanker, or any other suitable means entirely at his cost, and no separate payment for the same will be made. In spite of above mentioned arrangement, if it is found that the Contractor is using centre's/Institutes water, water charges shall be recovered from the contractor @03%(three percent) on gross amount of work done though centre cannot guarantee to maintain uninterrupted supply of water.

47.0 POWER

The contractor shall at his own cost arrange for necessary power for construction and lighting for the entire period of contract.

The Owner shall give all the recommendations necessary to obtain power and water connections from the concerned authorities; but the responsibility for obtaining the same shall rest with the contractor.

If any other contractor, appointed by the Owner, is required to use water and power, he shall be allowed to use the same and make temporary connections from the supply arranged by the main contractor at rates and terms that may be mutually agreed upon by both failing which, at rates, terms and conditions that may be decided by the Architect shall be adjusted from his dues.

48.0 LAND FOR CONTRACTOR'S ESTABLISHMENT

For the purpose of construction of contractor's storeyard, godowns, site office, etc, the contractor may utilise with the permission of the Owner, portion of the land belonging to the Owner if available at such location as would not interfere with the execution of the works.

49.0 METHOD OF MEASUREMENT

Unless otherwise mentioned V elsewhere in the tender measurement will be on the nett quantities or work produced in accordance with upto date rules laid down by the Indian Standard Institution. In the event of any dispute with regard to the measurement of the work executed, the decision of the Architect/ Owner shall be final and binding on the contractor.

50.0 ACTION WHERE NO SPECIFICATION

In the case of any class of work for which there is no such specification in Technical Specification, such work shall be carried out in accordance with the I.S. Specification and in the event of there being no I.S. specification, then in such case the work shall be carried out in all respects in accordance with the instructions and requirements of the Architects/Owner.

51.0 CONTRACTOR NOT TO DEPOSIT MATERIALS IN A

MANNER THAT MAY/INCONVENIENCE TO THE PUBLIC /CAUSE

The contractor(s) shall not deposit materials on any site which will seriously inconvenience the public. The Architects may require the contractor to remove any materials, which are considered by him to be a danger or inconvenience to the public or cause them to be removed at the contractor's cost.

52.0 LIQUIDATED DAMAGES

If the contractor fails to maintain the required progress in terms of clause 21 or to complete the work and clear the site on or before the contract or extended date of completion, he shall, without prejudice to any other right or remedy available under the law on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below as the authority, whose decision in writing shall be final and binding, may decide on the amount of tendered value of the work for every completed day/month (as applicable) that the progress remains below that specified in Clause 21 or that the work remains incomplete.

This will also apply to items or group of items for which a separate period of completion has been specified.

(i) Compensation for delay of work	@ 1.5 % per month of delay to be computed on per day basis
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Provided always that the total amount of compensation for delay to be paid under this Condition shall not exceed 10% of the Tendered Value of work.

The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with the Owner/Architects.

53.0 ACTION WHEN WHOLE OF SECURITY DEPOSIT IS FORFEITED

In any case in which under any clause or clauses of this contract, the contractor shall have rendered himself liable to pay liquidated damages amounting to the whole of his security deposit (whether paid in one sum or deducted by installments) the Owner/Architects shall have power to adopt any of the following courses as they may deem best suited to the interest of the Owner :-

a) To rescind the contract (of which rescission notice in writing to the contractor under hand of the Owner/Architects shall be conclusive evidence), and in which case the security deposit of the contractor shall stand forfeited and be absolutely at the disposal of the Owner.

b) To employ labour paid by the Owner and to supply materials to carry out the work, or any part of the work, debiting the contractor with the cost of the labour and price of material (of the amount of which cost and price of a certificate of the Architect/Owner shall be final and conclusive against the contractor) and crediting him with the value of the work done, in all respects in the same manner and at the same rates as if it had been carried out by the contractor under the terms of this contract the certificate of Architects/Owner as to the value of the work done, shall be final and conclusive against the contractor.

c) 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 certificates in writing of the Architects /Owner shall be final and conclusive) shall be borne and paid by the original contractor and may be deducted from any money due to him by the Owner under the contract or otherwise, or from his security deposit or the proceeds of sale thereof, or a sufficient part thereof.

In the event of any of above courses being adopted by the Owner/Architects the contractor shall have no claim to compensation for any loss sustained by him by reasons of his having purchased or procured any materials or entered into any engagements, or make any advances on account of, or with a view to the execution of the work or the performance of the contract. And in case the contract shall be rescind under the provision aforesaid, the contractor shall not be entitled to recover or be paid any sum or any work thereto for actually performed under this contract, unless, and until the Owner/Architects will have certified in writing the performance of such work and the value payable in respect thereof, and he shall only be entitled to be paid the value so certified.

54.0 CONTRACTOR REMAIN LIABLE TO PAY COMPENSATION IF ACTION NOT TAKEN UNDER CLAUSE 53

In any case in which any of the powers conferred upon the Owner/Architect by Clause 53 hereof, shall have become exercisable and the same shall not be exercised, the non exercise thereof shall not constitute a waiver of any of the conditions hereof and such power shall notwithstanding he exercisable in the event of any future case of default be the contractor for which by any clause or clauses hereof he is declared liable to pay compensation amounting to the whole of his security deposit, and the liability of the contractor for past and future compensation shall remain unaffected in the event of the Owner/Architect putting in force either of the powers (a) or (b) vested in him under the preceding clause, he may, if so desire, take possession of all or any tools, plants, materials and stores, in or upon the works, Or the site thereof or belonging to the contractor, or procured by him and intended to be used for the execution of the work or any part thereof, paying or allowing for the same in account at the contract rates or in case of these not being applicable a current market rates to be certified by the Owner/Architect whose certificate thereof shall be final, otherwise the Owner/Architect may by notice in writing to the contractor or his clerk of the works, foreman or other authorized agent required him to remove such tools, plant materials or stores from the premises (within a time to be specified in such notice) and in the event of the contractor failing to comply with any such requisition the Owner/Architect may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor at his risk in all respects and the certificate of the Owner/Architects as to the expenses of any such removal and the amount of the proceeds and expense of any such sale shall be final and conclusive against the contractor.

55.0 SUM PAYABLE BY WAY OF COMPENSATION

All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to applied to the use of Owner without reference to the actual loss or damage sustained and whether or not any damage shall have been sustained.

56.0 GUARANTEE FOR THE SPECIALISED WORKS

Wherever provision for submission of a guarantee has been advised, the same shall be submitted from the specialised agency alongwith a counter guarantee by the main contractor engaged for the work. The guarantee shall be furnished on a non-judicial stamp paper of appropriate value. If the contractor is required to submit guarantee/guarantees for any item/items for a period of more than 12 months, the guarantee/guarantees in case of those items shall remain valid even after expiry of the defect liability period of 12 months as stipulated in the contract.

57.0 TESTS/RESULTS/SITE REGISTERS ETC.

The contractor will be required to maintain the following registers at site of work and should produce the same for inspection of the Owner/Architects whenever desired by them.

Typical proforma are enclosed (Refer Table I to II)

- i) Table -I Proforma of Hindrance to work
- ii) Table -II Proforma of Running Account Bill

Contractor will have to submit their Running Account Bills in printed form shown in Table I to II.

58.0 INCOME TAX/SALES TAX / VAT ON WORKS CONTRACT

Statutory deduction of Income Tax/Sales Tax on works contract, Labour Welfare Cess shall be made from all interim and final payments as per extend statute.

59.0 AGREEMENT

The successful contractor will be required to enter into an agreement in accordance with the Draft Agreement form enclosed & the schedule of conditions within 15 days from the date of the contractor is advised by the Owner/Architect that his tender has been accepted and he shall pay for all stamps & legal expenses incidental thereto. However, the written acceptance by the Owner of a tender will constitute a binding contract between the Owner and the person so tendering whether such formal agreement is or is not subsequently executed.

60.0 WORKING HOURS

No work shall be done on Sunday and other Govt. holidays/without prior approval in writing of the Owner/Architects. Working hours on other days of the week shall be from 7.00 A.M to 6.00 P.M. Work programme for completion of the project within the stipulated time of completion shall be prepared accordingly.

61.0 NO COMPENSATION FOR ALTERATION IN OR RESTRICTION OF WORK TO BE CARRIED OUT

If at any time after the commencement of the work, the Owner/ Architects shall for any reason whatsoever not require the whole work thereof as specified in the tender to be carried out the Architects/Owner shall give notice in writing of the fact to the contractor who shall have no claim to any payment or compensation whatsoever on account of any profit or advantage with which he might have derived from the execution of the work in full, but which he did not derive in consequence of the full amount of the work not having been carried out; neither shall he have any claim for compensation by reason of any alterations having been made in the original specification, drawing, designs and instructions which shall involve any curtailment of the work as originally contemplated.

62.0 ARBITRATION

All disputes or differences of any kind whatsoever (except for excepted matters vide –Clause no. 15) which shall at any time arise between the parties hereto touching or concerning the works or the execution or maintenance thereof of this contract or the rights touching or concerning the works or the execution of maintenance thereof of this contract or the construction remaining operation or effect thereof or to the rights or liabilities of the parties or arising out of or in relation thereto whether during or after determination foreclosure or breach of the contract (other than those in respect of which the decision of any person is by the contract expressed to be final and binding) shall after written notice by either party to the contract to the other of them and to the Employer hereinafter mentioned be referred for adjudication to a sole Arbitrator to be appointed as hereinafter provided.

For the purpose of appointing the sole Arbitrator referred to above, the Employer will send within thirty days of receipt of the notice to the contractor a panel of three names of persons who shall be presently unconnected with the organisation for which the work is executed.

The contractor shall on receipt of the names as aforesaid, select any one of the person's name to be appointed as a sole Arbitrator and communicate its name to the Employer within thirty days of receipt of the names. The Employer shall thereupon without any delay appoint the said person as the Sole Arbitrator. If the contractor fails to communicate such selection as provided above Within the period specified, the Competent Authority shall make the selection and appoint the selected person as the Sole Arbitrator.

If the Employer fails to send to the contractor the panel of three names as aforesaid within the period specified, the contractor shall send to the Employer a panel of three names of persons who shall all be unconnected with either party. The Employer shall on receipt of the named as aforesaid select any one of the persons names and appoint him as the Sole Arbitrator. If the Employer fails to select the person and appoint him as the Sole Arbitrator within 30 days of receipt of the panel and inform the contractor accordingly, the contractor shall be entitled to appoint one of the persons from the panel as the Sole Arbitrator and communicate his name to the Employer.

If the Arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacates his office due to any reason whatsoever another Sole Arbitrator shall be appointed as aforesaid.

The work under the Contract shall, however, continue during the arbitration proceedings and no payment due to payable to the contractor shall be withheld on account of such proceedings.

The Arbitrator shall be deemed to have entered on the reference on the date he issued notice to both the parties fixing the date of the first hearing.

The Arbitrator may from time to time, with the consent of the parties, enlarge the time for making and publishing the award.

The Arbitrator shall give a separate award in respect of each dispute or difference referred to him. The Arbitrator shall decide each dispute in accordance with the terms of the contract and give a reasoned award. The venue of arbitration shall be Kolkata.

The fees, if any, of the Arbitrator shall, If required to be paid before the award is made and published, be paid half and half by each of the parties. The cost of the reference and of the award including the fees, if any, of the Arbitrator who may direct to and by whom and in what manner, such costs Of any part thereof shall be paid and may fix or settle and amount of costs to be so paid. The award of the Arbitrator shall be final and binding on both the parties.

Subject to aforesaid the provisions of Arbitration and conciliation Act , 1996 or any statutory modification or re-enactment thereof and the rules made thereunder and for the time being in force, shall apply to the arbitration proceeding under this clause.

The Employer and the contractor hereby also agree that arbitration under clause shall be a condition precedent to any right to action under the contract with regard to the matters hereby expressly agreed to be so referred to arbitration.

63.0 DECLARATION

I/We have inspected the site of works and have made me/us fully acquainted with the local conditions in and around the sites of works. I/We hereby declare that I/We have gone through the

conditions laid down in the Notice Inviting Tender, General Conditions of Contract, Technical Specifications and understood the same and on the basis of the same I/We quoted our rates in the schedule of quantities attached with the tender documents.

I/We shall also uniformly maintain such progress with the work, as may be directed by the Owner/Architects to ensure completion of same within the target date as mentioned in the tender document.

Witness

.....
Signature of Tenderer

Address:

.....

Date :

Office Seal

PROFORMA HINDRANCE TO WORK

Table-I

Name of work :

Date of Start of Work :

Name of Contractor :

Period of Completion :

Agreement No :

Date of completion of work :

SL No	Nature of Hindrance	Date of occurrence of hindrance	Date of on which hindrance was removed	Period for which hindrance existed	Signature of Engineer-in-Charge	Signature of PWD/ Architect's Representative

Running A/C Bill

- i) Name of Contractor/Agency : _____
- ii) Name of work : _____
- iii) Sl. No. of this bill : _____
- iv) No. and date of previous bill : _____
- v) Reference to Agreement No. : _____
- vi) Date of written order to commence : _____
- vii) Date of completion as per agreement : _____

Table-II

Sl. No	Item Description	Unit	Rate (Rs)	As per Tender Qty 1 Amount(Rs)	Upto Previous R/A Bill Qty . Amount (Rs.)	Upto Date (Gross) Qty . Amount(Rs.)	Present bill Qty . Amount(Rs.)	Remarks

Note:

1. If part rate is allowed for any item, it should be indicated with reasons or allowing such a rate
2. If adhoc payment is made, it should be mentioned specifically

Net value since previous bill

CERTIFICATE

The measurements on the basis of which the above entries for the running bill No
... Were made have been taken jointly on and
are recorded at pages To
..... of measurement book No.

.....
Signature and date of
Contractor

.....
Signature and date of
Architects' Representative

.....
Signature and date of
Owner / Representative

The work recorded in the above mentioned measurements has been done at the site satisfactorily
as per tender drawings, conditions and specifications.

.....
Architect

.....
Owner / Representative

6. SAFETY CODE

Scaffolds

- i) Suitable scaffolds shall be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except in the case of short duration work which can be done safely from ladders. When a ladder is used, it shall be of rigid construction made either of good quality wood or steel. The steps shall have a minimum width of 450 mm and a maximum rise of 300mm. Suitable hand holds of good quality wood or steel shall be provided and the ladder shall be given an inclination not steeper than 114 to 1(1/4 horizontal and 1 vertical).
- ii) Scaffolding or staging more than 4 m above the ground floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly bolted, braced or otherwise secured, at least 1 m above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.
- iii) Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform, gangway or stairway is more than 4m above ground level or floor level, they shall be closely boarded and shall have adequate width and be suitably fenced as described in (ii) above.
- viii) Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 1m. Wherever there are open excavations in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping into the excavations.
- ix) Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No. portable single ladder shall be over 9 m in length while the width between side rails in rung ladder shall in no case, be less than 290 mm for ladder upto and including. 3 m in length. For longer ladders this width shall be increased at least 20 mm for each additional metre of length.
- vi) A sketch of the ladders and scaffolds proposed to be used shall be prepared and approval of the Engineer obtained prior to construction.

Other Safety Measures

- vii) All personnel of the contractor working within the plant site shall be provided with safety helmets. All welders shall wear welding goggles while doing welding work and all metal workers shall be provided with safety gloves. Persons employed on metal cutting and grinding shall wear safety glasses.
- viii) Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any. of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.

Excavation & Trenching

- ix) All trenches, 1.25 m or more in depth shall at all times be supplied with at least one ladder for each 30 m in length or fraction thereof. The ladder shall be extended from bottoms of the trench to at least 1 m above the surface of the ground. Sides of trenches which are

1.5 m or more in depth shall be stepped back to give suitable slope or securely held by timber bracing so as to 'avoid the danger of sides collapsing. The excavated materials shall not be placed within 1.5 m of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.

- x) The contractor shall take all measures on the site of the work to protect the public from accidents and shall be bound to bear the expenses of defence of every suit, action or other proceedings at law that may be brought by any persons for injury sustained owing to neglect of the above precautions and to pay any such persons or which may with the consent of the contractor, be paid to compromise any claim by any such person.

Demolition

- ix) Before any demolition work is commenced and also during the process of the work :
 - a) All roads open areas adjacent to the work site shall either be closed or suitably protected.
 - b) No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain electrically charged.
 - c) All practical steps shall be taken to prevent danger to persons employed from the risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so over-loaded with debris or materials as to render it unsafe.

Personal Safety Equipment

- xii) All necessary personal safety equipment as considered adequate by the Engineer should be kept available for the use of the person employed on the site and maintain in a condition suitable for immediate use and the contractor should take adequate steps to ensure proper use of equipment by those concerned.
 - a) Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.
 - b) Those engaged in white washing and mixing or stacking of cement bags or any materials which is injurious to the eyes shall be provided with protective goggles.
 - c) Those engaged in welding works shall be provided with welder's protective eyesight lids.
 - d) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
 - e) When workers are employed in sewers and manholes, which are in use, the contractor shall ensure that the manhole covers are opened and are ventilated at least for an hour before the workers are allowed to get into manholes and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public.
 - f) The contractor shall not employ men below the age of 14 years and women on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting the following precautions should be taken:

- i) No paint containing lead or lead products shall be used except in the form of paste or readymade paint.
 - ii) Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scraped.
 - iii) Overalls shall be supplied by the contractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.
- xiii) When the work is done near any public place where there is risk of drowning all necessary equipments should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be Made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

Hoisting Machine

- xiv) Use of hoisting machines and tackle including their attachments anchorage and supports shall conform to the following standards or conditions :
1. a) These shall be of good mechanical constructions sound material and adequate strength and free from patent defect and shall be kept in good repair and in good working order.
 - b) Every rope used in hoisting or lowering materials or as means of suspension shall be of durable quality and adequate strength and free from patent defects.
 2. Every crane driver or hoisting appliance operator shall be properly qualified and no person under the -age of 21 years shall be in charge of any hoisting machine including any scaffolding which or give signals to operator.
 3. In case of every hoisting machine and of every chain ring hook, shackle shovel and pulley block used in hoisting or as means of suspension the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load. in case of a hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.
 4. In case of departmental machines, the safe working load shall be notified by the Engineer. As regards contractor's machines, the contractor shall notify the safe working load of the machine to the Engineer whenever he brings any machinery to site of work and get it verified by the Engineer concerned.
- xv) Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards, hoisting appliances should be provided with such means as will reduce to the minimum of the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energised, insulating mats, wearing apparel, such as gloves, sleeves and boots as may be necessary, should be provided. The workers should not wear any rings, watches and carry keys or other materials which are good conductors of electricity.

- xvi) All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scissor-fold, ladder or equipment shall be altered or removed while it is in use.

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

- xvii) These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at work spot. The person responsible for compliance of the safety code shall be named therein by the contractor.
- xviii) To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by the Labour Officer, Engineers of the Department or their representatives.
- xix) Notwithstanding the above clause from (1) to (xviii), there is nothing in these to exempt the contractor from the operations of any other Act or Rule in force in the Republic of India.

7. PROFORMA FOR APPLICATION FOR EXTENSION OF TIME PERIOD

1. Name of Contractor :
2. Name of the work as given in the Agreement :
3. Agreement No. :
4. Estimated Tender Amount :
5. Date of commencement of work as per Agreement. :
6. Period allowed for completion of work as per Agreement :
7. Date of completion stipulated in Agreement :
8. Period for which extension of time has been given previously
 - a) 1st extension vide Architect's/Month Owner's Month days
 - b) 2nd extension vide Architect's/Month Owner's Month days
 - c) 3rd extension vide Architect's/ Month Owner's Month days
 - d) 4th extension vide Architect's/Month Owner's Month days
- Total Extension previously given
9. Reason for which extensions have been previously given (copies of the previous applications should be attached)
10. Period for which extension is applied for
11. Hindrances on account of which extension is applied for with dates on which hindrances occurred and the period for which these are likely to which these are likely to last.
 - a) Serial No. :
 - b) Date of occurrence :

c) Period for which it is likely to last :

d) Period for which extension required for this particular hindrance :

e) Overlapping period if any with reference to item (e) above :

f) Net extension applied for :

g) Remarks, if any :

12. Extension of time required for extra work :

13. Details of extra work and the amount involved :

a) Total value of extra work :

b) Proportionate period of extension of time on estimated amount put to tender :

14. Total extension of time required for 11 & 12. :

Submitted to the Architect/Owner

Date :

.....

Signature of the Contractor

8. SPECIAL CONDITIONS

1. SAFETY CODE

The Safety Code will be as per Indian Electricity Rules. 1956 and subsequent amendments made upto date, and as per various prevailing I.S. Codes of Practice for Electrical Installation.

Temporary Electrical Wiring shall be done in the manner as advised by the Owner/ Architect with necessary supports when drawn overhead and proper clamping/ fixing and should conform to requirement of Indian Electricity Rules, various I.S. Codes of Practice for Electrical Installation and Local Regulations.

2. All tools, plants & equipments etc required for timely completion of the project shall be provided by the contractor. At least the following equipments are to be deployed by the contractor at site.
 - a) Concrete mixer machine(7-10 cft capacity) : 2Nos
 - b) Diesel/Electrical operated Hoist : 4 Nos
 - c) Welding Machine : 1 No.
 - d) Gas Cutter : 1 No.
 - e) Drilling machine : 1 No.
 - f) Electrical Testing Instruments : One set
(Insulation Megger, Earth Megger, Multimeter, Neon Tester, wire gauge, Screw gauge, Cable crimping machine with dies, Vernicur caliper, Tong tester etc)
 - g) Pipe cutter , thread cutting : equipment, wrenches of different sizes & categories for sanitary & plumbing work, Hydrolic testing machine, smoke testing machine.
3. Schedule of Quantities have been split under different subheads. Quoted rate for similar items under anyone of the subheads shall be applicable for similar items of other subheads.
4. All chases to wall, column etc (both R.C.C & masonry) are to be cut by power operated chase cutting machine for concealing of any work as per direction.
5. It is compulsorily for all workmen(for PEB) at site which need to be supplied by the contractor. The colour of the helmet to be worn by Contractor Personnel is YELLOW. The colour of safety shoe is BLACK.
6. All tools and plants for the job are in the scope of the contractor.
7. Contractor has to submit as built drawings of work done after completing the job.

9. TECHNICAL SPECIFICATION

1.0 EXCAVATION AND EARTHWORK

1.1 General

The excavation will generally refer to open excavation of foundation wet or dry and in all sorts of soils.

1.2 Examine the Site

The Contractor shall visit and ascertain the nature of the ground to be excavated and the work to be done and shall accept all responsibility for the cost of the work involved.

1.3 Setting Out

The contractor shall set out the building or other involved works after clearing the site and get the same approved by Owner/Architects. It shall be the responsibility of the Contractor to install substantial reference marks, bench marks etc. and maintain them as long as required by the Owner/Architects. The contractor shall assume full responsibility for proper setting out, alignment, elevation and dimension of each and all parts of the work.

1.4 Ground Level and Site Level

Before commencement of excavation spot levels on an approved grid covering the entire plot shall be taken by the Contractor in consultation with the Owner/Architects and a proper record of these levels shall be kept jointly signed by the Contractor and the Owner/Architects. A block level plan showing all ground levels of the plot shall be prepared by contractor and shall also be jointly signed by the Contractor and the Owner/Architects.

1.5 Excavation & Preparation of Foundation for Concrete

Excavation shall include removal of all materials of whatever nature at all depths and whether wet or dry necessary for the construction of foundation and sub-structure (including mass excavation for basement underground reservoir where applicable) exactly in accordance with lines, levels, grades and curves shown in the drawings or as directed by the Owner/Architects. The bottoms of excavation shall be leveled both longitudinally and transversely or Sloped as directed by the Owner/Architects.

Should the contractor excavate to a greater depth or width than shown on the drawings or as directed by the Owner/Architects, he shall at his own expense fill the extra depth or width in cement concrete in proportion as directed by the Owner/Architects but in no case with concrete of mix leaner than 1:4:8 cement concrete.

The contractor shall report to the Owner/Architects when the excavations are ready to receive concrete. No concrete shall be placed in foundations until the contractor has obtained Owner/Architects approval. In case, the excavation is done through different types of soil and if different rates are applicable as per provision in the Schedule of Quantities, the contractor must get the dimensions of the strata agreed by the Owner/Architects for payment. If no specific provisions is made in the schedule of quantities it will be presumed that excavation shall be in all types of soil and the contractor's rate shall cover for the same.

After the excavation is passed by the Owner/Architects and before laying the concrete, the contractor shall get the depth and dimensions of excavation and levels (and nature of strata as

applicable as per Schedule of Quantities like hard rock, soft rock) and measurements recorded by the Owner/Architects.

1.6 Shoring

The sides of the excavations should be timbered and supported in such a way as is necessary to secure these from falling in, and the shoring shall be maintained in position as long as necessary. The contractor shall be responsible for the proper design of the shoring to be approved by Owner/Architect to hold the sides of the excavation in position and ensure safety of persons & properties etc. The shoring shall be removed as directed after the items for which it is required are completed. No extra payment will be made for shoring.

1.7 Protection

If instructed by the Owner/Architects all foundation pits, and similar excavations shall be strongly fenced and marked with red lights at night to avoid accidents. Adequate protective measure shall be taken to make sure that the excavation does not affect or damage adjoining structures. All measures required for the safety of excavations, the people working in & around the foundation trenches, property and the people in the vicinity shall be taken by the contractor at his own cost. He shall be entirely responsible for any injury and damage to property caused by his negligence or accident due to his constructional operations, storage of materials etc.

1.8 Stacking of Excavated Materials

All materials excavated will remain the property of the Owner and rate for excavation shall include sorting out of useful materials and stacking them on site as directed. Materials suitable and useful for back filling, plinth filling or leveling of the plot or other use shall be stacked in convenient places but not in such a way as to obstruct free - movement of men, animals and vehicles or encroach on the area required for constructional purposes.

1.9 Backfilling

All shoring and form work shall be removed after their necessity ceases and trash of any sorts shall be cleaned out from the excavation. All space between foundation masonry or concrete and sides of excavation shall be refilled to the original surface with approved excavated materials in layers 15 cm in thickness watered and rammed. The filling shall be done after concrete or masonry is fully set and done in such a way as not to cause undue thrust on any part of the structure. Where suitable excavated materials is to be used for refilling it shall be brought from the place where it is temporarily stacked and used in refilling.

No excavation of foundations shall be filled in or covered up until all measurements of excavations, masonry concrete and other works below ground level are jointly recorded. Black cotton soil shall not be used for back filling or in plinth filling.

1.10 Dewatering

Rates for excavation shall include bailing or pumping out water which may accumulate in the excavation during the progress of work either from seepage, springs, rain or any other cause and diverting surface flow if any by bunds or other means. Pumping out of water shall be done in such approved manner as to preclude the possibility of any damage to the foundation trench concrete or masonry or any adjacent structure. When water is met in foundation trenches or in tank excavations, pumping out water shall be carried out from auxiliary pit of adequate size dug slightly outside the building excavations. The depth of auxiliary pit shall be more than the working foundation trench levels. The auxiliary pit shall be refilled with approved excavated materials after the dewatering is over.

The excavation shall be kept free from water :-

a) during inspection and measurement.

b) when concrete and/or masonry works are in progress and till they come above the natural water level and

c) till the SBI/Architects consider that the concrete/ mortar is sufficiently set.

1.11 Surplus Excavated Materials

All excavated materials certified as surplus and not useful shall be removed by the Contractor from the site in an approved manner with the approval of the Local Authority as required to his own dump and shall be paid as a separate item as in the Schedule of Quantities. No extra claim on any account will be paid.

The items of removal of surplus excavated materials shall only be undertaken by the Contractor when specific instruction in this regard has been obtained from the SBI/ Architects. The contractor must also secure the approval of the SBI/Architects regarding the quantity of surplus materials to be removed prior to commencement of this item of work.

1.12 Rates to Include for Excavation Items

Apart from other factors mentioned elsewhere in this contract, rates for the item of excavation shall also include for the following :-

i) Clearing Site

ii) Selling out works as required.

iii) Providing shoring and shuttering to avoid sliding of soil and to protect adjacent structures and subsequently by removing the same, if not stated separately in the schedule of quantities.

iv) Bailing and pumping out water as required and directed.

v) Excavation at all depth (unless otherwise specified in the Schedule of quantities) and removal of all materials of whatever nature wet or dry and necessary for the construction of foundation underground reservoir etc and preparing bed for laying concrete.

vi) Sorting out useful excavated materials and conveying beyond the structure and stacking them neatly on the site for back filling or re-use as directed.

vii) Necessary protection works involving, labour, materials, and equipment ensure safety and protection against risk or accident.

viii) Drilling of small holes as directed to explore the nature of substrata if necessary.

1.13 Measurement for Excavation

Excavation for foundation of columns, beams, walls and the like shall be measured and paid net as per drawing, dimensions of concrete (bed concrete where so specified) and the lowest level in regard to length and breadth and depth shall be computed from the excavation levels and ground level's taken before excavation for that area. Any additional excavation required for working space, form work, planking, shuttering for concrete work, dewatering and strutting etc. shall not be

measured and shall not be paid for separately but rates quoted for excavation shall include for all these factors. No increase in bulk after excavation shall be allowed.

1.14 Rates to Include for Backfilling Item

Apart from other factors mentioned elsewhere in this contract, rates for the item of backfilling item of work shall also include for the following :-

- i) Backfilling the trenches alongside masonry or concrete with approved excavated materials upto the natural ground level in layers as specified including watering and ramming.
- ii) **Earth filling in Plinth** : If there is approved surplus earth after backfilling the sides of excavations, the same will be used for plinth filling if required. Any additional quantities of good quality earth, if required for plinth filling, shall be brought to the site, by the contractor from outside. No borrow pits shall be opened on the site. Filling in plinth shall be done in layers of 15 cm thick each layer being consolidated by ramming and watering. The payment of back filling item shall be made on measurement of finished consolidated quantity, arrived by difference of levels taken before and after the back filling.
- iii) No payment shall be made for backfilling to the trenches excavated by the contractor for working space, form work, planking, shuttering for concrete work, dewatering and strutting etc with approved excavated materials upto the natural ground level in layers as specified including watering and ramming.

2.0 CONCRETE

2A General

A.1 Supervision

A competent person approved by the Owner/Architects shall be employed by the contractor whose first duty will be to supervise all stages in the preparation and placing of the concrete. All cubes should be made and necessary site tests carried out under his direct supervision in the presence of Owner/ Architects.

A.2 Approval of Concreting Arrangement etc

Before commencement of construction the contractor shall submit detailed arrangements for concreting, system of form work and all other devices which he proposes to use for the construction of structural frame work for approval of Architects/Owner.

A.3 Sample and Tests

Every facility shall be provided by contractor at site to enable the Owner/Architects to select samples, get contractor to collect samples and carry out tests on the materials and construction. At least 10% of the cube tests should be carried out in Laboratory/ Institution approved by the Architect/Owner. If those tests shows that strength of cubes do not comply with the acceptance criteria of specifications, the contractor will be responsible for replacement of the defective construction. The necessary cost of all such sampling and testing has to be borne by the contractor.

A.4 Rejected Materials

All materials which have been damaged, contaminated or have deteriorated or do not comply in any way with the requirements of this specification, shall be rejected and shall be removed immediately from the site at the Contractor's own expense.

A.5 Loading of Floor Slabs

No materials shall be stored or stacked on suspended floors and roofs without the Owners/Architects' prior approval.

A.6 Coordination

The Contractor shall be responsible for the co-ordination with sub-contractors or other contractors for incorporating any inserts, electrical conduit pipes, fixing blocks, chases, holes etc in concrete members brick works as required. The contractor shall ensure that these requirements have been approved by the Owner/Architects before the operations are put in hand. All blocks, chases, inserts, holders etc. to be left in the concrete shall be of the sizes specified and be accurately set out and placed before pouring concrete.

The Contractor's rates quoted for concrete items shall include all these factors. No holes and chases shall be cut in concrete without prior approval of the Owner/Architects.

A.7 Inserts to Concrete

The contractor should note that he Shall provide necessary wooden plugs, m.s inserts, sleeves etc: required for the works for which no extra payment will be made. He will have to provide if so directed, any inserts, wooden plugs sleeves for other contractors, such as Electrical Contractor', Fire Fighting Contractors, Contractor for Lifts etc for which he will be entitled for payment but in case the other contractors provide such inserts, then he will have to take proper measures (at his expense) and care not to disturb their work while laying concrete.

A.8 Equipment

The contractor shall keep at work site testing equipment for aggregate and concrete, viz. test sieves, balance, slump cones, concrete cube testing machine etc all items required conforming to relevant I.S. specification. Dial gauge of cube testing machine should have been calibrated recently from a Govt. approved laboratory.

2.B Materials

All materials shall be of approved quality as per relevant I.S. specifications/or as specified in the contract.

B.1 Cement

- a) Ordinary portland cement and Portland Slag Cement shall conform to the I.S. specification I.S. 269 and IS 455 of latest edition.
- b) Cement at site shall be stored in dry weatherproof godowns (or shed) built at the cost of the contractor. Cement must not be stacked in more than 10 bag height. Sufficient space shall be provided for circulation and rotation of bags in order to minimise the length of storage of any of the bags. The floor of the godown shall consists of wooden planks resting on base prepared of dry bricks laid on edge.

The contractor shall be fully responsible for the quality of cement brought by him at the work site. The contractor shall ensure that the cement brought to the work site conforms to the requirements of IS 269 or IS 455 and shall procure manufacturer's certificate to this effect, in his own interest_ In case the contractor has any doubt regarding the quality of cement

brought on work site by him, it is upto him to have it tested at his own expenses & make sure that cement is of right quality.

- d) Owner/Architects can order on the contractor to have the cement tested or they can take samples in the presence of contractor from cement bags stored at work site and forward them to a approved Laboratory for testing & the contractor shall be responsible for the cost of testing including transporting of samples to the laboratory.

Daily record of cement received and consumed shall be maintained by the Contractor in cement register at site and submitted to Architects if called for. Theoretical consumption vis-a-vis materials brought at site by the Contractor shall also be submitted with proper documents with every bill for verification. A chart showing the consumption of cement for different items of work is annexed. Consumption of cement in the corresponding items of work under the contract shall be computed on the basis of the quantities shown in the table subject to a variation of plus/minus three percent (The weight of 'I' cum of cement shall be taken as 1,440 kg). For the items not available in the enclosed cement consumption chart, C.P.W.D schedule shall be followed.

- e) Cement of doubt full quality shall not be used until satisfactory results is obtained after testing. All cement not conforming to specifications and cement that has deteriorated, damaged or set shall not be allowed to be used. All such cement shall be immediately removed from -work site by the contractor. The cost of all such cement shall be borne by the contractor.

B.2 Aggregate

Aggregate shall conform to IS 383 of latest edition.

B.3 Fine Aggregate : Sand

- a) The fine aggregate - sand shall be hard, strong, dense, durable clean with uncoated grains. The maximum size of the particles shall be 4.75 mm (3/16 in) and shall be graded down. The sand shall not contain any harmful materials such as iron, Pyrites, coal, mica, silt, clay, alkali, sea shells organic impurities, loam etc. or in case of reinforced concrete work, any materials which might attack the reinforcement or detrimental to concrete. Aggregate, which are chemically reactive with the alkalis of the cement, shall not be used. The maximum quantity of deleterious materials shall not exceed the limit specified in the relevant I.S. Specifications. The silt content shall be within 8%.
- b) Grading : The natural sand used for work shall have a grading conforming to grading zones of I and II of I.S. 383 of latest edition.

B.4 Coarse Aggregate

- a) Coarse aggregate shall consist of hard, dense, durable uncoated crushed rock. Gravel aggregate shall be allowed to be used only if specially specified in the bill of quantities. Otherwise it shall be taken that only crushed rock shall be permitted as coarse aggregate.
- b) The aggregate shall be free from soft, friable thin or long laminated pieces. Aggregate shall be free from injurious amounts of alkali, organic matter and other deleterious materials. Flacky or weathered stones shall not be used. The maximum percentage of deleterious materials shall not exceed those specified in the relevant I.S. specification.
- c) The contractor shall arrange to supply coarse aggregate of nominal size conform to the grading in the limits specified in LS. 383 of latest edition.

d) **Size of Aggregate:**

i) Generally for reinforced concrete work, nominal maximum size of aggregate be 20 mm graded suitably.

e) In selecting the aggregate, the contractor shall satisfy himself that the source is suitable for regular supply and a watch shall be maintained that the particles shape and grading remain reasonably uniform throughout the progress of work.

f) Where so directed by Owner/Architects aggregate shall be washed by approved methods at Contractor's expenses.

B.5 Water

Water used for both mixing and curing shall be clean and free from injurious amounts of deleterious materials which are likely to affect the strength or durability of concrete.. Water containing any sugar shall not be allowed for use. Water is to be tested In accordance with I.S. 456 of latest edition. The pH values of Water shall generally be not less than 6.

2C Mixing and Placing of Concrete

C.1 Cement

Cement shall be batched by weight even though aggregate are batched by volume. Where the weight of the cement is deter-mined by accepting the maker's weight per bag, a number of bags as directed by Owner/Architects shall be weighed separately to check the nett weight. Where the cement is weighed on the site and not in bags, it should be weighed separately from Aggregate.

C.2 Aggregate

The aggregate shall be batched by volume, the form as used shall be of the correct sizes to be certified by the Owner/Architects before use. Heaping of aggregates on the form is prohibited and aggregates shall be filled level in form and struck off with a horizontal timber or steel rule. ,Where sand is measured by volume, bulkage allowance as determined by the Owner/Architects shall be accounted for while measuring sand.

C.3 Water

Water shall be measured either by volume in calibrated tanks/vessels having conical shape narrow at top or water shall be weighed. Water shall not be measured using ordinary buckets which are wider at top and narrower at the base. The measurement of water to control and maintain a constant water cement ratio is of utmost importance and adequate attention to this end by the contractor to the satisfaction of the Owner/Architects shall be made so as to produce concrete of adequate workability as required.

C.4 Mixing of Concrete

a) Machine Mixing

Concrete shall be mixed in Mechanical Mixer. Mixing shall be continued until there is uniform distribution of materials and the mass is uniform in colour and consistency. The mixing time from the time of adding water shall be in accordance with I.S. 1791 of latest edition but in no case mixing shall be done for less than two minutes.

b) Hand Mixing

Hand mix: shall not be permitted except for unimportant structural members and purely at the discretion of the Owner/Architects. When hand mixing is permitted it shall be taken to ensure that the mixing is continued until the mass is uniform in colour and consistency: If hand mixing is permitted by the Architects/Owner, the contractor shall use 10% extra cement for hand mixing for which no extra payment will be made.

C.5 Transporting, Placing, Compaction and Curing of Concrete

C.6 Transporting

Concrete shall be handled from the place of mixing to the place of final deposit as rapidly as practicable, by method which will prevent the segregation or loss of any of the ingredients. If segregation occurs during transport, the concrete shall be remixed before use. The concrete shall be placed in position and compacted before the initial set of cement has commenced and shall not be subsequently disturbed. During hot or cold Weather concrete shall be transported in deep container to reduce loss of water by evaporation during hot weather and loss of heat during cold weather. Deep containers are specified on account of their lower ratio of surface area to mass.

C.7 Dropping of Concrete

Concrete shall not be dropped into position from a height greater than 1.0 metre unless directed otherwise by Owner/Architect.

C.8 Debris etc Removed

All debris, saw dust etc. shall be removed from the shuttering before any concrete is placed. Care shall be taken to see that the shuttering is watertight and has been properly treated with approved composition to prevent absorption of water.

C.9 Protection and Placing in Layers

Concrete shall be placed into the forms in layers not exceeding 300 mm (approx) in thickness. Concrete after placing and finishing shall be protected by use of covering as approved by the Owner/Architects during first stage for hardening against high winds, heat, rain, surface water etc. No shock or vibration shall be allowed to imparted to forms supporting fresh finished concrete.

C.10 Compaction

Concrete shall be thoroughly compacted during operation of placing by the use of Mechanical Vibrators. Sufficient number of vibrators (including stand by) of adequate capacities shall be used for compaction of concrete. Vibration shall be carried out by trained men and in the presence of a qualified supervisor trained in the use of vibrators and vibrated concrete. In certain portions where vibration is not effective, careful rodding and taping shall be carried out and sufficient men employed to ensure that thorough consolidation takes place. Where manual compaction becomes necessary, the workability of the mix should be controlled to strength requirement.

C.11 Continuous Concreting

Concreting shall be carried out continuously upto predetermined positions of construction joints. The position and arrangement for construction joints shall be approved by the Owner/Architect. Rest pauses for meals etc. shall be subject to the Owner/Architects' approval.

C.12 Packing round Reinforcement

In the case of reinforced concrete work, the concrete shall be carefully consolidated and packed round the reinforcement and care shall be taken to ensure that reinforcement is not displaced during the placing and compaction of concrete. If reinforcement moves out of its place, it must be brought back in position immediately.

C.13 Curing

All concrete work shall be water cured for a minimum period of 7 days after concreting or as directed by Owner/Architects. Horizontal surfaces shall be kept covered with water ponded by means of bunds and Vertical surfaces like those of columns, fins etc, by burlaps kept constantly wet with water sprays. Mere sprinkling of water on vertical surface without sacks. will not be allowed. In respect of concrete made out of pozzalana cement, curing shall be continued for another 8 days.

C.14 Trained Supervisor

It is essential that the contractor's supervisor who is in charge of the construction of all concrete work whether reinforced or not, shall be skilled in this class of work and shall superintend personally the whole construction and pay special attention to :-

- a) The quality, testing, proportioning and mixing of the materials and particularly control of water cement ratio
- b) Laying of materials in place and thorough consolidation of the concrete to ensure solidity and freedom from voids.
- c) Position of reinforcements.

2.D Tests for Concrete

Tests shall be conducted in accordance with I.S. : 516 of latest edition.

Test Cubes

- a) Works tests cubes shall represent quality of concrete incorporated in the work and taken out in sets of 6 cubes. The concrete for preparation of one set of 6 cubes shall be taken from one batch of mixed concrete discharged from mixer. The cubes shall be moulded in accordance with Indian Standard Code of Practice.
- b) A minimum of one set of 6 cubes shall be taken for every 20 cum or part thereof in case of beam, slabs. & connected columns; one set for 5 cum or part thereof of concrete poured for columns and they shall be considered as representative for said quantity. This is an average figure, and may be increased to cater for special conditions at the discretion of the Owner/Architects at site.
- c) The cubes shall be cured as per IS Code of Practice. The entire operation of casting, arranging and despatch of cubes to Laboratory will be carried out by the Contractor under the supervision of the Owner's Site Engineer/Architect. Out of 6 cubes, 3 cubes shall be tested at an age of 7 days and balance at an age of 28 days in an approved Laboratory
- d) The cubes shall be initialed, numbered, dated jointly by the contractor's representatives and the Site Engineer of Owner/Architects' representative with a piece of wire or nail so that an indentation of the initials is left on the cubes.

- e) The contractor shall arrange to transport the cubes to the approved laboratory and arrange to have the test results forwarded (in duplicate) directly from the laboratory to the Owner/Architects. The contractor shall bear all expenses in connection with the preparation of test cubes, i.e provision of moulds, cost of concrete, labour and transportation charges to the approved laboratory, laboratory testing charges etc and his rates for concrete items should be quoted accordingly.
- f) A Register shall be maintained at site by the Contractor with the following-details entered and initialed by the Contractor and the Site Engineer/Architects.
 - i) Reference to specific structural members receiving the batch of concrete from which the cubes were cast.
 - ii) Mark on cubes:
 - iii) The mix of concrete.
 - iv) Date and time of casting.
 - v) Slump
 - vi) Crushing strengths as obtained at the end of 7 days for 3 cubes out of a set of 6 and at the end of 28 days for the other 3 cubes.
 - vii) Laboratory in which tested and reference to test certificate.
 - viii) Any other information directed by the Owner/Architects.
- g) A record of the quality of concrete incorporated in the work that is represented by the quality of concrete of the set of cubes along with the description of the structural members where concrete has been deposited shall be mentioned.

2.E Vibration of Concrete

a) Water Cement Ratio

The water cement ratio (by weight) for all vibrated concrete (except controlled concrete) shall generally conform to relevant 1.S. provision and it shall not be varied unless otherwise directed. In respect of "Design Mix" the water cement ratio shall be as determined in the laboratory mix design suitable for vibrated concrete.

b) Placing

Concrete shall be placed in layers not over 45 to 60 cm (18 to 24 inches) deep and each layer shall be vibrated into places by methods which will not permit the ingredients to separate. Surfaces shall be smooth and free from voids caused by stone pockets, where necessary vibration shall be supplemented by hand spading to secure these results.

c) Number and Size of Vibrators

Vibrators shall be of sturdy construction, adequately powered. The vibration shall be sufficiently tense to cause the concrete to flow or settle readily into place and visibly affect the concrete over a radius of at least 450 mm (1811) when used in concrete having slump of one inch. A sufficient number of vibrators (at least one vibrator for a rate of concreting of 1.5 cum. (50 cft) per hour shall be employed so that at the required rate of placement, vibration throughout the entire volume of each layer of concrete and complete compaction are secured.

d) Manipulation of Vibrators

Internal vibrators shall be kept constantly moving in the concrete and shall be applied at points uniformly placed not further apart than the radius over which the vibrator is visibly effective. The vibrator shall not be held in one location long enough to draw a pool of grout from surrounding concrete. The vibration shall be such that the concrete becomes uniformly plastic and there shall be at least 200 seconds of vibration per square metre (20 second of vibration per sq.ft.) of surface of each layers of concrete, computed on the basis of visibly affected radius and taking overlap into consideration.

2.F a) Grade of Concrete

The concrete shall be of grades designated as M-15, M-20, M-25, M-30 of cube crushing strengths as specified in I.S. Code 456 of latest edition.

Note : The designation of concrete mix : Letter M refers to the mix and the number to the characteristic compressive strength of 15 cm cube of 28 days, expressed in N/sq.mm.

b) i) Ordinary Cement : Concrete made without preliminary tests but by adopting volumetric concrete mix, shall be called "ORDINARY CONCRETE" unless ordinary concrete as per Table 3 I.S. 456 of latest edition.

ii) Nominal Volumetric Mixes : If in the bill of quantities concrete is specified in volumetric proportions such as 1:4:8, 1:3:6, 1:2:4, 1:1 1/2:3, 1:1:2 etc. it shall be taken to mean that the proportions by volume of cement; sand and coarse aggregate shall be in the order in which the mix is specified.

Table-I

Minimum cement content for different volumetric mix of concrete are as under :

Volumetric Proportion of Cement Concrete
Cement : Fine Aggregate : Course Stone Aggregate

Minimum Cement Content Kg/cum

1:1 ¹ / ₂ :3	412
1:2:4	317
1:3:6	235
1:4:8	180

c) Strength Requirements of Concrete

Where ordinary portland cement is used, the compressive strength requirements for various grades of concrete shall be as given in Table 2 of IS. 456 of latest edition. It shall be the contractor's responsibility to obtain specified strengths for the various grades of concrete. Where rapid hardening Portland cement is used, 28 days' compressive strength requirements specified shall be met at 7 days.

d) Design Mix Concrete

Concrete made with preliminary tests by designing concrete mix in a laboratory shall be called "DESIGN MIX CONCRETE and shall be designated as M-20, M25 and M-30.

i) Concrete Mix for Various Grades of Design. Mix Concrete : Concrete mixes shall be designed for various grades of concrete (M-20, M-25, M-30) by the contractor to achieve the respective strength, durability and workability necessary for the job by the most economical use of various ingredients. The design should be made conforming to the relevant IS Specifications (IS-456, IS-516 of latest edition) in respect of proportioning -Of fine aggregate to coarse aggregate, maximum quantity of dry aggregates and water cement ratio, the minimum cement content as mentioned in the Schedule of Quantities. The contractor will arrange for the testing of various trial mixes of sufficient number (as per direction of the Architects/Owner) at his own cost in laboratory approved by the Architects/ Owner for the preliminary test for different grades of concrete. The Architects/ Owner will adopt the concrete mixes for the respective concrete grades from the test results of the said trial mixes, conducted and certified by the approved laboratory and the contractor will accordingly proceed with the concreting at work site. Constant Check on grading and mix proportion shall be done by the contractor who will always be responsible to produce quality concrete of required grades as per the acceptance criteria of IS 456 of latest edition. If there is any change in the quality of aggregates (both coarse_ and fine), necessary alteration to the mix proportion should further be approved by the Architect/Owner before the same are used at work site.

The Architects will always have the unquestionable right to revise the minimum cement content as decided above, if in his opinion, there is any chance of deterioration of quality of aggregate or other reason.

2 .G Classification of Concrete of Lower or Higher Strength than Specified

Where the strength of concrete mix (for ordinary concrete or design mix concrete) as indicated by tests, lies in between the strengths of any of two grades, such concrete shall be classified as a grade belonging to the lower of the two grades between which its strength lies. In case the cube test strength show higher strengths than those specified for the particular grade, the concrete Shall not be placed in any higher grade nor shall contractor be entitled for any extra payment on such account.

2.H Cement Concrete Mudmat

Concrete for the purpose shall be in the proportion of (1:3:6) 1 part of cement, 3 parts Of sand and 6 parts of stone chips and 1:4:8 (1 cement, 4 parts of sands and 8 parts of Stone chips/jhama khoa) may be mixed by volumetric batching as mentioned in the Schedule of Quantities.

2.1 Form Work

1.1 Materials and Design

- a) The form work shall be of approved dressed timber of not less than 3.5 cms thick except where otherwise stated. As an alternative sufficiently rigid steel ply. Board shuttering of approved design may be used. Joints of the shuttering must not allow loss of liquid from concrete. In timber shuttering the joints shall therefore be either tongued or grooved or the joints must be perfectly closed and lined with craft paper or other types of approved materials. In case of steel shuttering also the joints are to be similarly lined. If any particular material or materials be specified in the Schedule of Quantities for formwork such particularly specified material or materials shall be used in work. The form work shall be constructed as to remain sufficiently rigid during placing of the concrete. All shuttering and framing must be adequately stayed and braced to the satisfaction of the Owner/Architects for properly supporting the concrete during the period of hardening. The forms shall have sufficient strength and rigidity to hold concrete and withstand the pressure of ramming and vibration without deflection from the prescribed lines and levels. The surface of all forms in contact with concrete shall be clean, rigid, watertight and smooth. Suitable devices shall be used to bold corners, adjacent ends and edges of panels of other forms together in accurate alignment.
- b) The form work shall conform to the shape, lines and dimensions to suit the R.C.C. members as shown on drawing. Form work shall be adequately designed to support the full weight of workers, fresh placed concrete without yielding to settlement or deflection and to ensure good and truly aligned concrete finish in accordance with the construction drawings. A camber in all direction of 6 mm for every 5 metre span in all slab and beam centering shall be given to allow for unavoidable sagging due to compression or other causes.
- c) The form work shall be so designed that the sides of the beams shall be first struck leaving the soffit of beams and supporting props in position. Props shall be designed to allow accurate adjustment & to permit of their being struck without jarring the concrete.
- d) Temporary openings shall be provided at the base of columns forms and at other points where necessary for facilities of cleaning and observations immediately before concrete is deposited.
- e) **Vertical Shuttering** : The vertical shuttering shall be carried down to such solid surface as is sufficiently strong to afford adequate support and shall remain in position until the newly constructed work is able to support itself. Props shall be securely braced against lateral deflection. Steel props of approved quality shall be used. In case timber props and bullies are allowed to use these shall be of minimum 10 cm diameter and shall be straight and adequately strong. Bamboo props shall not be used. The spacing of such struts shall be designed to carry loads imposed on it without undue deflection of the members supported by the props and shall be approved by the Owner/Architects. Any alterations suggested by them shall be carried but at Contractor's expenses. Bracing shall be provided as directed without extra cost. The contractor shall allow in his rates for providing props and struts for any height shown in the working drawings issued to the contractor from time to time.

1.2 Water Tightness

The Contractor shall ensure that the forms are checked for water tightness just before concreting operation starts and shall make good any deficiencies. If instructed by the- Owner/Architects building paper or any other approved materials will have to be used without any extra charge for the same.

1.3 Cleaning and Treatment of Forms

All rubbish, particularly wood chippings, shavings and saw dust, shall be removed from the interior of the forms before the concrete is placed and the form work in contact with the concrete shall be cleaned and thoroughly wetted or treated with an approved composition. Care shall be taken that such approved composition is kept out of contact with the reinforcements, Interior of all moulds and boxes must be thoroughly washed out with hosepipe or otherwise so as to be perfectly cleaned and free from all extraneous matter before deposition of concrete. Prior approval of the formwork should be taken from Architects before placing reinforcement on the formwork.

1.4 Stripping

Form shall be left in -place until their removal is authorized by the Owner/Architects and shall then be removed with care so as to avoid injury to concrete. Under no circumstances shall form be struck until the concrete reaches a strength of at least twice the stress to which the concrete may be subjected at the time of striking. The strength referred to shall be that of concrete using the same cement and aggregate with the same proportion, and cured under conditions of temperature and moisture similar to these existing on the work. Where possible, the formwork should be left longer as it would assist the curing.

1.5 Stripping Time

In normal circumstances (generally where temperatures are above 20°C and where ordinary Cement is used) forms shall be struck after expiry of the following periods unless otherwise directed at site by the Owner/Architects.

Location	Striking time in days	
	Ordinary Portland Cement	Pozzalana Cement
a) Vertical sides of walls, slabs, beams and columns	2	4
b) Bottom of slabs upto 4.5 M span	7	14
c) Bottom of slabs above 4.5 M span. Bottoms of beams upto 6.0 M span	14	21
d) Bottoms of beams over 6.0 M span & arch rib bottoms above 6.0 IVI span.	21	30
For rapid hardening cement, 317 of the above periods will be sufficient in all cases except vertical sides of walls, slabs, beams and columns which should be retained for a minimum period of 24 hours.		

1.6 Formwork in Lifts for Continuous Surface

Where forms for continuous surface are placed in successive units, (as for example in columns or walls) the forms shall fit tightly over the completed surface so as to prevent leakage of mortar from the concrete and to maintain accurate alignment of the surface.

1.7 Procedure while Removing the Formwork

All formwork shall be removed Without such shock or vibration as would damage the reinforced concrete. Before the soffit and struts are removed the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened. Proper precautions shall be taken to allow for the decrease in the rate of hardening that occurs with all cement in the cold weather.

1.8 Tolerance

The following shall be the maximum permissible tolerance:

- a) In general, setting out dimensions upto 4M in length a tolerance upto 3 mm will be allowed.
- b) On lengths of more than 4 M tolerance of not more than 5 mm will be allowed.
- c) On the cross sectional dimensions of columns, beams, slabs, facias, chajja, mullions, grills, fins, louvers, and such other members, tolerance of more than 3 mm will not be allowed.
- d) The top surface of concrete floor slab will be within 6 mm of the level and line shown on the drawings.
- e) Columns and walls and other vertical members shall not be more than 3 mm out of plumb in their storey height and not more than 6 mm out of plumb in their full height.
- f) If work is not carried out within the tolerance set out above in (a) to (e), the cost of all rectification measures of dismantling and reconstructing as decided by the Owner/Architects shall be borne by the contractor. In case of work dismantled, the same not to be measured and paid for.

2.J Defective or Poor Concrete — Procedure for Dealing With

J.1 General

If in the Owner's/Architects' opinion there is doubt as to the strength of the structure due to the works test cube failing to attain specified strength due to poor workmanship like honeycombing etc or any reason attributable to negligence on the part of the contractor then the Owner's/Architect's decision regarding dismantling, of such concrete or rectification if concrete is allowed to be retained in its place shall be final and binding on the contractor.

J.2 Where Concrete in Structure is Allowed to be Retained

In the case of concrete showing the result of the tests strength less than those specified, the quantities in cubic metre certified by the Owner/Architects as so deficit may be allowed to remain in such a case subject to deduction for such sums as are or may become due under the contract not exceeding Rs. 50.00 per cum of the quantity so certified in case where deficiency does not exceed five percent and Rs.100.00 per cum of the said quantity where the deficiency exceeds five percent. The Owner/Architect shall have full power in their absolute discretion to fix the actual rate of deduction subject only to that the rate so fixed shall not exceed the maximum as provided above.

J.3 Concrete Ordered to be Dismantled

If the deficiency exceeds standard Deviations arrived as per IS 456 of latest edition, the Owner/Architects may at their discretion direct the portion of concrete certified by them so as deficient in strength to be dismantled from the structure and replaced by concrete of specified strength and the contractor shall in that case have to carry out that direction at his own cost irrespective of the amount of loss, inconvenience and difficulties involved. Concrete thus dismantled will not be measured and paid for.

J.4 Concrete Retained with rectification

Where the Owner/Architects consider that defective concrete be strengthened, the contractor shall carry out all rectification work as per direction of Owner/Architects at contractor's expense. The concrete of lower strength thus accepted shall, however, be paid for concrete as mentioned above after necessary strengthening.

J.5 Quality of Defective Concrete Represented by Cubes

In all cases of defective concrete as revealed by work test cubes strength falling below the specified strength, the quantity of concrete thus affected and represented by the cubes will be decided by the Owner/Architects whose decision shall be final and binding on the contractor.

J . 6 Honey Combing

- a) Where honeycombed surface are noticed in the concrete, the contractor shall not patch up the same until examined by the Owner/Architects and decision given regarding the acceptance with rectification or rejection of the same. If the contractor patches up such defects without the knowledge of the Owner/Architects

the Owner/Architects will be at liberty to order demolition of the concerned concrete members to the extent they consider necessary. In such case, the contractor at his expense, shall demolish and reconstruct defective work. The demolished work shall not be measured and paid for.

- b) If in the opinion of the Owner/Architects the honeycombing is harmful to the structure and where so directed by the Owner/Architect the full structural members affected by honeycombing as decided by Owner/Architects shall be dismantled and reconstructed to Owner/Architects' approval at the contractor's expense. The demolished concrete will not be measured and paid for.
- c) Where in the opinion of the Owner/Architects the Structural members containing honeycombing can be allowed to be retained with rectification, the rectification shall be carried out as directed by the Owner/Architects by gunniting (with cement mortar 1:3 proportion) the areas concerned at the contractor's expense.
- d) If such honeycombed areas are not severe in the opinion of the Owner/Architects and where so directed shall be patched up with cement mortar consisting of 1 part of cement and 3 parts of sand after removing defective concrete up to sound concrete surface to the satisfaction of Owner/ Architects all at the expense of the contractor.

J.7 Other Defects

Any other defects in concrete shall be made good as directed by the Owner/Architects at the contractor's expenses.

2.K Contractor's Rates to Include

The rates of the contractor for providing and laying cement concrete in various grades or proportion in the schedule of quantities shall, apart from any other factors specified elsewhere in the tender documents, include for the following :

- a) For all factors and method of work described in this specification and relevant Indian Standards.
- b) For all materials, labours, tools and plants, scaffolding, staging etc mixing conveying and placing concrete in position, ramming, vibrating, troweling, curing, and removing the scaffolding after the work is complete.
- c) Unless otherwise specified in the Schedule of Quantities the cost for concrete items shall include for providing, stays, struts, bolts, nuts and every item necessary to keep the forms rigid, smoothing the surface to receive concrete as per detailed drawing, striking and stripping formwork after the concrete is cured or as specified, hacking the concrete surfaces required to receive plaster etc. Where shuttering is described as a separate item in the schedule of quantities, rate for shuttering shall be inclusive of all the works mentioned in this para apart from other factors mentioned in specification for form work and also elsewhere in this contract. Shuttering to curve structure will be measured and paid as detailed in Schedule of Quantities.
- d) The reinforcement in case of reinforced concrete work will be paid for separately unless otherwise stated in the particular items, but rate shall include for pouring concrete and packing around reinforcement.
- e) The measurement of concrete will be as per detailed drawing, shapes and size based on net structural sizes as per drawing i.e. exclusive of plaster.
- f) Rates for concrete items shall cover for any shape of structural members like columns, beams, fascia, fins, louvers etc. and for cantilever beams, slabs, etc including curve structures.
- g) Formation and treatment of construction joints, and expansion joints where water bars of approved materials or joint fillers like "Shalitex" are specified such materials shall be paid as per separate rates.
- h) Design of mixes, if required by specification, testing in an approved laboratory, tests of materials and work required in the opinion of the Architect and described in these specification.
- i) Fixing all inserts like pipe, plugs, forming holes etc as described.
- j) Weigh-batching using a Mechanical Weigh Batchers of a batching plant or where so specified for volumetric batching.
- k) For taking out dowel bars, fan hooks, etc. through shuttering.

- l) For forming drip moulds in chajja, sills etc. as shown in the drawings or as described.
- m) For work at all levels.
- n) In cases where at the junctions of beams, column and slab the composition of concrete mix of specified strength be different for columns, beams and slab then in such cases only the richer concrete among those specified for in all these members shall be used at the junctions and rate quoted for columns, beams and slabs or any members entering such junctions shall allow for the same. Rate shall also cover for spill over of rich concrete in beams to natural angle of repose of wet concrete required from practical consideration while concreting the junctions.

2.L Steel Reinforcement

L.1 Mild Steel Bars

Mild steel reinforcement bars shall conform to I.S. 226 of latest edition "Standard Quantity" or I.S. 432 of latest edition "Grade 1". Other qualities of steel shall not be acceptable.

L.2 High Strength Deformed Bars

Where high strength deformed steel bars and wires are specified, the material shall be as manufactured by M/s. Hindusthan Steel, M/s. Tata Iron & Steel Company Ltd or other manufacturers conforming to IS 1786 of latest edition accompanied by a certificate from manufacturer.

Test : Necessary tests on steel reinforcements bars & wires shall be carried out by the contractor as per instruction of Owner/Architects at an interval mentioned in this contract at no extra cost.

L.3 Cleaning of Reinforcement

Before steel reinforcement is placed in position, the surface of the reinforcement shall be cleaned of rust, dust, grease and any other objectionable substances.

L.4 Bar Bending Schedule of Reinforcement

On receipt of structural drawing, Contractor shall prepare bar bending schedule of reinforcement and shall obtain approval of the Owner/Architects.

L.6 Cutting of Reinforcement

Before steel reinforcement bars are cut, the contractor shall study the lengths of bars required as per drawing and shall carry out cutting only to suit the sizes required as per drawing.

L.6 Placing and Security

Reinforcement bars shall be accurately placed and secured in position and firmly supported or wedged by precast concrete blocks of suitable thickness at sufficiently close intervals so that they will not sag between the supports or get displaced during the placing of concrete or any other operation of the work. Contractor Shall maintain reinforcement in its correct position without displacement and correct specified cover. The contractor shall be responsible for all costs for rectification required in case the bars are displaced out of their correct position.

L.7 Binding Wire

The reinforcement shall be securely bound wherever bars cross or whenever required for with 20 gauge soft black annealed steel wire.

L.8 Welding

Welding of bars shall not be carried out unless specifically authorised in writing by Owner/Architects as per LS. Code of Practice in place of splicing. However, no extra payment shall be allowed for the same.

L.9 Bends etc

Bends, cranks, etc. in steel reinforcement shall be carefully formed, care being taken to keep bends out of winding. Otherwise all rods shall be truly straight. If any bend shows signs of cracking the rod shall be removed immediately from the site. Minimum radius of 9 times diameter of the bar shall be used unless otherwise specified in the drawings. However, in respect of standard hooks the radius of bend shall be 2 times the diameter of bar. Heating of reinforcement of bars to facilitate bending will not be permitted. The bars shall always be bent cold. In case of mild steel reinforcement bars of larger sizes where cold bending is not possible they may be bent by heating with written permission of the Owner/Architects. Bars when bent shall not be heated beyond cherry red colour and after bending, shall be allowed to cool slowly without quenching. The bars damaged or weakened in any way in bending shall not be used on the work. High strength deformed bars shall in no case be heated to facilitate bending or cranking.

L.10 Inspection of Reinforcement

No concreting shall commence until the Owner/Architects have inspected the reinforcement in position and until their approval have been obtained. A notice of at least

72 hours shall be given to the Owner/Architects by the contractor for inspection of reinforcement. If in the opinion of the Owner/Architects any materials are not in accordance with the specification or the reinforcement is incorrectly spaced, bent or otherwise defective, the contractor shall immediately remove such materials from the site and replace with new and rectify any other defects in accordance with the instruction of the Owner/Architects and to their entire satisfaction.

L.11 Nett Measurement

Reinforcements shall be placed as shown on the structural drawings and payment will be made on the nett measurements from drawings. Only such laps, dowels, chairs and pins in reinforcement as approved by the Owner/Architects or shown on drawings shall be paid for. The contractor shall allow in his quoted rates for all wastage which will not be paid separately.

L.12 Stock Piling of Steel

Steel required shall be stock piled well in advance of need in the work. Contractor shall stock pile 1/3 requirement within 15 days, 2/3rd requirement at 1/4 contract time and full requirement at 1/2 contract time or to suit the accepted work programme.

L.13 Cover for Reinforcement

Cover shall be measured from the outer surface of main reinforcement. Cover shall be as follows if not specified/shown in construction drawings.

- a) At each end of a reinforcing bar, 25 mm or twice the diameter of such rod or bar, whichever is greater.
- b) For longitudinal reinforcing bar in beams 25 mm or the diameter of such rod or bar, whichever is greater.
- c) For tensile, compressive shear or other reinforcement in a slab (5 mm or the diameter of such reinforcement whichever is greater).
- d) For reinforcement in any other member such as a lintel, chajja, canopy or pardi, 15 mm or the diameters of such reinforcements, whichever is greater. For main reinforcement in isolated footings (side and bottom) clear cover shall be 50 mm.
- f) For column bars clear cover shall be 40 mm, unless otherwise specified as in drawing. In case of columns of minimum dimension of 200 mm or under, whose reinforcing bars do not exceed (2 mm, minimum cover of 25 mm should be provided.
- g) For bars in slabs of strip footings and mat foundations the clear cover shall be 50 mm. Beam bars shall be placed over slab bars in respect of beam & slab type foundations.

L.14 Rates quoted for Reinforcement in Addition to Any Factors mentioned elsewhere shall also include for

- a) All cutting to length, labour in bending and cranking, forming hooked ends, handling , hoisting and everything necessary to fix reinforcement in work as per drawing.
- b) Decoiling, straightening (coiled bars, bent bars to facilitate transporting).
- c) Cost of binding work required as described.
- d) Cost of precast concrete cover blocks to maintain cover and holding reinforcement in position.
- e) For fabricating and fitting reinforcement in any structural member irrespective of its location, dimensions and level.
- f) Removal of rust and every other undesirable substances, using wire brush etc as described.
- g) Work at all levels.
- h) Rolling tolerance and wastage.
- i) Stock piling of reinforcements as described.

2.M Damp Proof course

Damp proof course shall be 40 •mm125 mm thick (as specified in the Schedule of Quantities) artificial stone 1:1 1/2:3 (1 part cement, 1/2 parts sand and 3 parts stone chips of 6 mm graded down Approved waterproofing compound of proportion as specified by manufacturer should be mixed with the concrete- during mixing, as per manufacturer's specification. Before laying the

concrete on the wall, the top surface shall be thoroughly cleaned of dirt, loose particles, cake mortar dropping and latiance, if any kind by scrubbing with coir or steel wire brush or by hacking if necessary. The surface shall be moistened before laying the concrete. The concrete should be laid in every case over the full width of the superstructure walls or as shown in the drawing. The top surface shall be finished with double chequered marks for adhesion of mortar for brickwork. Proper curing should be done before starting the brickwork over the damp proof course.

If any particular materials or any other treatments be specified in the schedule of quantities for damp proof course such particular materials or specifications shall be followed.

2.M Reinforced Cement Concrete

After the excavation as per cl.1.5, upto required depth, single layer B. F. S to be laid over which cement concrete 1:2:4 (1 cement : 2 course sand : a graded stone aggregate of 20mm nominal size) at least required thickness as decided by the Engineer- in –charge over which RCC slab of required thickness to be cast to the entire flat floor area. Whole work to be executed as per CPWD specification.

Similarly for providing RCC footing for required nos of RCC column of required size and shape with provision all arrangement to provide / rest manufacturer and statement of items of work.

3.0 BRICK WORKS

3.1 Bricks

- a) The bricks shall be locally available kiln burnt bricks of generally regular and uniform size, shape & colour, uniformly well burnt but not overburnt. The bricks shall be free from cracks, chips, flaws, stones or lumps of any kind and the rating of efflorescence shall not be more than "moderate", when tested as per IS. 3495 of latest edition. They shall not have any part unburnt. They shall not break even after being- dropped on the ground on their flat face in a standard condition from a height of 60 cm.
- b) The size Of brick shall normally 250 mm x 125 mm x 75 mm or 230 mm x 115 mm x 65 mm. Bricks of one standard size shall be used on one work unless specially permitted by the Owner/Architects.
- c) After immersion in water, absorption by weight shall not exceed 20% of dry weight of the brick when tested according to IS 1077. Unless otherwise specified the load to crush the brick when tested according to IS 1077 shall not be less than 50 Kg/Sq.cm.
- d) Prior approval of Owner/Architects shall be obtained for the brands of bricks to be used in the work after compliance with the above specifications/tests.

3.2 Mortar

Unless otherwise specified, mortar for brick work shall .be composed of 1 part of cement to 6 parts of approved sand for walls of one brick thick (25 cm) and over and one part of cement to 4 parts of approved sand for half brick thick and brick on edge walls.

3.3 Construction Details

- a) Soaking : All brick shall be immersed in water for 24 hours before being put into work so that they will be saturated and will not absorb water from the mortar.

- b) Bats : No bats or cut bricks shall be used in the work unless absolutely necessary around irregular openings or for adjusting the dimensions of different course and for closers, in which case, full bricks shall be laid at corners, the bats being placed on the middle of the courses.
- c) Laying : The bricks shall be laid in mortar to line, level and shapes shown on the plan, slightly pressed and thoroughly bedded in mortar and all joints shall be properly flushed and packed with mortar so that they will be completely filled with mortar and no hollows left anywhere. Bricks shall be handled carefully so as not to damage their edges. They should not also be thrown from any height to the ground but should be put down gently. All course shall be laid truly horizontal and all vertical joints made truly vertical. Vertical joints on one course and the next below should not come over one another and shall not normally be nearer than quarter of a brick length. For battered faces beading shall be at right angles to the face

Fixtures, pluos, frames etc. if any, shall be built in at place shown in the plans while laying the courses only and not later by removal of bricks already laid. The top layer of bricks of one or more thick wall coming in contact with R.C.C. beam/slabs and at window sill level etc shall be laid on edge as per direction.

Care shall be taken during construction to see that edges of bricks at quoins, sills, heads etc. are not damaged.

The verticality of the walls and horizontality of the courses shall be checked very often with plumb bob and spirit level respectively.
All external wall should have fair face on exterior surface.

- d) Bond : Unless otherwise specified, brick work shall be done in English Bond for foundation (upto Plinth level) and Rat Trap Bond for Superstructure coming in contact with reinforced concrete columns, beams etc. should be properly bonded by inserting reinforcements. Extra labour shall be included in the rates (reinforcements will be measured and paid separately against reinforcement item provided in the Schedule of Quantities.
- e) Joints : Joints shall not exceed 10 mm (about 3/8") in thickness and this thickness shall be uniform throughout. The joints shall be raked out not less than 10mm (about 3/18") deep when the mortar is green where pointing is to be done. When

the brick surface are to be plastered, the joints shall be raked to a depth of 5 mm when the mortar is green, so as to provide good key to plaster.

- f) Uniform Raising : Brick work shall be carried up regularly in all cases where the nature of work will admit, not leaving any part 60 mm lower than another. But where building at different levels is necessary, the bricks shall be stepped so as to give later at uniform level and effective bond. Horizontal courses should be to line and level, and face plumb as shown. on the plan. The rate of laying masonry may be upto a height of 80 cm (about 32") per day if cement mortar is used, and 45 cm (about 18") if lime mortar is used.

3.4 Scaffolding

The scaffolding must be of approved type strong and rigid stiffened with necessary cross bearers and safe to prevent injury to persons or materials. The contractor shall have to allow other trades to make reasonable use of his scaffolding as directed by the Owner/ Architects. If for the interest of

work the contractor have to erect scaffolding in the other properties including local bodies or Corporation, the arrangement for the same including the cost of licensing fees etc. shall have to be borne by The contractor and the Owner should be kept free from any liability on this account. Put log holes shall be made good by bricks to match the face work when put logs are removed after ensuring that the holes behind are solidly filled in with 1:4:8 cement concrete.

3.5 Curing

All brick works shall be kept well watered for 14 days after laying. While pozzalana cement is used for mortar the curing shall be extended by one week at contractors expense.

3.6 Half Brick/Brick on Edge Work

Half brick thick and brick on edge walls, shall be provided with H.B. wire netting of approved quality as -reinforcements. For -half brick thick *wall* and brick on edge wall H.B. wire netting reinforcements of approved quality shall be provided at every third course and in alternate course respectively according to standard practice.

3.7 Rates to Include

Apart from other factors mentioned elsewhere in this contract, the rates for items of brick work shall include for the following:

- a) All labour, materials, use of tools, equipment and other items incidental to the satisfactory completion of brick masonry at all heights and levels.
- b) Erecting and removing of all scaffolding, ladders and plant required for the execution of, the work to the height and depths and shapes as shown on the plan or as ordered 'by the Owner/Architects including extra labour and materials for using cut bricks in the construction of wall of varying thickness other than one brick, one and half brick, half brick and brick on edge walls as per drawings.
- c) Constructing brick work to lines, levels, batters, pillars, curve, projection, cutting, tothing etc. in strict conformity with the drawings and to any position or shape, to any heights or levels including raking out joints and housing frames, fixtures etc
- d) Necessary charges of outside scaffolding work for construction of external brickwork from outside to have fairface on exterior surface.
- e) Curing brick work.
- f) Extra labour for bonding brick work to RC works as specified.
- g) Removing of all stains and adhering mortar lumps on the brick work surface.
- h) Cost of reinforcement in half brick walls and brick on edge walls.
- i) Raking out joints for receiving plaster as specified.

3.8 Measurements

- a) Half brick thick and brick on edge walls shall be measured in sq.m unless otherwise mentioned..
- b) One brick wall and thicker walls shall be measured in cum. Brick walls upto and including 3 brick in thickness should be measured in multiples of half bricks which shall be deemed to be inclusive of mortar joints. Widths of more than three bricks in walls will be measured actually and limited to the width specified.
- c) No deduction or addition shall be made on any account for :-
Ends of dissimilar materials (i.e. joists, beams, lintels, posts, girders, rafters, purlins, trusses, corbels steps etc.) upto 0.1 sqm in section.
- d) For details of measurements not mentioned elsewhere in the contract, the method of measurement should be as per relevant LS. Code.

3.9 Brick Flat Soling

For soling the bricks shall be of approved, quality, hard, tough, durable, dense, clean, free from soft spots, cracks decay and other defects. Brick bats shall not be used. All the fillings shall be watered and compacted to get maximum consolidation. All necessary trimming or filling for laying of the soling in line and required grade shall be done.

The sub-grade shall be marked by stacks and strings for required depth for laying of soling. The cushioning will also consist of local sand.

The bricks shall be laid on flat (unless otherwise specified) touching each other. Brick shall be laid in parallel rows breaking bond or in herring bond pattern as directed and firmly embedded true to line and filled with local sand. Measurement shall be in sqm.

The in-situ and precast terrazzo paving shall be composed of 7 parts marble chipping of the required colour & 4 parts cement marble powder mix, the whole rolled or trowelled to a dense even surface free from holes and blemishes

4.0 STRUCTURAL STEEL

4.1 STEEL WORK IN BUILT UP SECTIONS (RIVETED AND BOLTED)

The steel work in built up section (Riveted and bolted) such as trusses, framed work etc. is specified in this clause.

4.2 Laying Out

A figure of the steel structure to be fabricated shall be drawn on a level platform to full scale. This may be done in full or in parts, as shown on drawings or as directed by the Engineer-in-Charge. Steel tape shall be used for measurements.

4.3 Fabrication

Fabrication shall generally be done as specified in IS 800. In major works or where so specified, shop drawings giving complete information for the fabrication of the component parts of the structure including the location, type, size, length and details or rivets, bolts or welds, shall be prepared in advance of the actual fabrication and approved by the Engineer-in-charge. The drawings shall indicate the shop and field rivets, bolts and welds. The steel members shall be distinctly marked or stenciled with paint with the identification marks as given in the shop drawings. Great accuracy shall be observed in the fabrication of various members, so that these can be

assembled without being unduly packed, strained or forced into position and when built up, shall be true and free from twist, kinks, buckles or open joints.

Wooden or metal sheet templates shall be made to correspond to each member, and position of rivet holes shall be marked accurately on them and holes drilled. The templates shall then be laid on the steel members, and holes for riveting and bolting marked on them. The ends of the steel members shall also be marked for cutting as per required dimensions. The base of steel columns and the positions of anchor bolts shall be carefully set out at the required location.

4.4 The steel section shall be straight or to be straightened or flattened by pressure unless required to be of curvilinear form and shall free from twists. These shall be cut square either by shearing or sawing to correct length and measured by steel tape. No tow pieces shall be welded or joined to make up for the required length of member.

4.5 Making Holes : Holes through more than one thickness of materials for members, such as compound stanchion and girder flanges shall, where possible, be drilled after the members are 403 SUB HEAD 10.0 : STEEL WORK assembled and tightly clamped or bolted together. Punching may be permitted before assembly, provided the holes are punched 3mm less in diameter than the required size and reamed after assembly to the full diameter. The thickness of material punched shall be not greater than 16 mm.

4.6 Assembly : Before making holes in individual members, for fabrication and steel work intended to be riveted or bolted together shall be assembled and clamped properly and tightly so as to ensure close abutting, or lapping of the surfaces of the different members. All stiffeners shall be fixed (or placed) tightly both at top and bottom without being drawn or caulked. The abutting joints shall be cut or dressed true and straight, and fitted close together. Web plates of girders, which have no cover flange plates, shall have their ends flush with the tops of angles unless otherwise required. The web plate when spliced, shall have clearance of not more than 5mm. The erection clearance of cleated ends of members connecting steel to steel shall preferably be not greater than 1.5 mm. The erection clearance at the ends of beams without web cleats shall not be more than 3 mm at each end but where for practical reasons, greater clearance is necessary, seating designed suitably shall be provided. Column splices and butt joints of struts and compression members *requiring* contact for stress transmission shall be accurately, machined and close butted over the whole section. In column caps and bases, the ends of shafts together with the attached gussets, angles, channels etc. after riveting together shall be accurately machined so that the parts connected, butt against each other over the entire surfaces of contact. Connecting angles or channels shall be fabricated and placed in position with great accuracy so that they are not unduly reduced in thickness by machining. The ends of all bearing stiffeners shall be machined or grounded to fit tightly both at top and bottom.

4.7 Bolting : The nominal length of the bolt shall be the distance from the underside of the head to the further end of the shank. The nominal diameter of the bolt shall be the diameter at the shank above the screwed threads. Bolts, nuts and washers shall be thoroughly cleaned and dipped in double boiled linseed oil, before use. All bolts heads and nuts shall be hexagonal unless specified otherwise. The screwed threads shall conform to IS 1363 and the threaded surface shall not be tapered. The bolts shall be of such length as to project at least two clear threads beyond the nuts when fixed in position, and these shall fit in the holes without any shake. The nuts shall fit in the threaded ends of bolts properly. Where necessary, washers shall be tapered or otherwise suitably shaped to give the heads and nuts of bolts a satisfactory bearing. The threaded portion of each bolt shall project through the nut at least two thread. In all cases where the full bearing area of the bolt is to be developed, the bolt shall be provided with a washer of sufficient thickness under the nuts to avoid any threaded portion of the bolt being within the thickness of the parts bolted together. Where there is a risk of the nuts being removed or becoming loose due to vibrations or reversal of stresses, these shall be secured from slackening by the use of lock nut, spring washers as directed by the Engineer-in-charge.

4.8 Erection

- 4.8.1** Steel members shall be hoisted and erected in position carefully, without any damage to itself, other structures and equipment and injury to workmen. The method of hoisting and erection proposed to be adopted by the contractor shall be got approved from the Engineer-in-charge in advance. The contractor however shall be fully responsible for the work being carried out in a safe and proper manner without unduly stressing the various members and proper equipment such as derricks, lifting tackles, winches, ropes etc. shall be used.
- 4.8.2** The work of erection may be done in suitable units as may be directed by the Engineer-in-charge. Fabricated members shall be lifted at such points so as to avoid deformation or excessive stress in members. The structure or part of it placed in position shall be secured against over-turning or collapse by suitable means. During execution, the steel members shall be securely bolted or otherwise fastened when necessary temporarily braced to provide for all loads including those due to erection equipments and its operation to be carried safely by structure during erection. The steel members shall be placed in proper position as per approved drawing, final riveting or permanent bolting shall be done only after proper alignment has been checked and confirmed.
- 4.8.3** Trusses shall be lifted only at nodes. The trusses above 10 m in span shall not be lifted by slinging at two mid points of rafters, which shall be temporary braced by a wooden member of a suitable section. After the trusses are placed in position, purlins and wind bracings shall be fixed as soon as possible. 405 SUB HEAD 10.0 : STEEL WORK
The end of the truss which faces the prevailing winds shall be fixed with holding down bolts, and the other end kept free to move. In case of trusses of spans upto 10m the free end of the truss shall be laid on lead sheet or steel plate as per design, and the holes for holding down bolts shall be made in the form of oblong slots so as to permit the free movements of the truss end. For larger spans the truss shall be provided with proper bearing as per design.
- 4.8.4** Columns and stanchions shall be erected truly vertical with the necessary cross bracing etc. and the base shall be properly fixed with the foundation concrete by means of anchor bolts etc. as per drawing.
- 4.8.5** Anchor bolts to be placed in the concrete foundation should be held in position with a wooden template. At the time of concreting anchor bolt locations shall be provided with suitable timber mould or pipe sleeve to allow for adjustment which shall be removed after initial setting of concrete. The spaces left around anchor bolts shall be linked to a stopping channel in the concrete leading to the side of the pedestal and on the underside of the base plate to allow the spaces being grouted up after the base plate is fixed in the position along with the column footing. Grouting shall be of cement mortar 1:3 (1 cement: 3 coarse sand) or as specified.
- 4.8.6 Bedding of Column, Stanchions etc.:-** Bedding shall not be carried out until the steel work has been finally levelled, plumbed and connected together. The stanchion shall be supported on steel wedges and adjusted to make the column plumb. For multistoreyed buildings, the bedding shall not be done until sufficient number of bottom lengths of stanchions have been properly lined, levelled and plumbed and sufficient floor beams are fixed in position. The base plates shall be wedged clear of the bases by M.S. wedges and adjusted where necessary to plumb the columns. The gaps under the base plate may be made upto 25 mm which shall be pressure grouted with cement grouts. With small columns, if permitted by the Engineer-in-charge, the column base shall be floated on a thick cement grout on the concrete pedestal. The anchor bolt holes in the base plate may be made about 10 to 15 mm larger than the bolts. In such cases suitable washers shall be provided.
- 4.8.7 Painting**
Before the members of the steel structure are placed in position or taken out of the workshop these

shall be painted as follows :

All surfaces which are to be painted, oiled or otherwise treated shall be dry and thoroughly cleaned to remove all loose scale and loose rust. Surfaces not in contact but inaccessible after shop assembly, shall receive the full specified protective treatment before assembly. This does not apply to the interior of sealed hollow sections. Part to be encased in concrete shall not be painted or oiled. A priming coat of approved steel primer such as Red Oxide/Zinc Chromate primer conforming to IS 2074 shall be applied before any member of steel structure are placed in position or taken out of workshop.

4.8.8 Measurements

The work as fixed in position shall be measured in running metres correct to a millimeter and their weight calculated on the basis of standard tables correct to the nearest kilogram. The standard weight of steel sections shall conform to IS 808 with tolerance in sizes as per IS 1852.

Tolerance in weight is given in Table 10.3. Steel sections shall be acceptable within tolerance limits. Payment for steel sections shall be made as per actual weight within tolerances. Sections having weight on higher side than permissible tolerance, may be acceptable but payment shall be made on the basis of standard weight only. Steel sections having weight variations lower than permissible variation shall not be acceptable.

Unless otherwise specified. Weight of cleats, brackets, packing pieces, bolts nuts, washers, distance pieces, separators diaphragm gussets (taking overall square dimensions) fish plates etc. shall be added to the weight of respective items. No deductions shall be made for skew cuts. In riveted work, allowance is to be made for weight of rivet heads. Unless otherwise specified and addition of 2.5% of the weight of structure shall be made for shop and site rivet heads in riveted steel structures. No deduction shall be made for rivet/ or bolt holes (excluding holes for anchor or holding down bolts). Deduction in case of rivet or bolt hole shall, however, be made if its area exceeds 0.02 m². CPWD SPECIFICATIONS 2009 406

The weight of steel sheet and strips shall be taken from relevant Indian Standards based on 7.85 kg/m² for every millimeter sheet thickness. For rolled sections, steel rods and steel strips, weight given in relevant Indian Standards shall be used.

4.8.9 Rate

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

4.9 Roof Sheeting :

Alum/Zinc coated (Galvalume) alloy sheets are 0.71 mm nominal thickness, cold roll formed from a cold rolled coil conforming to ASTM A-792 M, Grade-80 with a minimum yield strength of 550 MPa. These sheets are hot dip coated with a 55% Aluminium and 45% Zinc alloy.

Pre-painted sheets are 0.5 mm nominal thickness, coated with a baked silicon polyester finish on top of an Alum/Zinc alloy finished steel sheet (as per the specification above). The paint finish film thickness is 20 microns of silicon polyester on the exterior face and 10 microns of polyester on the interior face.

5.0 FLOOR FINISHING WORKS

5.1 IRONITE FLOOR FINISH

- a) It shall consist of an underbed and a topping (incorporating iron particles) laid over an already laid and matured concrete base.
- b) Thickness: Unless otherwise specified the total thickness of the finish shall be minimum 50 mm for horizontal surface of which topping shall not be less than 12 mm. While topping shall be of uniform thickness, the under bed may vary in thickness to provide necessary slope. The vertical surface shall

project 6 mm from adjacent plaster or other finishes. Necessary cutting into the surface receiving the finish shall be done to accommodate the specified thickness.

- c) **Material:** The hardening compound shall be uniformly graded iron particles, free from non-ferrous metal impurities, oil, grease, sand, soluble alkaline compounds or other injurious materials. When desired by the MMCI/HPCL Engineer-In-Charge, actual samples shall be tested.
- d) **Mix :**
The under bed for floor and similar horizontal surfaces shall consist of a mix of 1 part of cement, 1 part of sand and 2 parts of stone aggregates by volume. The stone aggregates shall be 10 mm down well graded. Just sufficient water shall be added to give workable consistency.
- e) **Proportion of metallic hardener shall be as specified or as indicated by the manufacturer.** However, in absence of any such direction 1 part metallic hardener shall be mixed dry with 4 parts cement, by weight. To this mixture 6 mm nominal size stone aggregates shall be added in proportion of 1 part cement mixed with hardener to 2 parts of stone aggregates by volume and uniformly mixed. Minimum quantity of water shall be added to make it workable.
- f) **Laying**
The concrete floor shall be laid in panels of 1m x 1m or as directed by the Engineer. Alternate panels shall be laid on one day followed by the other group of alternate panels the next day. The edges of the panels shall be supported either by wooden strips or flat angle iron pieces fixed in position properly. The concrete floor shall be laid upto the required grade. The forms if any shall remain sufficiently projecting to take the finish. The surface shall be roughened by wire brush as soon as possible.
- g) The junction of floor and walls, floors and dado or skirting shall be rounded off as directed.
- h) Wooden strips or flat iron pieces shall be removed from their places before the succeeding alternate layers are laid. The finish shall be laid while the concrete underbed is still very 'green' within about 3 hours of laying of the later. The finish shall be of uniform thickness and even dense surface without trowel marks, pinhole etc. The topping layer shall be pressed firmly and worked vigorously and quickly to secure full bond with the concrete base. Just when the initial set starts the surface shall be finished and smoothed with steel trowel. The finish floor shall be cured for 7 days by keeping it wet.

5.2 VITRIFIED TILES :

Materials :

a) **Non-Skid Joint less Vitrified** tiles shall be of the colour and pattern approved by the Engineer and the size shall be 60 cm. x 60 cm. x 10 cm. They shall conform to IS : 15622 in respect of constituent materials , manufacture , shape , dimensions , tolerances , wearing layers, colour and appearance , general quality, strength resistance to wear , water absorption etc. Prior to use , the samples of tiles shall be approved by the Engineer who shall keep them in his office for reference. Tiles shall be properly cured by immersion in water before incorporation.

Tiles shall conform to the detailed specification , and shall be of colour and pattern as approved by the Engineer , who shall keep samples in his office for reference. Mortar for bedding the tiles shall be in the proportion of one part of cement to four parts of sand. The mortar shall be thoroughly mixed either manually or mechanically. The water added shall be the minimum required to give sufficient plasticity in laying and compacting. Care shall be taken in the preparation of the mortar to ensure that there are no hard lumps that would interfere with the even bedding of the tiles.

5.3 CONSTRUCTION DETAILS FOR NEW FLOOR:

- a) A bed of cement mortar consisting of one part of cement to four parts sand shall be laid and properly levelled to an average thickness of 20 mm. , the surface being kept slightly rough to provide a key for the tiles.
- b) Neat cement paste of honey like consistency shall be spread over the mortar bed over such an area as would be covered by about twenty tiles.
- c) Tiles should be soaked in water for 15 minutes and allowed to dry for an equal amount of time before being laid.
- d) The tiles shall then be coated with a thin coat of cement paste on the back and fixed in place and gently tapped with a wooden mallet till it is properly bedded and level with the adjoining tiles. The joints between tiles shall be fine and nearly imperceptible (1.1/2 mm maximum.).
- e) After tiles have been laid in a room or a days work completed , surplus cement paste that has come out of the joints should be wiped clean. A thick slurry of coloured pigment with white cement , matching the colour of the tiles is then spread over the laid tiles and rubbed so as to seal even the thinnest joint between the tiles.
- f) The floor shall be cured for 3 days.

5.4 Skirting :

Skirting shall be 15 cms. high unless otherwise specified and shall perfectly match with the adjacent flooring. Mortar used shall be 1 :4 cement mortar and joining shall be done by a thick slurry of coloured pigment with white cement , matching the colour of the tiles is then spread over the laid tiles and rubbed so as to seal even the thinnest joint between the tiles.

5.5 GLAZED TILES :

General :

This item relates to the furnishing of materials and installations of glazed tiles in flooring, dado, and also in counters , shelves, sill etc. as per requirement.

Materials :

The tiles shall be of first quality of approved manufacturers. Tiles shall be of size 300x300 mm or more (thickness to be specified by the manufacturer) of 1st quality conforming to IS : 15622. No chipped ,cracked, crazed or warped tiles shall be used. Glazed rounded corners and cups (convex or concave) shall be provided at corner of walls , edge, junctions of floor and dado etc., if so specified. The mortar shall be in the proportion 1 : 3. Preparation of mortar & fixing shall be as specified for vitrified tiles.

Laying :

The fixing shall generally conform to IS : 1443.

Workmanship :

The surface to be covered shall be plastered rough to a thickness of 20 mm. Fix 12 mm size stone chips (5 no. one in each corner and one in the middle of each tile with Adhesive viz., Areldite of

equivalent for keying action) and the tiles shall be soaked in water for at least 2 (two) hours prior to fixing at site. A thin layer of cement paste shall be buttered on the back of the tile and on the side after which the tile shall be pressed and tapped home taking care that the corner tiles are perfectly matching. After the backing coat has set the tile joints shall be grouted with neat, white cement slurry with necessary pigment. All surplus slurry that remains on the surface shall be carefully wiped off before it sets. Care shall be taken to ensure that the finished surface is absolutely plumb and to proper levels without any profusions , waviness or zig- zag. Joints between tiles shall be uniform in straight level lines. After completion of the entire work or part of it , the surface shall be cleared of all stains , cement etc., by washing with oxalic acid (1:10) or any other approved compound.

6.0 ALUMINIUM DOOR, WINDOW ETC.

6.1 All aluminium doors, windows, jallies, curtain wall etc. shall be procured from A class manufacturer subject to the approval of Owner/Architects. Aluminium sections for fabricating framework of doors, windows, jallies, etc. shall be of extruded sections as manufactured by Indian Aluminium Co Ltd or approved equivalent. Extruded section shall have a wall thickness as specified in the Schedule of Quantities or detail drawings. All sections shall be approved by the Owner/Architects before fabrication is taken up, Doors, frames and mullions, transoms shall be anodised to required thickness in a bath of sulphuric acid to provide a uniform casting. A protective transparent coating shall be applied to the Sections before shipment from the Factory. All works for doors, windows, and frames etc. shall be fitted and shop assembled to a first class job, and ready for erection. Shop joints shall be made to hair lines and then welded or braced. Work on the above, other than described shall be carefully fitted and assembled with neat joints with concealed fasteners. Wherever possible, joint shall be made in concealed location and on edges of doors field connections of all work may be made with concealed screws or other approved type of fasteners. All fasteners connecting between aluminium members or between aluminium and concrete shall be either high strength aluminium or of stainless steel. Glazing beads shall be shop fit type without visible screw and shall be of sizes to accommodate various thickness of glazing as specified in the Schedule of Quantities. All works shall be adequately braced and reinforced as necessary for strength and rigidity. The members of the frame work shall be of one piece and no joint shall be allowed unless the same has prior approval of Owner/ Architects. Fabrication drawings for the aluminium curtain waft, jallies etc shall be prepared by the contractors based on the design of the Architects indicating the detailed of frame work, fixing arrangement and other necessary details well in advance of the actual fabrication work and casting of structural element supporting the jallies, curtain wall etc and to be approved by the Owner/Architects. A sample of the jalli, curtain wall etc unit fabricated as per approved drawing shall be produced for approval of Owner/Architects before commencement of bulk fabrication of jall I units curtain wall etc at shop_

6.2 HANDLING & STORAGE OF FABRICATING MATERIALS

All aluminium doors, windows, curtain wall, jallies etc shall be packed and crated properly before despatch, to ensure that there will be no damage to the fabricated materials. Loading in to 'Wagons/ Truck' shall be done with all care to ensure safe arrival of materials at site in undamaged condition. All the fabricated materials at site shall be stored under cover in such a way to prevent damage or distortion. Special care shall be taken to prevent staining of aluminium products by mortar etc. after erection at site.

6.3 ACCEPTANCE CRITERIA

6.3.1 For Fabricated Items :

- a) Overall dimensions shall be within + 1.5 mm of the size shown on drawings.

- b) Mullions, transoms etc. shall be in one length and permissible deviations from straightness shall be limited to + 1.5 mm from the axis of the member.
- c) Door and window shutters shall operate without jamming. The clearance at head and jamb for door shutters shall not exceed 1.5 mm. For double leaf doors, the gap at the meeting stiles shall not be more than 1.5 mm.
- d) Door leaves shall be undercut where shown on drawings.
- e) Doors, windows, frames and curtain wall frame work etc. shall be on a true plane, free from warp or buckle.
- f) All welds shall be dressed flush on exposed and contact surfaces.
- g) Correctness of location and smoothness of operations of all shop installed hardware and fixtures.
- h) Provision for hardware and fixtures like floor spring etc as directed to be installed at Site.
- i) Glazing beads shall be cut with mitred corners.
- j) Glazing clips, fixing devices etc. shall be supplied in adequate numbers
- k) Shop coats shall be properly applied.
- l) Exposed aluminium surfaces shall be free from scratches, stains and discolouration. Anodised surfaces shall be present a uniform and pleasing look.
- m) Anodising thickness shall be minimum 20 micron.

6.3.2 For Installed Items :

- a) Installations shall be at correct location, elevation and in general, on a true vertical plane.
- b) Fixing details shall be strictly as shown on drawings.
- c) Assembly of composite units shall be strictly as per drawings with mastic caulking at transoms and mullions, gaskets, weather strips etc. complete.
- d) All openable sections shall operate smoothly without jamming.
- e) All frames on external walls shall be mastic caulked to prevent leakage through joint between frames and masonry.
- f) Locks, fasteners, floor spring etc. shall be fitted in position properly. Keys shall be non-Interchangeable.
- g) Cutting to concrete or masonry shall be made good and all abrasions to shop paint shall be touched up with paint of same quality as shop paint.

6.4 METHOD OF MEASUREMENT

- a) Supply and installation of doors shall be measured in number of each type used or in sqm as specified in the Schedule of Quantities. The types shall be as shown on drawings and described In Schedule of Items.
- b) Supply of windows shall be measured in square metres correct to two places of decimal. The width and height shall be measured overall from out to out of the frame. The height and width shall be measured correct to 0.5 cm. The Jai & curtain wall shall be measured in sqm.. The height and width shall be measured correct to 0.5 cm.

7. METAL ROLLING SHUTTERS / ROLLING GRILLS

Metal Rolling Shutters and Rolling Grills shall conform to IS:6248, and shall be as per drawings issued by the Engineer. The Contractor shall submit for EIC's approval, the shop drawing covering all details of fabrication, construction and installation. After approval of shop drawing the Contractor shall submit one sample for approval before mass fabrication.

Rolling shutters shall be of following alternative types depending on the method of operation.

Sl. No.	Type	Clear Area of Shutter	Remarks
i.	Self Coiling or Pushing Pull Type	Up to 8 sq.m	Without ball bearing
		8 to 12 sq.m	With ball bearing
ii.	Gear Operated	12 to 25sq.m	With ball bearing. Operated by bevel gear box and crank
		25 to 35 sq.m	With ball bearing operated by chain wheel and hand
iii.	Electrically Operated type	35 to 50 sq.m	

7.1 Materials

Cold Rolled Steel Strips

Cold Rolled Steel Strips used for rolling shutter lath sections shall conform to temper No. 5, Dead soft quality of IS 513.

Mild Steel Sections

Mild Steel Sheets and Plates used for manufacturing the guide channels, brackets and lock plate shall be of hot rolled steel of thickness not less than 3.15 mm conforming to IS:5986. These shall be free from surface defects and the edges shall be cleanly sheared.

Steel Pipe

Mild Steel Pipes used for the suspension shaft of the roller shall be heavy duty pipe suitable for mechanical purposes and shall conform to IS:1161.

Cast Iron Castings

Cast Iron Castings used for roller pulley wheels, U-clamps and bevel gears shall conform to Grade 15 of IS:210. These shall be free of blow holes, surface defects such as cracks, burrs etc.

Springs

The springs used in the roller for counter balancing the rolling shutter shall be made either from high tensile spring steel wire or flat spring steel strip. The spring steel wire used for helical spring

shall conform to Grade 2 of IS:4454. Flat spring steel strip used for spiral spring shall be from 0.8 to 1.0 percent carbon steel strip especially hardened and tempered.

Aluminium Alloy Sheets

Aluminium Alloy Sheets used for curtains in case of rolling grills, shall conform to 52000 (NS4), 53000 (NS5) or 64430 (HS30) of IS:737.

Aluminium Alloy Extrusions

Aluminium Alloy Extrusion for the components of rolling shutters of aluminium shall conform to 53000 (NE5) or 64430 (HE30) of IS:733.

7.2 Fabrication

Curtain

This shall be built up from interlocking lath sections. The lath sections shall be from 18 gauge (1.25 mm) section for curtains up to 9 metres in width. Curtain above 9 metres in width should be divided in two parts with provision of one middle fixed or movable guide channel or supported from the back to resist wind pressure. The lath section shall be rolled so as to have interlocking curls at both edges and a deep corrugation at the centre with a bridge depth of 16 mm to provide sufficient curtain stiffness for resisting manual pressure and normal wind pressure. Each lath section shall be continuous single piece without any welded joint. When interlocked, the lath section shall have a distance of 75 mm between rolling centres. Each alternate lath section shall be fitted with a malleable cast iron or mild steel clips securely riveted at either end, thus locking the lath section at both ends and preventing lateral movement of the individual lath sections. The clips shall be so designed as to fit the contour of the lath sections.

Lock Plate

The Lock Plate provided at the bottom of the shutter, shall be composed of a mild steel plate 3.15 mm thick, reinforced with mild steel angle 35 x 35 x 5 mm at bottom of the plate. The lock plate shall be fitted with sliding bolts at either end to engage with suitable receiving pockets at the bottom of the guide channel. The sliding bolts shall be capable of being locked by means of padlocks both from outside and inside. The lock plate shall also be provided with pulling handles, one handle for 2.5 m width and 2 handles for widths above 2.5 m. Pulling handles shall be fixed on both inside and outside faces of the lock plate.

Guide Channels

These shall be of mild steel deep channel section of rolled, pressed or built up (fabricated) construction. The thickness of the sheet used shall not be less than 3.15 mm. The depth of the guide should be such that there is sufficient clearance between curtain and inner surface of guide. The curtain shall project into the guide at least 40 mm for shutters up to 3.5 m width and 60 mm for greater widths. There shall be a clearance of 10 mm between guide wall and the end clips of the curtain. Where the shutter is installed in heavy windy zones, special wind locking arrangements shall be provided to prevent the curtain coming out of the guide. The clear gap on either side of the curtain and inner faces of the guide channel shall be 5 mm. The depth and width of the guide channel shall be as follows:

Clear Width of	Depth of Guide Channel
Up to 3.5 M	65
3.5 to 8.0 M	75
8.0 m and above	100

Width of Guide Channel shall be 25 mm for lath sections with bridge depth of about 12 mm and 32 mm for lath sections with bridge depth of 16 mm.

Fixing Cleats

Each guide shall have a minimum of 3 fixing cleats. The spacing of cleats shall not exceed 0.75 m. Alternatively, the guide channels may also be provided with suitable dowels hooks or pins for embedding in the walls. The guide channel shall be attached to the wall plumb and true.

Bracket Plate

This shall be fabricated out of mild steel plate of 3.15 mm thick. Thicker plates may be used depending upon the height of the shutter. Dimensions shall be as given in IS:6248. The bracket plate may be square, circular or hexagonal with a U-shaped cast iron or mild steel clamp riveted or welded to it at the centre. The bracket plate should have sufficient cross sectional area to resist the shear arising out of the weight of the curtain, suspension shaft etc. and shall be held rigidly by suitable foundation bolts.

Roller

The suspension shaft of the roller shall be made of steel pipe conforming to heavy duty of IS:1161. The diameter shall be sufficient to limit deflection of shaft under the weight of the rolling shutter. The deflection of the shaft shall not exceed 5 mm per metre width of the shutter. Diameters of the steel pipe for various widths up to 6 m and height 5 m shall be as per IS:6248. Sizing of pipe diameter for greater widths and heights shall be designed giving due consideration for deflection limit mentioned above. The pipes of the suspension shaft which are clamped to the brackets shall be fitted with rotatable cast iron pulleys to which the curtain is attached. The pulleys and the pipe shaft shall be connected by means of pretensioned helical springs to counterbalance the weight of the curtain and to keep the shutter in equilibrium in any partly opened position.

Hood Covers

These shall be made of mild steel sheets not less than 0.9 mm thick, and shall be hexagonal, square or circular contour depending on the contour of the bracket plate. The hood cover shall be stiffened with angle or flat stiffeners at top and bottom edges to retain shape. The hood cover shall be fixed to the bracket plate by means of angle cleats. The hood cover shall also be supported all along the top at suitable intervals to prevent sagging.

Gears, Worms etc

These shall be machine cut. Worm gear wheels shall be of high grade cast iron or mild steel or phosphor bronze. The worms shall be of mild steel or gun metal or phosphor bronze.

Security Devices

For shutter widths exceeding 2.5 m, any one or both of the following security devices may be provided. Anchoring Rods as described in IS:6248. These shall be provided at the rate of one per extra 2.5 m width or part thereof above a clear width of 2.5 m.

Central Hasp and Staple

This shall be provided at the centre of the bottom lock plate. The hasp shall be embedded in the floor at the centre. The staple shall be fitted at the centre of the bottom lock plate outside in an accurate position so that the hasp may properly engage with staple when the shutter is in a closed position. The hasp shall be embedded within the floor so as not to cause any obstruction. Normally one central hasp and outside staple will be sufficient for any width of shutter.

7.3 Optional Features

Intermediate Posts or Mullions

These shall be either of fixed, sliding or removable type, and are used for unusually wide openings or for providing multiple door entries. The mullion also forms the guide channels between the various sections of the rolling shutter. The sliding mullion may also be winch operated for large sizes. The fixing of the intermediate post shall be plumb and true when in position before closing the rolling shutter.

Wicket Door

Large rolling shutter fixed at the main entrance of mills and factories may also be provided with a subsidiary door known as wicket door. This is a hinged service door allowing pedestrian traffic without the need of rolling up the shutter. The wicket door size shall be 600 x 1200 mm for ordinary use and 900 x 1800 mm for large installations. Sizes larger than these are not recommended as these cause difficulties in installation and operation. The wicket door shall be of good robust construction and shall be fitted with a good lever lock operated by key and lockable from both inside and outside. The wicket door shall be erected in such a way so as not to foul with the main rolling shutter when opening or closing. The wicket door shall be swung clear of the opening before the Rolling Shutter is raised.

Galvanising

All components of the rolling shutter may be hot dip galvanised with a zinc coating containing not less than 97.5% pure zinc. The weight of the zinc coating shall be not less than 230 g/sq. m and the coating shall be free from flaking or peeling.

7.4 Operation

Push Pull Type

Push Pull Type shall be operated manually by pulling hooks with appropriate pulling handles in the lock plate. The length of the pulling handle shall be sufficient to push the lock plate up to the top most position.

Gear Operated Type

These shall be operated by two types of arrangement:

- i. by bevel gear box and crank handle
- ii. by chain wheel and chain. The height of the bevel gear box or the bottom of the hand chain shall be 0.85 m from floor. If specified on drawing, the crank handle operation or hand chain operation shall be provided on both sides of the wall. The gear reduction shall be calculated

to reduce the pressure exerted on the crank handle or the pull exerted on the hand chain to not more than 16 kgs.

Electrically Operated Type

These shall be operated by an electric motor operating on 400/440V, 3 phase 50 cycles A.C. supply. Arrangements shall also be made for emergency mechanical operation of the rolling shutter in the event of failure of the electric equipment or electricity. The emergency mechanical operation shall be by an auxiliary chain wheel and hand chain drive. The motor shall have a push button control, with a minimum of 3 buttons marked "Up", "Down" and "Stop". Limit switches shall also be provided to cut off current to the motor when the shutter reaches the limit of its travel in the "Up" or "Down" directions.

7.5 Rolling Grills

These are similar in design and operation to Rolling shutters. Hence, all provisions of Rolling shutters are applicable to rolling grills except for the curtain. The rolling grill curtain may be manufactured out of 8 mm diameter mild steel or aluminium alloy round bars.

Rolling Shutter Cum Grill

These shall be provided in situation where certain amount of ventilation and safety is called for, e.g. in substations and transformer rooms. The rolling shutter may have a small grill portion as specified in the drawing the height of this grill shall generally be 500 mm.

7.6 Painting

All components of Rolling shutter except springs and inside of guide channel shall be thoroughly cleaned free of rust, mill-scale, dirt, oil etc. and two coats of red oxide zinc phosphate epoxy paint shall be applied. Two coats of approved epoxy finish paint shall be applied after installation. Other painting systems shall be employed if specified on the drawings.

Marking

Each shutter shall be clearly and legibly marked with the following information:

- i. Manufacturer's Name or Trade Mark
- ii. Size
- iii. Year of Manufacture.

8.0 CEMENT PLASTER (INTERNAL & EXTERNAL)

- a) **Preparation of Surface** : The walls to be plastered to have all joints raked out to a depth of 10 mm, if not already done. R.C.0 surface shall be properly hacked to get good key to the plaster. All dust and oily matter, if any, shall be brushed and cleaned and surface to be plastered shall be kept wet for 6 hours before plastering is commenced.
- b) **Proportion of Mortar** : The plaster in walls, lintels, columns, ceiling, ceiling beams, projected slabs, rails, chajja, marquise, domes etc shall be done with sand cement mortar in the proportion as described in the Schedule of Quantities. No more cement mortar shall be prepared than that can be used within half an hours.

- c) **Application of Plaster** : The mortar shall be applied evenly with force on the surface to be plastered. The mortar surface shall be finished at once by being rubbed over with a trowel till the cement appears on the surface. All corners, angles and junctions shall be truly vertical and horizontal as the case may be, carefully and neatly finished. Rounding of corners and junctions where required shall be done without extra charge. The mortar shall adhere to the surface intimately when set and there should be no hollow sound when struck.
- d) When neat cement finish is specified over the plaster surface, a coat of pure portland cement slurry, 1.5 -mm thick shall be applied and well rubbed to the plaster surface while the plaster surface is still fresh.
- e) When no finish is specified, the plastered surface shall be rubbed well to an even plane with a wooden float for external surface and finished smooth with a steel trowel for internal surface.
- f) **Rates to include** : Apart from other factors mentioned elsewhere in the contract rates for the item of plaster shall include for the following :-
- i) Erecting, dismantling and removing The scaffolding.
 - ii) Preparing the surface to receive the plaster.
 - iii) Providing cement plaster of the specified average thickness
 - iv) All labour, materials, use of tools and equipment to complete the plastering as per specification.
 - v) Curing for 7 days.
 - vi) Any moulding work if shown on the drawings or as specified unless separately provided in the tender.
 - vii) Plaster work in bends, arises, rounded angles, fair edges, narrow returns, quirks 'V' joints, splays, drip mouldings, making good to metal frame junctions with skirting's of dados narrow width and small quantities, making Good round pipes, conduits, timbers, sills, brackets, railings, etc and making good after all the sub-contractors or nominated sub-contractors have done their work.
 - viii) Neat cement finish when specified in the item.
- g) **Mode of Measurement:** Plaster shall be measured in square metre.

Walls : The measurement of wall plastering shall be taken between the walls or partitions (the dimensions before plastering shall be taken) for the length, and from the top of floor or skirting depending upon the situation to the ceiling for the height.

Deductions : For jambs soffits, sills, etc. for openings not exceeding 0.5 sq.m each in area, ends of joists, beams, posts, girders, steps etc. not exceeding 0.5 sqm each in area, and openings not exceeding 3 sqm each, deductions and additions shall be made in the following manners:-

- a) No deductions shall be made for ends of joists, beams, posts, etc and openings not exceeding 0.5 sqm and no additions shall be made for reveals, jambs, soffits sills etc. of these openings nor for finishing the plaster around ends of joists, beams, posts, etc,
- b) Deductions for openings exceeding 0.5 sqm but not exceeding three sqm each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings

- i) When both faces of wall are plastered with the same type of plaster, deduction shall be made for one face only.
- ii) When two faces of wall are plastered with different type of plasters or if one face is plastered and other pointed, deductions shall be made in the plaster or pointing on the side on which the width of reveals is less than that on the other side but no deduction shall be made from plaster or pointing on the other side. Where widths of reveals on both faces of wall are equal, deduction of 50 per cent of area of from areas of plastering and/or pointing as the case may be.
- ii) When width of door frame is equal to thickness of wall or is projecting beyond thickness of wall, full deduction for opening shall be made from each plastered/pointed face of the wall.
- iv) In case of openings of area above 3 sqm each .deductions shall be made for the openings but jambs, soffits and sills shall be measured.

Ceiling

- i) Ceiling shall be measured between the walls or partitions and the dimensions before plastering shall be taken.
- ii) Ceiling with projected beams shall be measured over beam and the plastered sides of beams shall be measured and added to plastering on

9.0 PUTTY

The surface shall be thoroughly cleaned of dust, old white or colour wash by washing and scrubbing. The surface shall then be allowed to dry for at least 48 hours. It shall then be sand papered to give a smooth and even surface. Providing and applying white cement based putty of average thickness 2 mm, of approved brand and manufacturer, over the plastered wall surface to prepare the surface even and smooth complete

9.1 Rates to include

Apart from other factors mentioned elsewhere in this contract, rates for the item of plaster of paris punning shall include the following:

- i) Erecting, dismantling and removing the scaffolding.
- ii) Preparing the surface to receive the said finish.
- iii) Providing white cement based putty of the required thickness to make the surface perfect smooth and even including cost of materials.
- iv) Any moulding work if shown in the drawings or as specified.

v) Finishing in bends, arises, rounded angles, fair edges, narrow returns, quirk, 'V' joints, splays, drip mouldings, making good to metal frames, junctions with skirting or dados, narrow widths and small quantities, making good round pipes, conduits, timbers, sills, brackets, railings etc. and making good after all the subcontractors or nominated sub-contractors have done their works.

9 . 2 Mode of Measurements

The measurement shall be in square metre. The mode of measurement shall be as applicable to that for plaster.

10.0 PLASTIC EMULSION PAINT

10.1 Material

The emulsion paint and primers in general shall be of approved quality colour and shade of approved manufacturers.

10.2 Scaffolding

This shall be double or single as required and directed. If ladders are used, pieces of gunny bags or cloth bags shall be tied on their tops to avoid damage or scratches to the plastered surfaces etc. proper stage scaffolding shall be erected when painting the ceiling.

10.3 Preparation of the Surface :

The surface to be painted shall be cleaned and all cracks, holes and surface defects shall be repaired with plaster of paris for spot, filling, and with filler prepared with whiting, water and a little quantity paint for filling and levelling the wider areas.

10.4 Priming Coat

The priming coat of the cement primer of approved quality make shall be applied over the completely dry surface in the manner as recommended by the paint manufacturers.

10.5. Application of Emulsion Paint

The recommendation of approved paint manufacturer, whose product is used, shall be followed regarding the preparation of the surface and the application of the priming and finishing coats. The contractor shall arrange for technical assistance and supervision from the paint manufacturer, during the execution of the painting work. After the priming coat has been applied and perfectly dried, all holes, scratches, if any, shall be repaired as mentioned in 'preparation of surface' and then the second coat of approved shade and manufacturer shall be evenly applied and allowed to dry. The third coat shall be carefully applied to achieve smooth and even surface after the previous coat has dried up. Minimum 3 coats of paint shall be applied inclusive of primer coat. If a proper and even surface is not obtained to the satisfaction of the Owner/Architects in 3 coats, Contractor shall carry out additional coats of painting to approval, at contractor's expenses. Care shall be taken that dust or other foreign materials do not settle or disfigure the various coats.

10.6 Rates to Include :

Apart from other factors mentioned elsewhere in this contract, the rates for the item of plastic emulsion paint shall include for the following :-

- i) All labour, materials and equipment necessary to carry out the work.
- ii) Supplying the approved emulsion paint for priming and finishing coats.
- iii) Preparing the surface for receiving the primer and finishing coats.
- iv) Scaffolding including its erections and dismantling.
- v) Application of one primer coat and minimum two coats of finishing. If a proper and even surface is not obtained to the satisfaction of Owner/Architects in 3 coats mentioned above, the contractor shall carry out additional coats of painting to approval at contractor's expense.
- vi) Protection to painted surface till dried and handed over.
- vii) Expense, if any, for supervision and technical assistance supplied by the approved paint manufacturers.

10.7 Mode of Measurement

The measurement shall be in square metre. The mode of measurement shall as applicable to that for white washing.

11.0 FALSE CEILING :

These specifications refer to the supply and installation of False ceiling.

Materials :

a) Suspension System :

The main load bearing member shall be a rectangular pressed metal formed section of size 2" x 1.5" fabricated from 22 gauge G.I. sheet. The cross runners or furring channel shall be in the form of a trough 2" x 3/8" fabricated from 24 gauge G.I sheet. Wall angles shall be 1" x 1". The main runners or load bearing members shall be suspended from the Roof by means of a metallic expansion fastener. The hanger rods with threaded ends and 2 heavy M.S. Check nuts shall hold the main runners with level adjusting holding clamp of size 3" x 1". The main runners shall be fixed at 3 feet centre to centre and the cross runner shall be fixed to the underside of the main runners at a distance not greater than 1'-6" and at right angles to the main by means of Galvanised Clips diagonally , made of 10/12 SWG G.I. Wire.

b) Ceiling Tiles:

The ceiling tiles shall be 12 mm hard reflecting Mineral fibre ceiling tile or Gypsum board as specified. They shall be of approved quality and manufacture .

Workmanship :

After the runners are fixed at the required height they shall be checked for straightness. They shall be made perfectly level by means of the threaded hangers. Before fixing the tiles, the upper surface and edges of the tiles shall be treated with double coat of double boiled linseed oil or water-resistant varnish. They shall then be screwed on to the underside of the cross runners. Care must be taken that the tiles present an absolutely flat and level surface and that all joints are perfectly straight. All joints shall be sealed with filler of approved quality.

12.0 STANDARD SPECIFICATIONS

Unless otherwise specified elsewhere in this contract, all work under this contract shall be carried out in accordance with the technical specification and the latest issue of the Indian Standard Specification applicable to the particular class of work. If Indian Standards are not formulated for any particular material of work, the relevant British Standard Specification shall apply. Relevant issue of I:S. specifications as applicable to the 'particular work have been described along with the specification for the respective Works, In case of any confusion or dispute regarding the meaning and interpretation of any specification for the respective works, the decision of the Owner/Architects shall be final and binding on the contractor.

13.0 APPROVED LIST OF MATERIALS

Unless otherwise stated elsewhere in this contract all materials to be used in the work shall be with ISI mark or equivalent as approved by the Owner/Architects. Contractors intent to use any material other than ISI mark prior approval of the Owner/Architects should be obtained.
(Please see Page- 92-93)

LIST OF MATERIALS APPROVED BRAND / MANUFACTURER

SL. NO	NAME OF MATERIALS	MAKE
1.	Cement	ULTRATECH / LAFARGE / AMBUJA / ACC or any brand approved by the Authority.
2.	Steel	SAIL / TATA / RINL.
3.	Ceramic Tiles	Kajaria / Orient / Johnson / NITCO
4.	Vitrified Tiles	Kajaria / Johnson / NITCO
5.	Calibrated Factory (Autoclave) Processed marble slab	Floriarna / Kalinga stone or any –brand approved by the Authority.
6.	Flush Door	Mayur / Oxford / Globe I Green Ply / Century with ISI mark.
7.	Floor Hardening Compound	Ironite R ^o .ronite
8.	Water Proofing Compound	Nils, BASF, Ws. Pidilite, M/s, Sika Qualcrete, M/s. Choksey Chemicals Pvt Ltd, Ws. os roc.
9.	Aluminium Doors, Windows, Curtain ,Wall, Structural Glazing	M/s. Nitson & Amitsu, M/s. Alfa Aluminium, M/s. Tara Engineering, M/s Hydro Building System
10.	Aluminium Extruded Sections	M/s. Hindalco, M/s.. Zindal, M/s. Century.
11.	Glazing	M/s. Saint Gobain Glass (I) Ltd, Ws. Pilkington Glass India Ltd, Ws. Ashai India Glass Ltd.
12.	Hardware Fittings, Locks	M/s. Acme, Mts. Hafele, Ws. Godrej, M/s. Dunex, M/s Hettich, M/s. Kich or as approved by the Authority.
13.	Water Proofing, Treatment to Roof / Sunken Floor	M/s. Texsa India Ltd, M/s. BASF or as approved by the Authority.
14.	Door Closures & Floor spring.	M/s. Hafele, Ws. Hettich, M/s. Godrej or as approved by the Authority.
15.	Water Proof Adhesive for Tile Fixing	M/s. Bal-Endura, Ws. Pidilite, M/s. Sika, M/s. MYK Laticrete.

SL. NO	NAME OF MATERIALS	MAKE
16.	M/s. Exterior Grade Acrylic Emulsion Paint	Asian Paints, ICI, Nerolac Paints, Berger Paints.
17.	Synthetic Enamel Paints, Distemper, Plastic Emulsion Paint	Asian Paints, Nerolac Paints, Berger Paints, ICI, Nippon.
18.	Glass Fibre Reinforced Concrete	Grasim Industries Ltd or as approved. Materials
19.	Glass Mosaic Tiles	Palladio, Piccabo, Bisazza or as approved.
20.	False Ceiling	Amstrong / Gypsum India

Note :

1. The Employer/Architects shall have the final say about which material amongst the over mentioned make/brand shall be used in the project and the contractor shall have no claim on this account.
2. If the approved brands mentioned above are not available, equivalent make as may be approved by the Employer/Architects, only to be used for the work.